2. A country imports 3 billion barrels of crude oil per year and domestically produces another 3 billion barrels of crude oil per year. The world price of crude oil is $90 per barrel. Assuming linear curves, economists estimate the price elasticity of domestic supply to be 0.25 and the price elasticity of domestic demand to be 0.1 at the current equilibrium.

a. **Consider the changes in social surplus that would result from imposition of a $30 per barrel import fee on crude oil that would involve annual administrative costs of $250 million. Assume that the world price will not change as a result of the country imposing the import fee, but that the domestic price will increase by $30 per barrel. Also assume that only producers, consumers, and taxpayers within the country have standing. Determine the quantity consumed, the quantity produced domestically, and the quantity imported after the imposition of the import fee. Then estimate the annual social benefits of the import fee.**

b. **Economists have estimated that the marginal excess burden of taxation in the country is 0.25 (see Chapter 3). Re-estimate the social net benefits assuming that 20 percent of the increase in producer surplus is realized as tax revenue under the existing tax system. In answering this question, assume that increases in tax revenues less the cost of administrating the import fee are used to reduce domestic taxes.**

c. **The reduction in the country's demand for imports may affect the world price of crude oil. Assuming that the import fee reduces the world price from $90 to $80 per barrel, and thus, the after-tax domestic price is $80 + $30 = $110 per barrel, a net increase in domestic price of $20 per barrel, repeat the analysis done in parts a and b.**

2.a. The imposition of the import fee would have the following effect on the domestic market:

Change in quantity consumed: $-.1 = (\Delta q/\Delta p)(p/q)$

$\Delta q = (-.1)\Delta p(q/p)$

$\Delta q = (-.1)(\$30)(6 \text{ billion})/(\$90)$

$\Delta q = -.2$ billion

Change in domestic supply: $.25 = (\Delta q/\Delta p)(p/q)$

$\Delta q = (.25)\Delta p(q/p)$

$\Delta q = (.25)(\$30)(3 \text{ billion})/(\$90)$

$\Delta q = .25$ billion

Thus, after imposition of the fee, domestic consumption will fall to 5.8 billion barrels per year, domestic production will rise to 3.25 billion barrels per year, and imports will fall to 2.55 billion barrels per year (5.8 billion – 3.25 billion).

The changes in surplus to producers, consumers, and tax-payers is as follows:

Change in domestic producer surplus:

A. Surplus from additional .25 billion barrels produced

Revenue = (.25 billion)($120) = $30 billion/year

Production costs (area under supply schedule) =

(.5)($120-$90)(.25 billion) + ($90)(.25 billion) = $26.25 billion/year

Net change in surplus from new production =

$30 billion/year-$26.25 billion/year = $3.75 billion/year

B. Surplus from higher prices on original production =

($120-$90)(3 billion) = $90 billion/year

Total change in producer surplus =

$3.75 billion + $90 billion = $93.75 billion/year

Change in consumer surplus:

C. "Deadweight loss" from reduced consumption =

(.5)($120-$90)(.2 billion) = $3 billion/year

D. Additional payments on quantity still consumed =

($120-$90)(5.8 billion) = $174 billion/year

Total change in consumer surplus =

(-$3 billion) + (-$174 billion) = -$177 billion/year

Change in tax revenues:

E. Import fee applied to new import level:
($30)(2.55 billion) = $76.5 billion/year

F. Administrative costs
-$.25 billion/year

Total change in tax revenues =
$76.5 billion - $.25 billion = $76.25 billion/year

CBA from country's perspective:

Costs:	
Change in consumer surplus	-$177.00 billion/yr
Benefits:	
Change in domestic producer surplus	$93.75 billion/yr
Net gain to tax-payers	$76.25 billion/yr
Net benefits:	-$7.00 billion/yr

The import fee would have negative net benefits of $7 billion/year and therefore does not pass the CBA test.

Notice that over half of the loss in consumer surplus is offset by an increase in producer surplus. Note also that we can base our decision on only one year if we assume that none of the parameter values will change over time. If any of the parameters changed over time, then we would have to extend the analysis to multiple periods. This would be the case, for example, if we thought that the estimated elasticities were appropriate for the short-run, but not for the longer-run because producers and consumers would be better able to adjust to higher prices as time passed because they would have more opportunities to change their capital stocks.

2.**b.** Assuming 20 percent of producer surplus is collected as taxes, the costs and benefits are:

Change in consumer surplus:	-$177.00 billion
After tax change in producer surplus:	$75.00 billion
Net gain to taxpayers:	$95.00 billion
Net gain to taxpayers times METB:	$23.75 billion
Net benefits:	$16.75 billion

Not only do tax-payers enjoy reductions in tax payments, but the reduction in tax payments results in a reduction in deadweight loss. To calculate this latter benefit, we multiply the fiscal change by the METB. Taking account of the METB in this case makes an important difference: the tax would not pass the net benefits test if METB is zero (implicitly assumed in part a), but would pass the net benefits test if the METB is .25.

2**.c.** The following changes in quantities result:

Change in quantity consumed: $-.1 = (\Delta q/\Delta p)(p/q)$

$\Delta q = (-.1)\Delta p(q/p)$

$\Delta q = (-.1)(\$20)(6 \text{ billion})/(\$90)$

$\Delta q = -.133$ billion

Change in domestic supply: $.25 = (\Delta q/\Delta p)(p/q)$

$\Delta q = (.25)\Delta p(q/p)$

$\Delta q = (.25)(\$20)(3 \text{ billion})/(\$90)$

$\Delta q = .167$ billion

Thus, after the tax, 5.867 billion barrels are consumed, 3.167 billion barrels are domestically produced, and 2.7 billion barrels are imported.

Consumer surplus loss =

(.5)(.134 billion)($110-$90) + (5.867 billion)($110-$90) = $118.68 billion/year

Producer surplus gain =

(.25 billion)($120) – [(.5)(.25 billion)($120-$90) + (.25 billion)($90)] + (3 billion)(120-$90)

= (.5)(.167 billion)($110-$90) + (3 billion)($110-$90)

= $61.67 billion/year

Net taxpayer gain =

($30)(2.7 billion) - $.25 billion = $80.75 billion/yr.

If the METB is assumed to be zero, then net benefits are $23.74 billion per year.

Assuming that 20 percent of producer surplus is transferred to the government through the existing tax system and the METB is 0.25, the net social benefits are:

(49.34) + (80.75+12.33) + (0.25)(80.75+12.33) – 118.68 = $47.01 billion/year.