Economics 1
Principles of Economics

The Costs of Taxation
(Chapter 8)

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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?

I. Review from Chapter 6

- A tax
  - drives a wedge between the price buyers pay and the price sellers receive.
  - raises the price buyers pay and lowers the price sellers receive.
  - 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.

II. The Effects of a Tax

Equilibrium with no tax:

Price = P_E

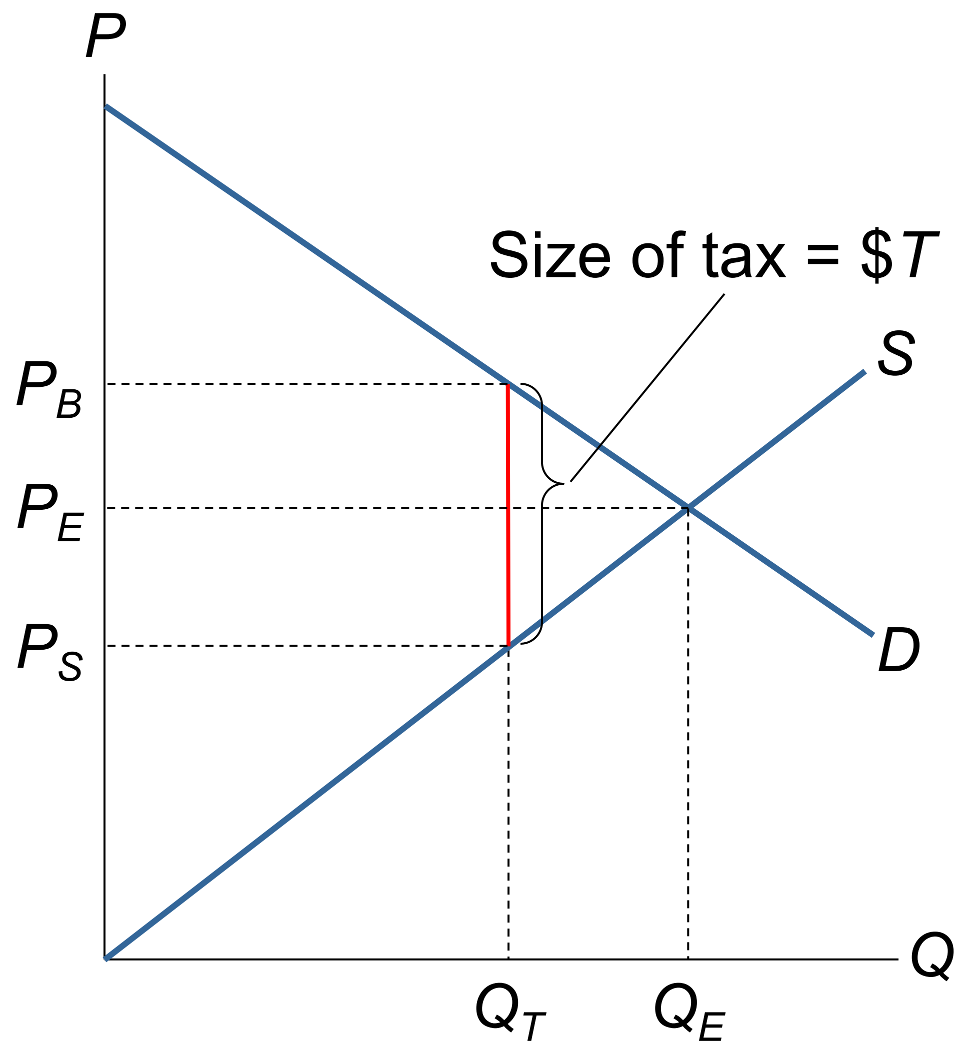
Quantity = Q_E

Equilibrium with tax = \$$T$ per unit:

Buyers pay P_B

Sellers receive P_S

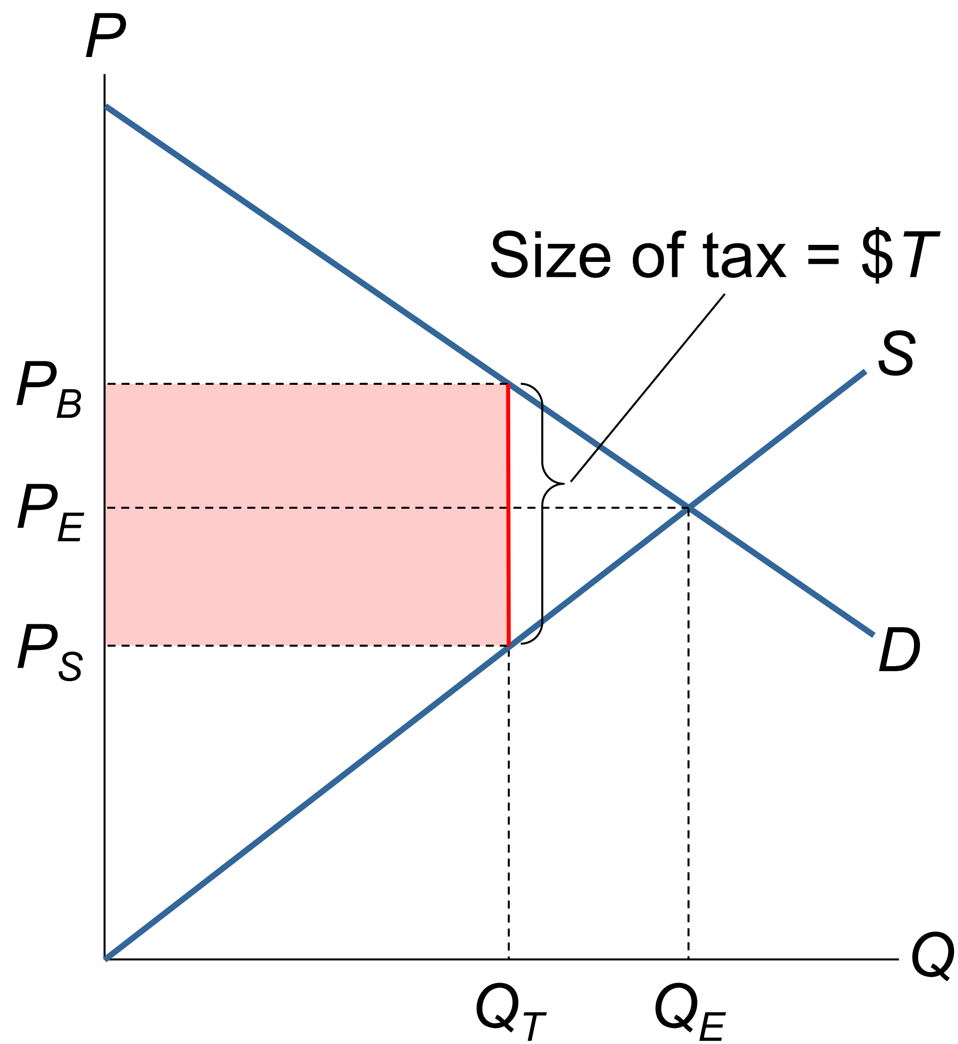
Quantity = Q_T



II. The Effects of a Tax

Revenue from tax:

