In this chapter, look for the answers to these questions:

- How does a tax affect consumer surplus, producer surplus, and total surplus?
- What is the **deadweight loss** of a tax?
- What factors determine the size of this deadweight loss?
- How does tax revenue depend on the size of the tax?

### Review from Chapter 6:

- A tax is a wedge between the price buyers pay and the price sellers receive.
- A tax raises the price buyers pay and lowers the price sellers receive.
- A tax reduces the quantity bought & sold.
- These effects are the same whether the tax is imposed on buyers or sellers, so we do not make this distinction in this chapter.

### The Effects of a Tax

- Eq’m with no tax:
  - price = $P_e$
  - quantity = $Q_e$
- Eq’m with tax = $T$ per unit:
  - Buyers pay $P_b$
  - Sellers receive $P_s$
  - Quantity = $Q_T$

### The Effects of a Tax

- Next, we apply welfare economics to measure the gains and losses from a tax.
- We determine consumer surplus (CS), producer surplus (PS), tax revenue, and total surplus with and without the tax.
- Tax revenue can fund beneficial services (e.g. education, roads, police) so we include it in total surplus.
The Effects of a Tax

Without a tax,
CS = A + B + C
PS = D + E + F
Tax revenue = 0
Total surplus = CS + PS = A + B + C + D + E + F

The Effects of a Tax

With the tax,
CS = A
PS = F
Tax revenue = B + D
Total surplus = A + B + D + F
The tax reduces total surplus by C + E

About the Deadweight Loss

Because of the tax, the units between QT and QE are not sold.
The value of these units to buyers is greater than the cost of producing them, so the tax prevents some mutually beneficial trades.

What Determines the Size of the DWL?

- Which goods or services should govt tax to raise the revenue it needs?
  - One answer: those with the smallest DWL.
- When is the DWL small vs. large?
  - Turns out it depends on the price elasticities of supply and demand.
- Recall:
  - The price elasticity of demand (or supply) measures how much QD (or QS) changes when P changes.
### Why Elasticity Affects the Size of DWL

- A tax distorts the market outcome: consumers buy less, producers sell less, market \( Q \) is below the surplus-maximizing \( Q \).
- Elasticity measures how much buyers and sellers respond to changes in price, and therefore determines how much the tax distorts the market outcome.

### ACTIVE LEARNING 2: Elasticity and DWL of a tax

Would the DWL of a tax be larger if the tax were on

A. Rice Krispies or sunscreen?
B. Hotel rooms in the short run or hotel rooms in the long run?
C. Groceries or meals at fancy restaurants?
**Active Learning 3:**

Discussion question

- The government must raise tax revenue to pay for schools, police, etc. To do this, it can either tax groceries or meals at fancy restaurants.
- Which should it tax?

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**How Big Should the Government Be?**

- A bigger government provides more services, but requires higher taxes, which cause DWLs.
- The larger the DWL from taxation, the greater the argument for smaller government.
- The tax on labor income is especially important; it’s the biggest source of govt revenue.
- For many workers, the *marginal tax rate* (the tax on the last dollar of earnings) is almost 50%.
- How big is the DWL from this tax? It depends on elasticity.…

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**How Big Should the Government Be?**

If labor supply is inelastic, then this DWL is small.

Some economists believe labor supply is inelastic, arguing that most workers work full time regardless of the wage.

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**The Effects of Changing the Size of the Tax**

- Policymakers often change taxes, raising some and lowering others.
- What happens to DWL and tax revenue when taxes change? We explore this next.…

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**DWL and the Size of the Tax**

Initially, the tax is $T$ per unit.

Doubling the tax causes the DWL to more than double.
**CHAPTER 8**  
**APPLICATION: THE COSTS OF TAXATION**

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**DWL and the Size of the Tax**

Initially, the tax is $T$ per unit.

Tripling the tax causes the DWL to more than triple.

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**Implication**

When tax rates are low, raising them doesn’t cause much harm, and lowering them doesn’t bring much benefit.

When tax rates are high, raising them is very harmful, and cutting them is very beneficial.

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**Summary**

When a tax increases, DWL rises even more.

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**Revenue and the Size of the Tax**

When the tax is small, increasing it causes tax revenue to rise.

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**Revenue and the Size of the Tax**

When the tax is larger, increasing it causes tax revenue to fall.

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**CHAPTER SUMMARY**

- A tax on a good reduces the welfare of buyers and sellers. This welfare loss usually exceeds the revenue the tax raises for the govt.
- The fall in total surplus (consumer surplus, producer surplus, and tax revenue) is called the deadweight loss (DWL) of the tax.
- A tax has a DWL because it causes consumers to buy less and producers to sell less, thus shrinking the market below the level that maximizes total surplus.

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CHAPTER SUMMARY

- The price elasticities of demand and supply measure how much buyers and sellers respond to price changes. Therefore, higher elasticities imply higher DWLs.

- An increase in the size of a tax causes the DWL to rise even more.

- An increase in the size of a tax causes revenue to rise at first, but eventually revenue falls because the tax reduces the size of the market.