How the Border Adjustment Tax Would Work

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With apologies to readers who long ago moved away from algebra, we offer here a short mathematical explanation of how a border adjustment tax would work. Those not wishing to endure the pain—and believe me I understand—can jump to "Results" below. I add that the presentation here resulted from a long night lying in bed developing the equations as sleep refused to come. The equations have since been confirmed to be accurate and not the ramblings of a crazy insomniac.

A border adjustment tax sounds like a fee on imports. While the inability to deduct the cost of an import under a situation where the corporate income tax is twenty percent suggests a tariff has been imposed, this conclusion is wrong. To see why, consider the following example.

A firm has determined its per-unit profit-maximizing retail price for a good, P_r, based on the per-unit cost of the material it produces, P_m. Assume the firm is a retailer that incurs a per-unit cost of C. The firm sells Q units and pays a tax rate of τ. The firm's after-tax profits are given by this equation:

$$\text{Profit} = (1 - \tau) * (P_r - C - P_m)Q \qquad [1]$$

The per-unit profit, π, is given by this equation:

$$\pi = (1 - \tau) * (P_r - C - P_m) \qquad [2]$$

Now suppose a border adjustment tax is imposed and that all the firm's materials are imported. The firm's profit equation becomes this:

$$\text{Profit} = (((1 - \tau) * (P_r - C)) - P_m)Q \qquad [3]$$

The per-unit profit becomes the following:

$$\pi = (1 - \tau) * (P_r - C) - P_m \qquad [4]$$

Obviously, profits have declined if Pm > 0.

To achieve the same profit under the tax, the firm must raise the retail price from P_r to P_r'. The new profit equation then becomes this one:

$$\pi = (1 - \tau) * (P_r' - C) - P_m \qquad [5]$$

Set equation [2] equal to equation [5] and solve as follows:

$$(1 - \tau) * (P_r' - C) - P_m = (1 - \tau) * (P_r - C - P_m) \qquad [6]$$

One finds this:

$$P_r' - P_r = \tau / (1 - \tau) * P_m \qquad\qquad [7]$$

In other words, the difference in the retail price that holds the merchant whole is equal to the tax rate divided by one minus the tax rate times the cost of the imported good. With a tax rate of twenty percent, this becomes twenty five percent.

Note also that one can use [7] to calculate the difference between the domestic and the imported price of materials. In this case, the per-unit profit equation for the firm using domestic goods and the firm using the foreign product are given by

$$\pi = (1 - \tau) * ((P_r - C) - P_d) \qquad\qquad [8]$$

and

$$\pi = (1 - \tau) * ((P_r - C) - P_m) \qquad\qquad [9]$$

respectively, where P_d and P_m are the costs of the domestic and imported materials.

For the domestic and the imported goods, because the goods sell for the same price, P_r, one can note the following:

$$P_r = (\pi / (1-\tau)) + C + P_d = (\pi + P_m) / (1 - \tau) + C \qquad\qquad [10]$$

Solving one finds this:

$$P_d = P_m / (1 - \tau) \qquad\qquad [11]$$

Results. The analysis shows that domestic prices would be twenty-five percent higher with a twenty-percent tax. Domestic prices would be eighteen percent higher with a fifteen-percent tax.