$\$T \times Q_T$



II. 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.

II. The Effects of a Tax

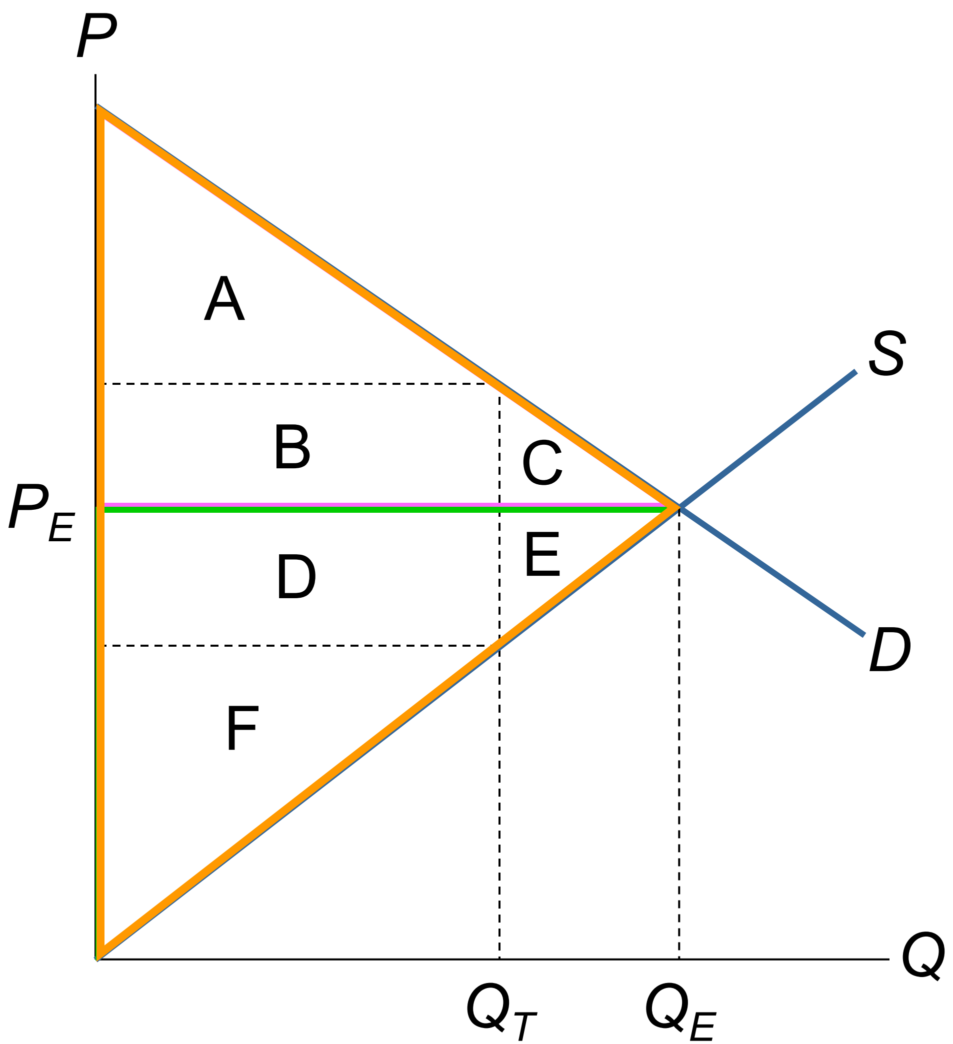
Without a tax,

CS = A + B + C

PS = D + E + F

Tax revenue = 0

Total surplus
= CS + PS
= A + B + C
+ D + E + F



II. The Effects of a Tax

With the tax,

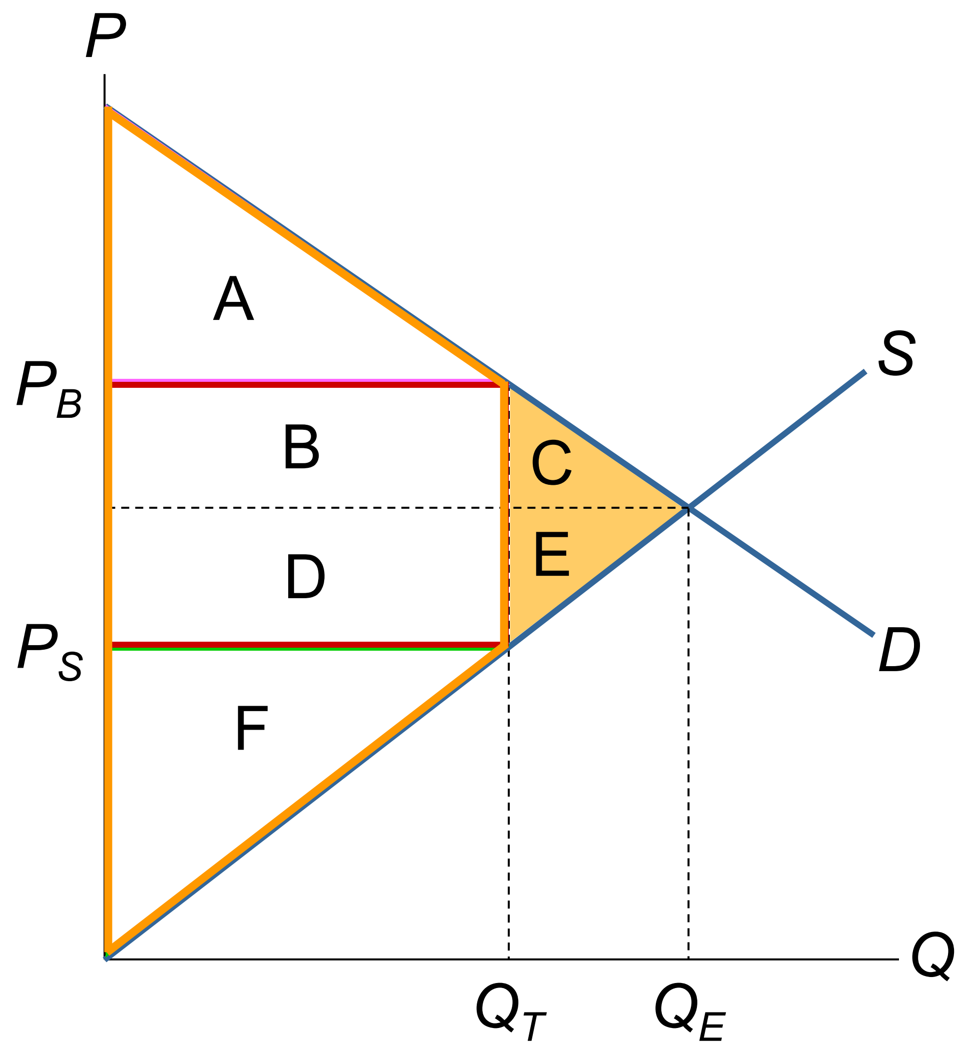
CS = A

PS = F

Tax revenue
= B + D

