

2. Recall exercise 2 from Chapter 5 in which a country imposes an import fee on the crude oil it imports. Assume that prior to the imposition of the import fee, the country annually consumed 900 million short tons of coal, all domestically mined, at a price of \$66 per short ton. How would the CBA of the import fee change if, after imposition of the import fee, the following circumstances are assumed to result from energy consumers switching from crude oil to coal?

- a. Annual consumption of coal rises by 40 million short tons, but the price of coal remains unchanged.**
- b. Annual consumption of coal rises by 40 million short tons and the price of coal rises to \$69 per short ton. In answering this question, assume that the prices of other goods, including coal, were not held constant in estimating the demand schedule for crude oil.**
- c. Annual consumption of coal rises by 40 million short tons and the price of coal rises to \$69 per short ton. In answering this question, assume that the prices of other goods, including coal, were held constant in estimating the demand schedule for crude oil. Also assume that the demand schedule for coal is completely inelastic.**
- d. The market price of coal underestimates its marginal social cost by \$7 per short ton because the coal mined in the country has a high sulphur content that produces smog when burned. In answering this question, assume that the annual consumption of coal rises by 40 million short tons, but the price of coal remains unchanged.**

2.a. As long as the secondary market for coal is undistorted and its price does not change, the increased consumption of coal is irrelevant to estimation of changes in social surplus in the primary (crude oil) market.

2.b. Since it was assumed that the price of other goods, including coal, were not held constant in estimating the primary market (crude oil) demand schedule, the crude oil demand curve can be viewed as an equilibrium demand curve. Consequently, there is no need to consider changes in the secondary market for coal.

2.c. If price rises in the secondary (coal) market and the prices of other goods were held constant in estimating the demand schedule in the primary (crude oil) market, then this demand schedule does not capture all the changes in social surplus. Hence, in principle, it is necessary to subtract the change in social surplus in the coal market from the estimated social surplus in the crude oil market.

The price rise in the domestic crude oil market can be thought of as causing an outward shift in the demand for coal. The change in social surplus in the coal market would be measured relative to the shifted demand schedule.

We can calculate the gain in producer surplus in the coal market as $(.5)(40 \text{ million})(\$69 - \$66) + (900 \text{ million})(\$69 - \$66) = \$2,760 \text{ million/year}$, because we have two points on the supply schedule (\$66, 900 million) and (\$69, 940 million), which allow us to calculate the area of the relevant trapezoid as a triangle above the added production and a rectangle above the previous production.

By assuming perfectly inelastic demand for coal, we can calculate the loss in consumer surplus as: $(940 \text{ million})(\$69 - \$66) = \$2,820 \text{ million/year}$.

Note that this amount would be slightly larger if we had assumed somewhat more realistically that the demand curve had a negative slope.

Thus, the net benefits of the import fee as measured in the crude oil market should be reduced by: $\$2,820 \text{ million} - \$2,760 \text{ million} = \60 million/year .

Notice that this amount is extremely small relative to the net benefits that occur in the primary market (see question 2 in Chapter 5). Thus, knowing the effect of the import fee in the secondary market for coal is unlikely to change our conclusions about whether the fee should be implemented.

2.d. If the market for coal is distorted with an externality, then a relevant social surplus change occurs even if price does not change. In this case, the social surplus loss in this secondary market would be $(40 \text{ million short tons})(\$7 \text{ externality per short ton}) = \$0.28 \text{ billion/per year}$.

Note that all of the analyses in the answers to question 2 in Chapter 5 and to this question assume that there are no externalities in the primary (crude oil) market. If there were an externality in this market, then the import fee would generate additional benefits because total crude oil consumption falls. Of course, the switch to coal might very well involve an even larger social surplus loss due to environmental externalities.