Chapter Summaries

Chapter 15: Taxes and Inefficiency – the Excess Burden of Taxation

Taxes are a necessary evil in the sense that they typically introduce inefficiencies into the market economy. Therefore, the efficiency goal with respect to taxation is to raise a given amount of tax revenue with the minimum efficiency loss. To this end, the chapter begins by describing the efficiency loss to a consumer from an *ad valorem* excise tax. The consumer purchases two goods, X and Y, and has a given amount of income. Good X is taxed; good Y is untaxed and $P_Y = 1$, so that a unit of Y is a unit of income.

1. The efficiency loss from a tax is referred to as *excess burden* or deadweight loss.
2. The excise tax on X rotates the consumer's budget line inward as the price of X rises by tP_X, the *ad valorem* tax rate times the original, without-tax price of X.
3. The loss to the consumer from the tax is measured by Hicks' equivalent variation (HEV), the parallel distance between the without-tax and with-tax indifference curves measured at the without-tax prices. It is the income the consumer would be willing to give up to return to the original prices.
4. The HEV exceeds the revenue collected from the tax. The difference between the HEV and the tax revenue is the excess burden or deadweight loss of the tax.
5. The movement from the without-tax to the with-tax equilibrium is the result of the substitution and income effects of the tax-induced price change. The substitution effect is the source of the efficiency loss. If there were only an income effect, as there is with a lump-sum tax, then the HEV would equal the tax revenues collected. This is the unavoidable loss from the tax, the tax revenues collected from the consumer. The substitution effect, by further reducing the quantity of X demanded and reducing tax revenue for the same level of after-tax utility, generates the excess burden of the tax, which is the avoidable loss from the tax.

The next section of the chapter pictures the efficiency loss of the tax using supply and demand curves. The supply curve is assumed to be perfectly elastic at the before-tax price (constant marginal cost), so that all the loss occurs to the consumer.

6. The compensated demand curve for X shows the quantity of X demanded as the price of X changes given that the consumer receives or sacrifices income to remain on the with-tax indifference curve. As such, it captures only the substitution effect of the price change. The compensated and actual demand curves for X meet at the with-tax price, and the compensated demand curve lies to the left of the actual demand curve for prices below the with-tax price.
7. The HEV, the income measure of loss from the tax, is the trapezoidal area behind the compensated demand curve to the price axis between the after-tax price and the before-tax price. The excess burden or deadweight loss subtracts the tax revenue collected; it is the area of the triangle whose base in the change in quantity demanded along the compensated demand curve as a result of the tax and whose height is the tax tP. The triangle is called the deadweight loss triangle.
8. The way to avoid deadweight loss is to tax goods (factors) whose compensated demand (supply) curves are highly inelastic because then the substitution effect, the source of the deadweight loss, is low.
9. Taxing a normal good whose actual demand elasticity is close to zero must have both substitution and income effects that are close to zero; therefore its compensated demand elasticity is also close to zero and the deadweight loss is low.
10. Taxing factors whose actual supply curves are highly inelastic may not avoid deadweight loss, however, since the substitution and income effects work in opposite directions for factor supplies. The labor–leisure model shows that even if the actual labor supply curve is perfectly inelastic, the compensated labor supply can be quite elastic. Hausman showed that the near-zero response of labor supply in the U.S. to the federal personal income tax masks a canceling of fairly substantial substitution and income effects. He estimates that the deadweight loss from the tax is on the order of 30% of the personal income tax revenues collected.
11. In the market for goods and services, if the supply curve is upward sloping, then the loss in producer surplus must be added to the loss in consumer surplus (measured with reference to the compensated demand curved) in calculating the deadweight loss from the tax.
12. The following principles apply when more than one goods market is taxed (assuming again the case of perfectly elastic supplies so that the only deadweight loss from taxation occurs on the demand side of the market):
    a. Consider the taxes levied one at a time, and use the compensated demand curve in each market to measure the loss. The order in which the taxes are added does not matter.

b. Loss rises or falls only in the markets that are already taxed.
c. For each tax that is added, calculate the deadweight loss triangle in that market in the usual manner. Then subtract the additional tax revenues collected (add the decreased tax revenues) as demand shifts in already taxed markets as a result of the new tax added. The tax revenues decrease (increase) in markets whose goods are complements (substitutes) to the good whose tax is being newly added from the list of taxed goods.

The chapter concludes by deriving three useful formulas for the loss from a single tax in a market for a good or service, X, again assuming that supply is perfectly elastic so that all the loss is on the demand side of the market.

13. The total loss from a single tax: $L = 1/2t^2E_{X,P}PX$, where t is the *ad valorem* tax rate, $E_{X,P}$ is the compensated demand elasticity of X, and P is the price of X without the tax. Loss varies with the square of the tax rate.
14. The marginal loss from the tax: $dL/dt = tE_{X,P}PX$.
15. The marginal loss from the tax per additional dollar of tax revenue collected, T: $dL/dT = tE_{X,P}$.