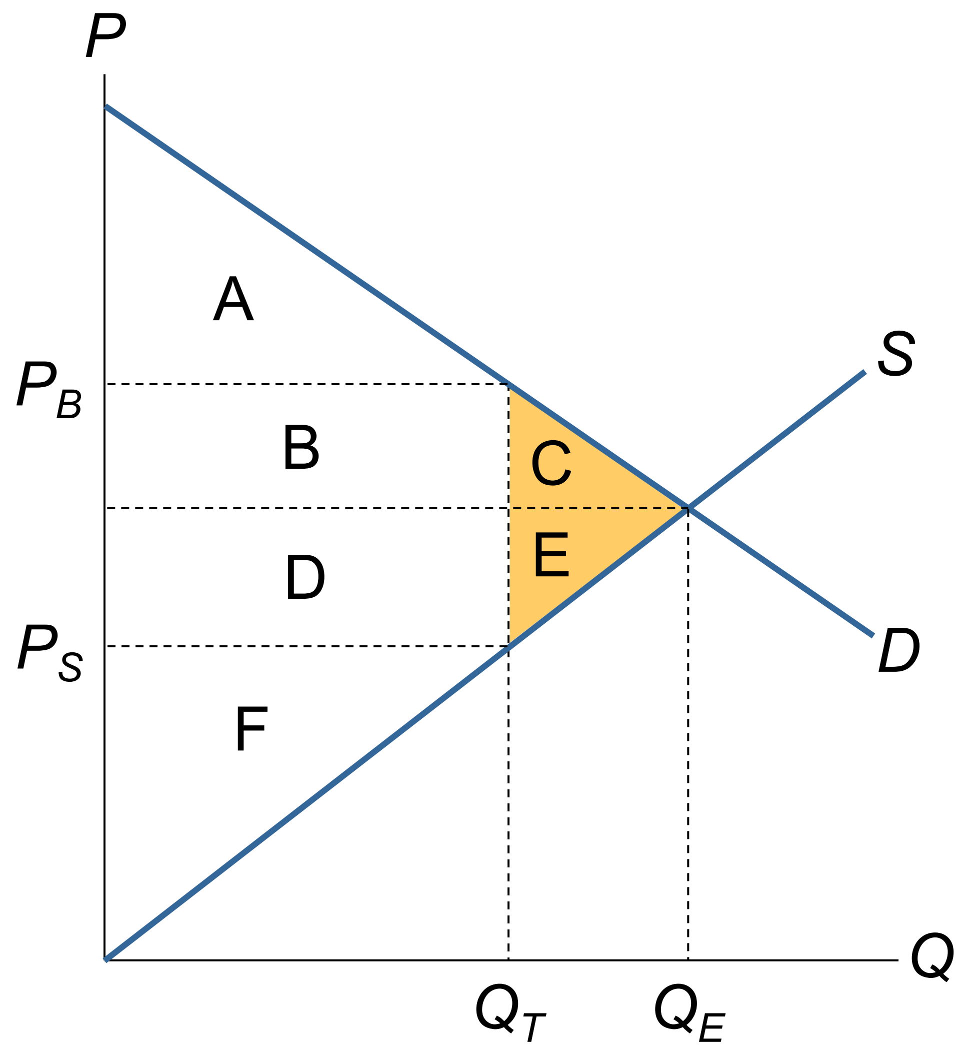
Total surplus
= A + B
+ D + F

The tax reduces total surplus by
C + E



III. The Effects of a Tax

C + E is called the **deadweight loss** (DWL) of the tax, the fall in total surplus that results from a market distortion, such as a tax.

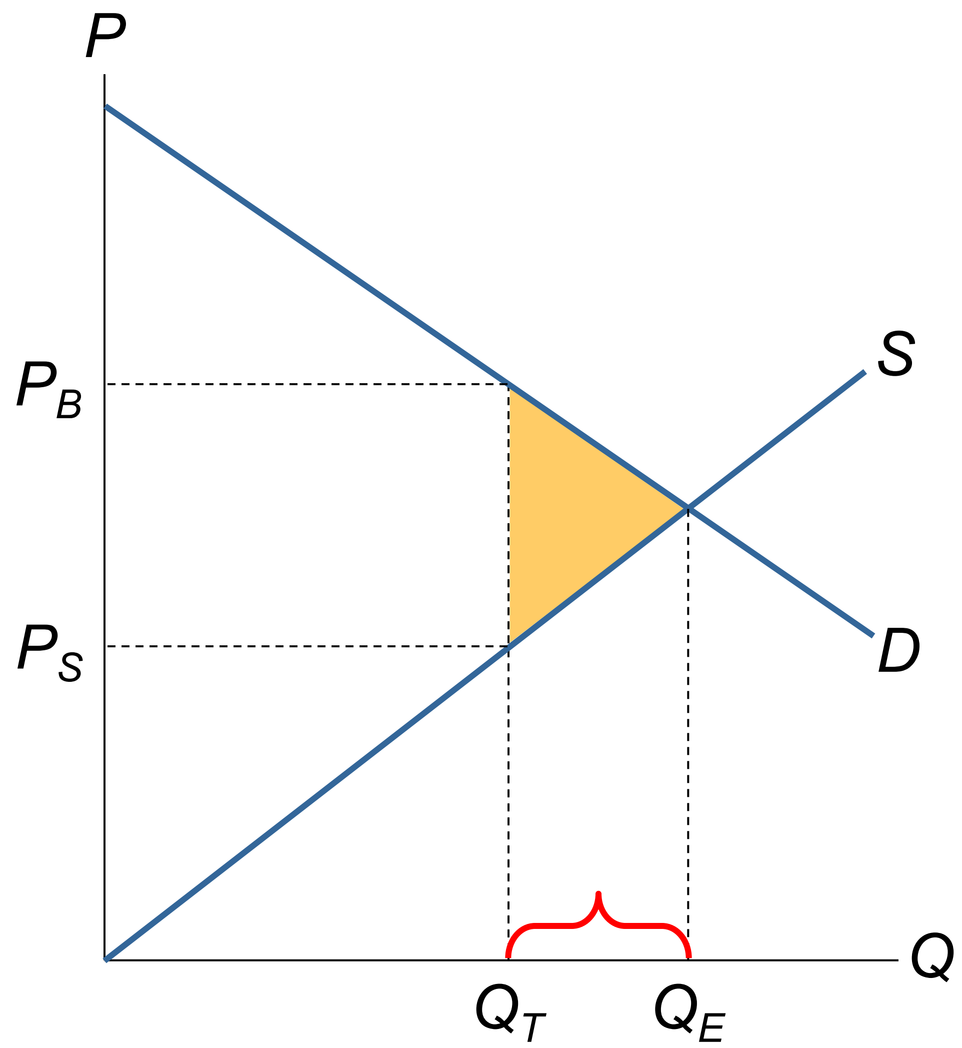


IV. About the Deadweight Loss

Because of the tax, the units between Q_T and Q_E are not sold.

The value of these units to buyers is greater than the cost of producing them,

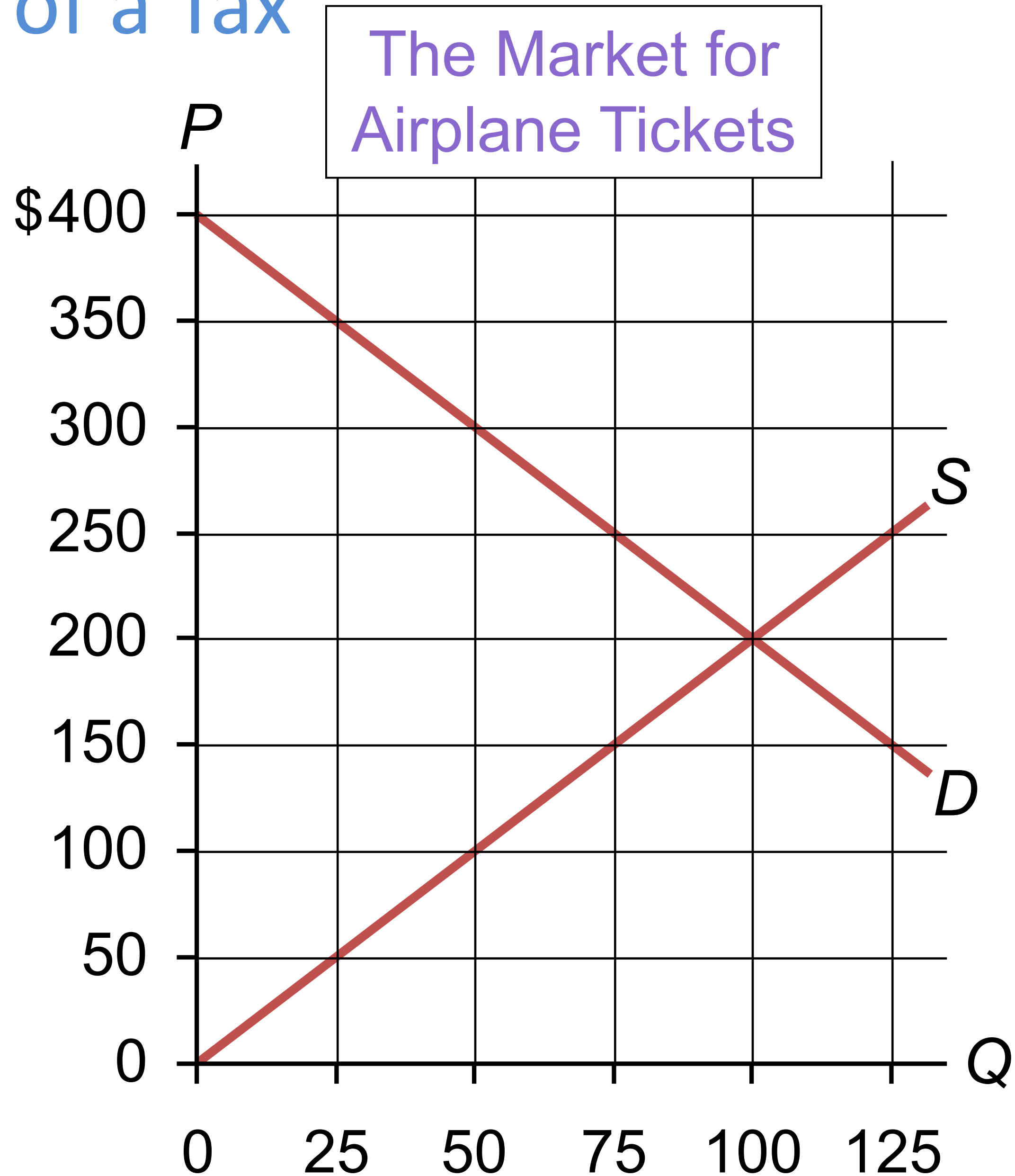
so the tax prevents some mutually beneficial trades.



Example: Analysis of a Tax

A. Compute CS, PS, and total surplus without a tax.

B. If $100 tax per ticket, compute the CS, PS, tax revenue, total surplus, and DWL.



Answers to A

CS

= ½ x $200 x 100

= <u>$10,000</u>

PS

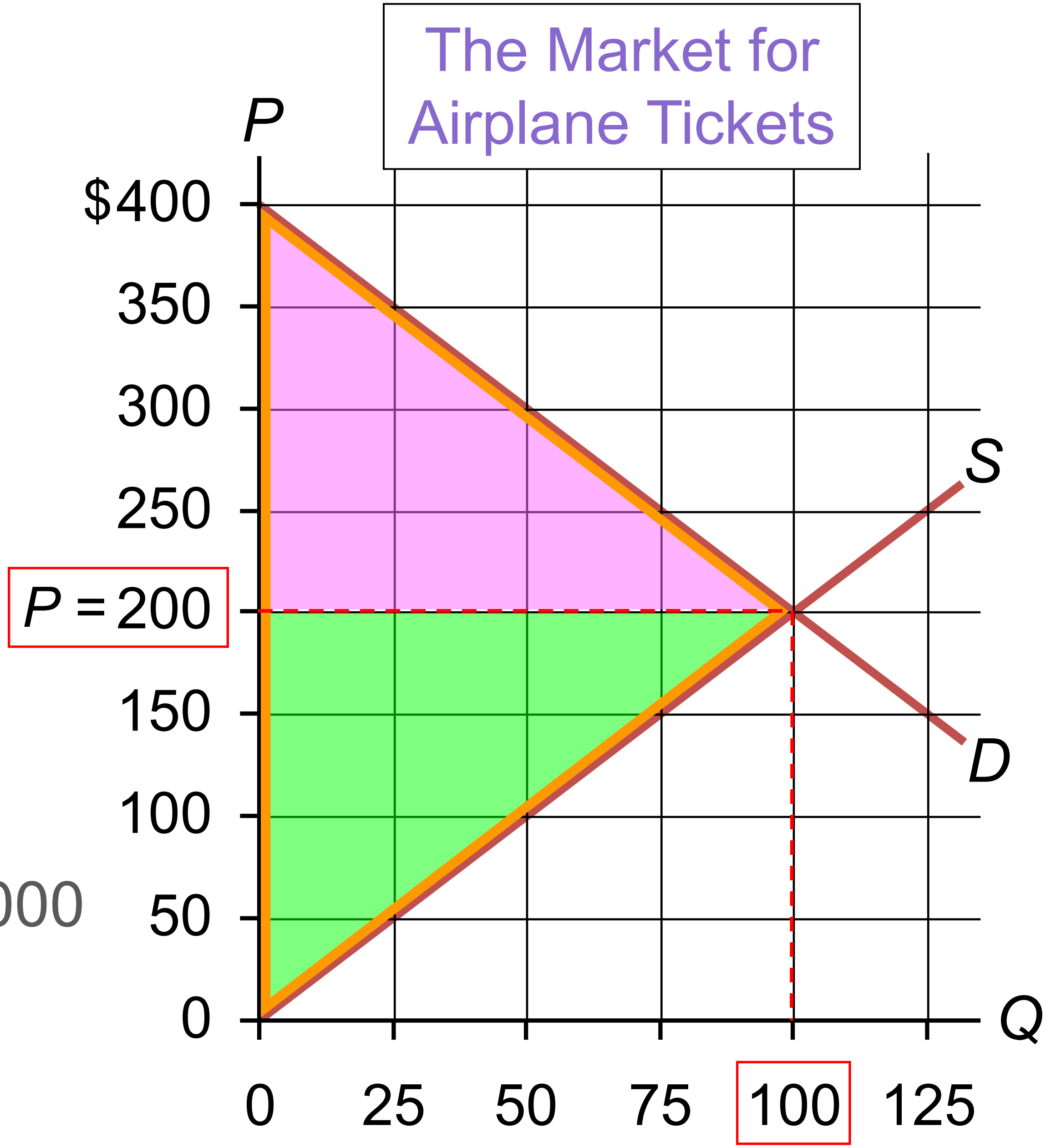
= ½ x $200 x 100

= <u>$10,000</u>

Total surplus

= $10,000 + $10,000

= <u>$20,000</u>



Answers to B

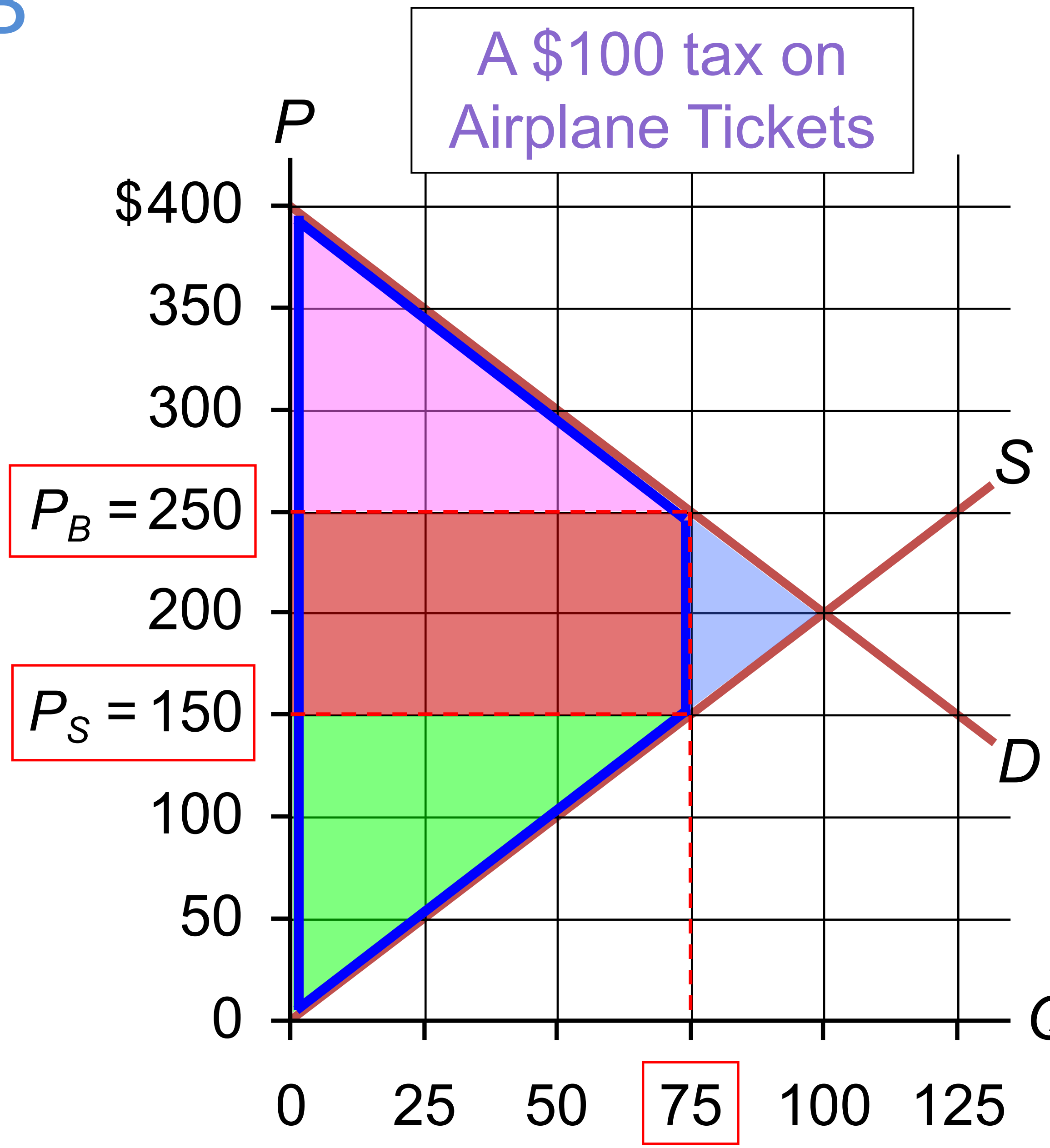
CS
= ½ x $150 x 75
= $5,625

PS = $5,625

Tax revenue
= $100 x 75
= $7,500

Total surplus
= $18,750

DWL = $1,250



V. What Determines the Size of the DWL?

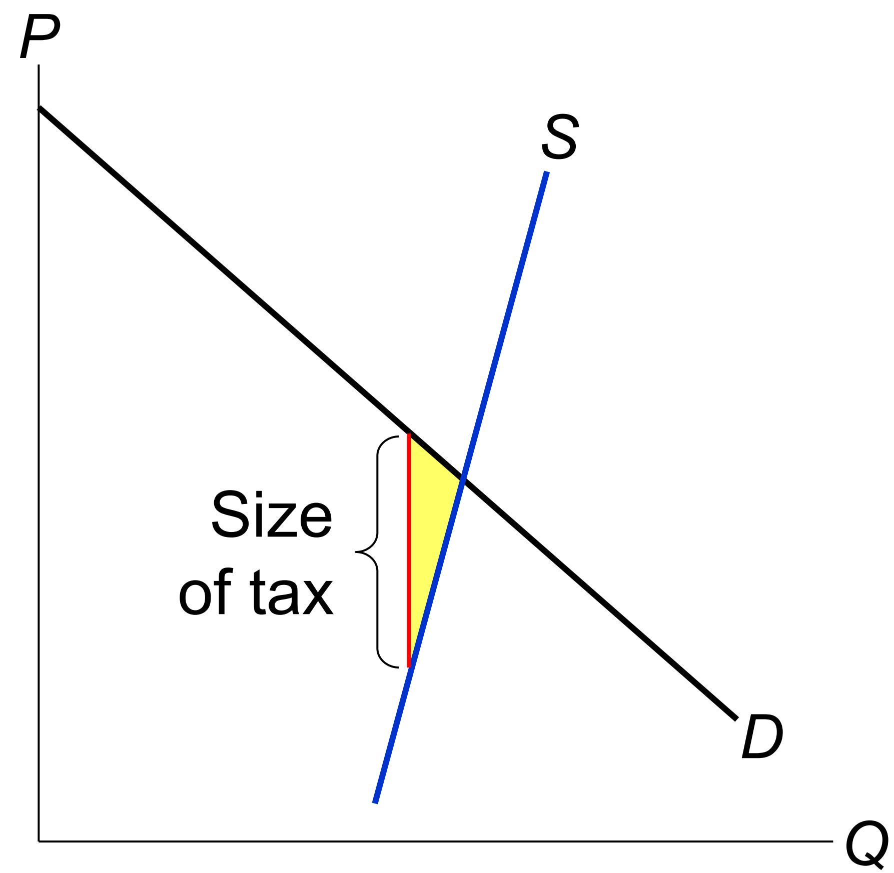
- Which goods or services should the government tax to raise the revenue it needs?
- One answer: those with the smallest DWL.
- When is the DWL small vs. large?
  Turns out it depends on the price elasticities of supply and demand.
- Recall:
  The price elasticity of demand (or supply) measures how much $\boldsymbol{Q^D}$ (or $\boldsymbol{Q^S}$) changes when $\boldsymbol{P}$ changes.

VI. DWL and the Elasticity of Supply

When supply is inelastic, it's harder for firms to leave the market when the tax reduces P_S.

So, the tax only reduces Q a little,

and DWL is small.

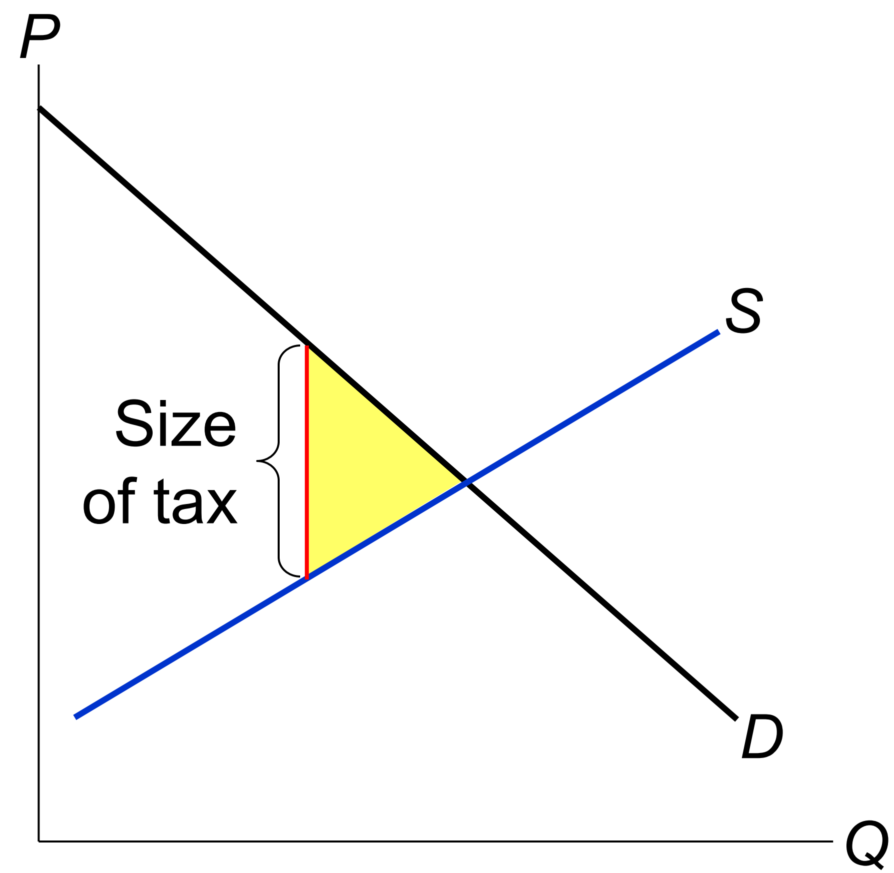


VI. DWL and the Elasticity of Supply

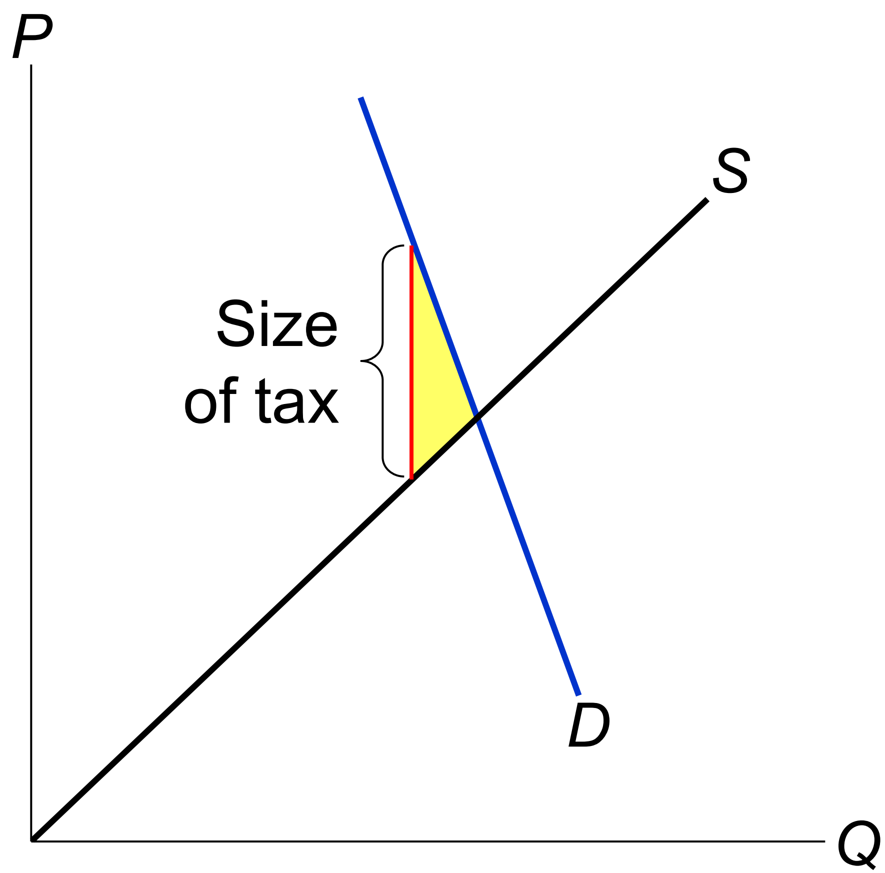
The more elastic is supply, the easier for firms to leave the market when the tax reduces P_S,

the greater Q falls below the surplus-maximizing quantity,

the greater the DWL.



VII. DWL and the Elasticity of Demand



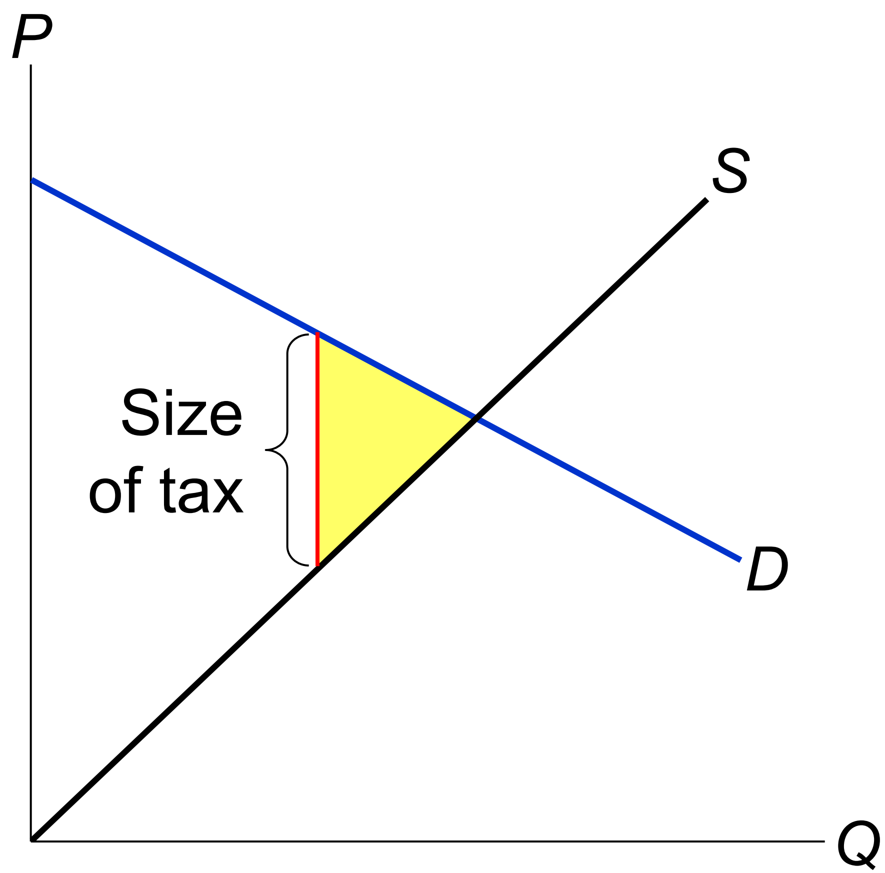
When demand is inelastic,

it's harder for consumers to leave the market when the tax raises P_B.

So, the tax only reduces Q a little,

and DWL is small.

VII. DWL and the Elasticity of Demand



The more elastic is demand, the easier for buyers to leave the market when the tax increases P_B,

the more Q falls below the surplus-maximizing quantity, and the greater the DWL.

Example: Elasticity and the DWL of a Tax

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

A. Breakfast cereal or sunscreen?
B. Hotel rooms in the short run or hotel rooms in the long run?
C. Groceries or meals at fancy restaurants?

Example: Elasticity and the DWL of a tax

A. Breakfast cereal or sunscreen

From Chapter 5:
Breakfast cereal has more close substitutes than sunscreen, so demand for breakfast cereal is more price-elastic than demand for sunscreen.

So, a tax on breakfast cereal would cause a larger DWL than a tax on sunscreen.

Example: Elasticity and the DWL of a Tax

B. Hotel rooms in the short run or long run

From Chapter 5:
The price elasticities of demand and supply for hotel rooms are larger in the long run than in the short run.

So, a tax on hotel rooms would cause a larger DWL in the long run than in the short run.

Example: Elasticity and the DWL of a Tax

c. Groceries or meals at fancy restaurants

From Chapter 5:
Groceries are more of a necessity and therefore less price-elastic than meals at fancy restaurants.

So, a tax on restaurant meals would cause a larger DWL than a tax on groceries.

VIII. 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 government revenue.
- For the typical worker, the *marginal tax rate* (the tax on the last dollar of earnings) is about 40%.
- How big is the DWL from this tax? It depends on elasticity….

VIII. 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.

VIII. How Big Should the Government Be?

Other economists believe labor taxes are highly distorting because some groups of workers have elastic supply and can respond to incentives:

- Many workers can adjust their hours, e.g., by working overtime.
- Many families have a 2nd earner with discretion over whether and how much to work.
- Many elderly choose when to retire based on the wages they earn.
- Some people work in the "underground economy" to evade high taxes.

IX. The Effects of Changing the Size of the Tax

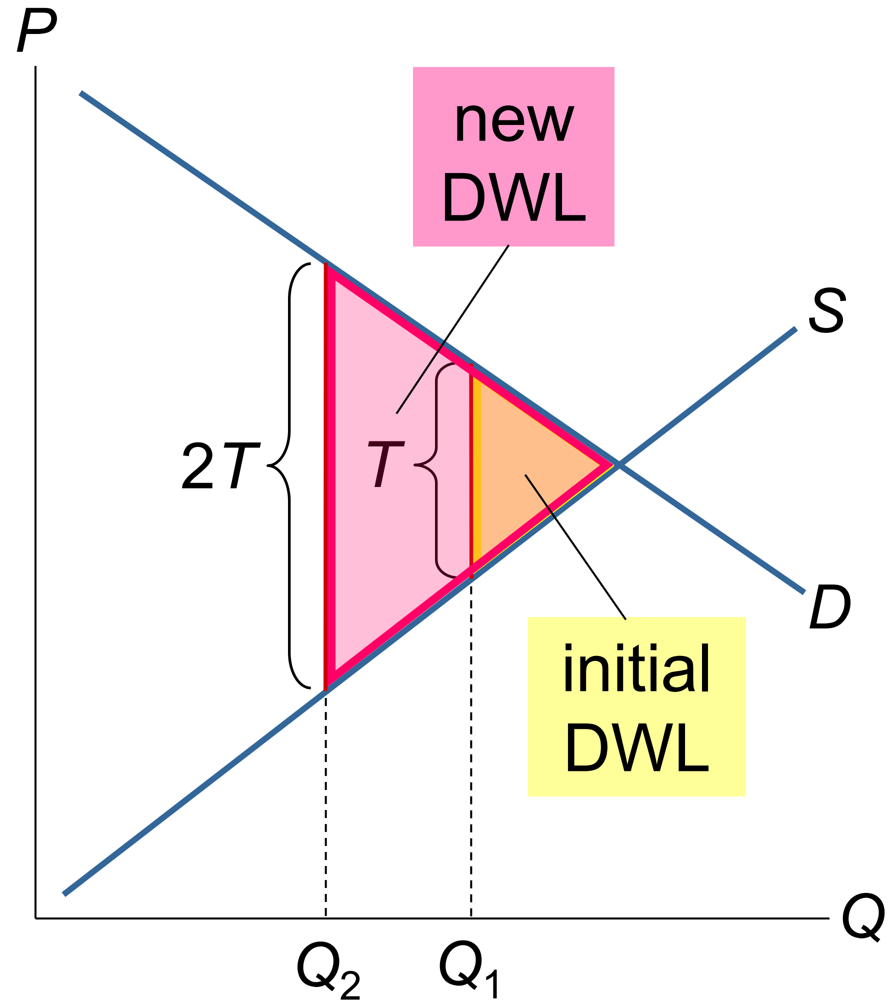
- Policymakers often change taxes, raising some and lowering others.

- What happens to DWL and tax revenue when taxes change? We explore this next....

X. DWL and the Size of the Tax

Initially, the tax is *T* per unit.

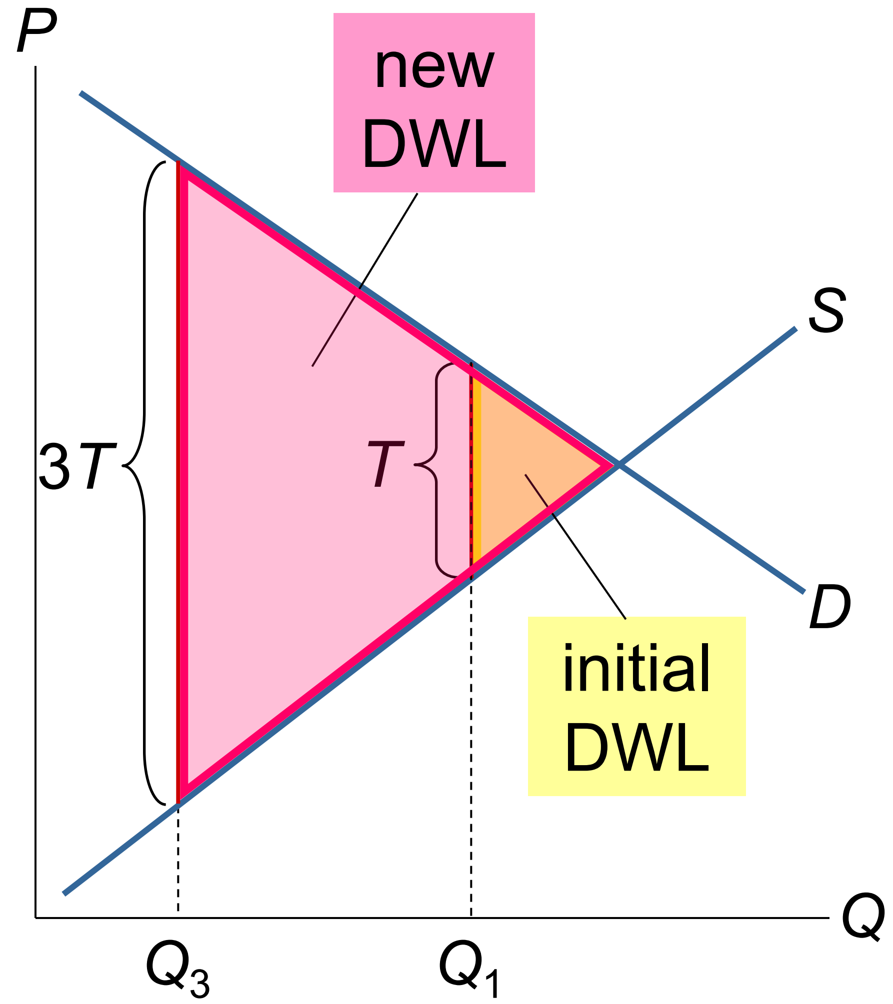
Doubling the tax causes the DWL to more than double.



X. DWL and the Size of the Tax

Initially, the tax is *T* per unit.

Tripling the tax causes the DWL to more than triple.



X. DWL and the Size of the Tax

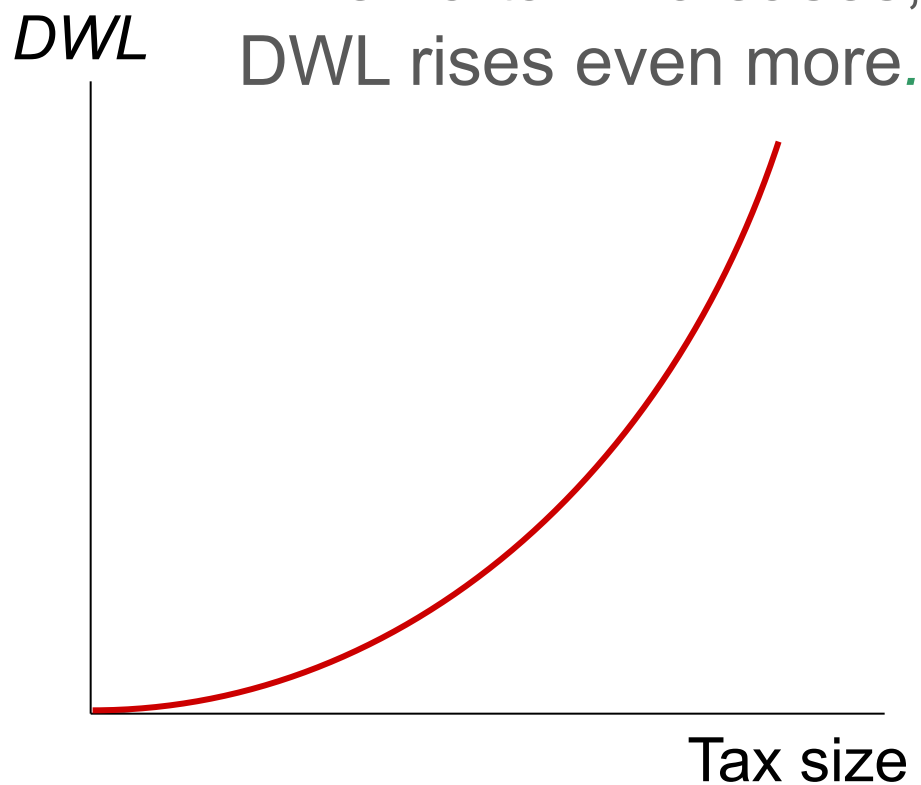
Implication

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.

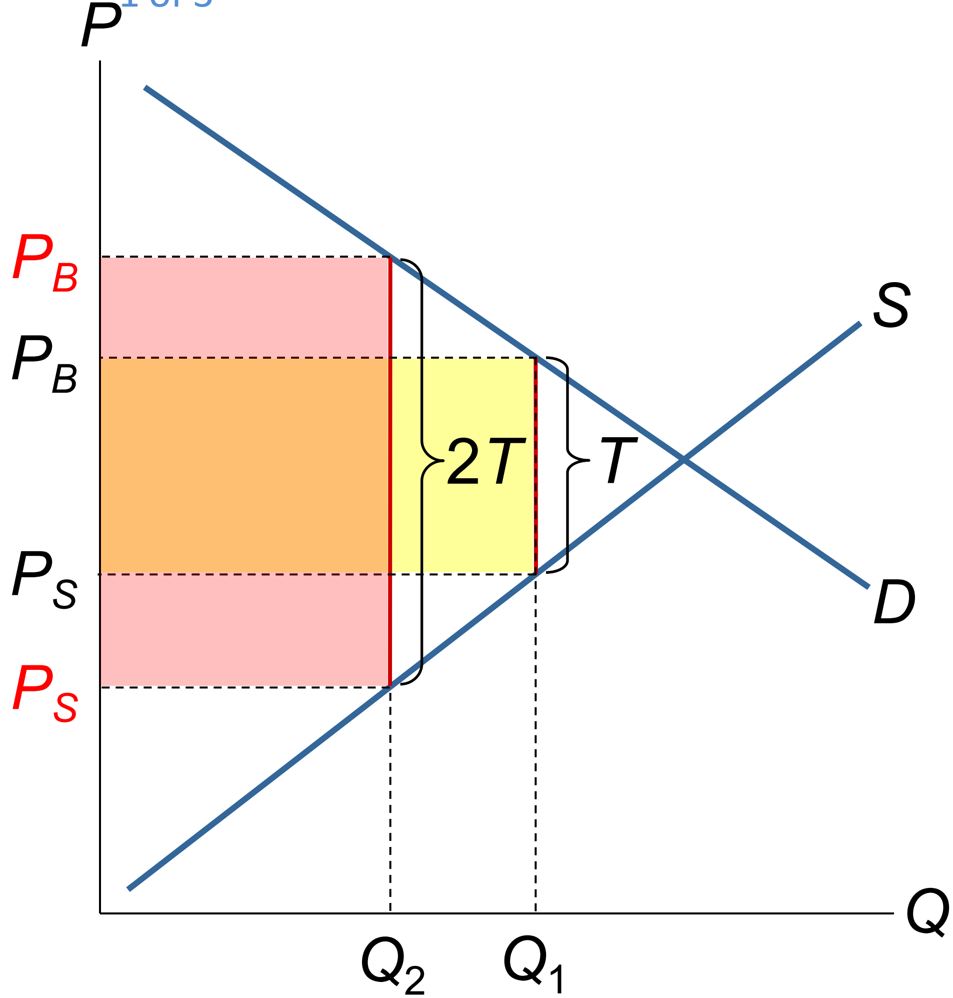
Summary

When a tax increases, DWL rises even more.



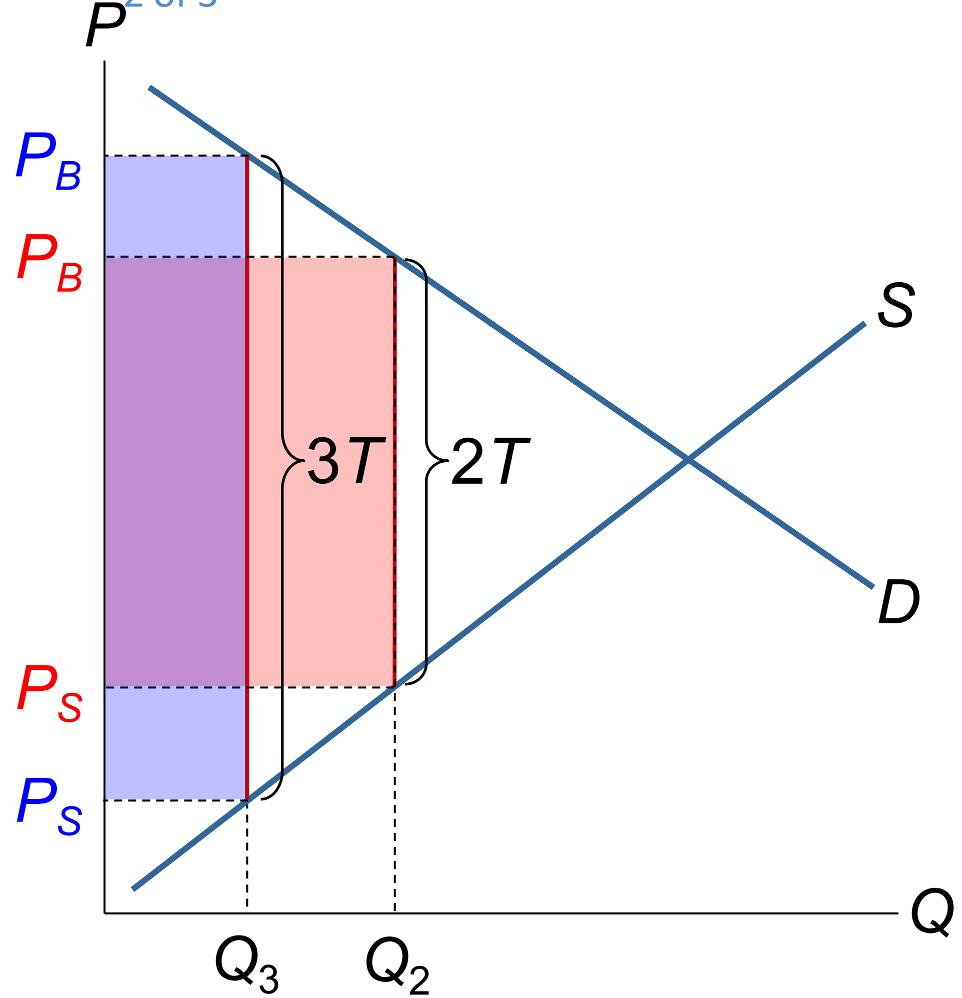
XI. Revenue and the Size of the Tax

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



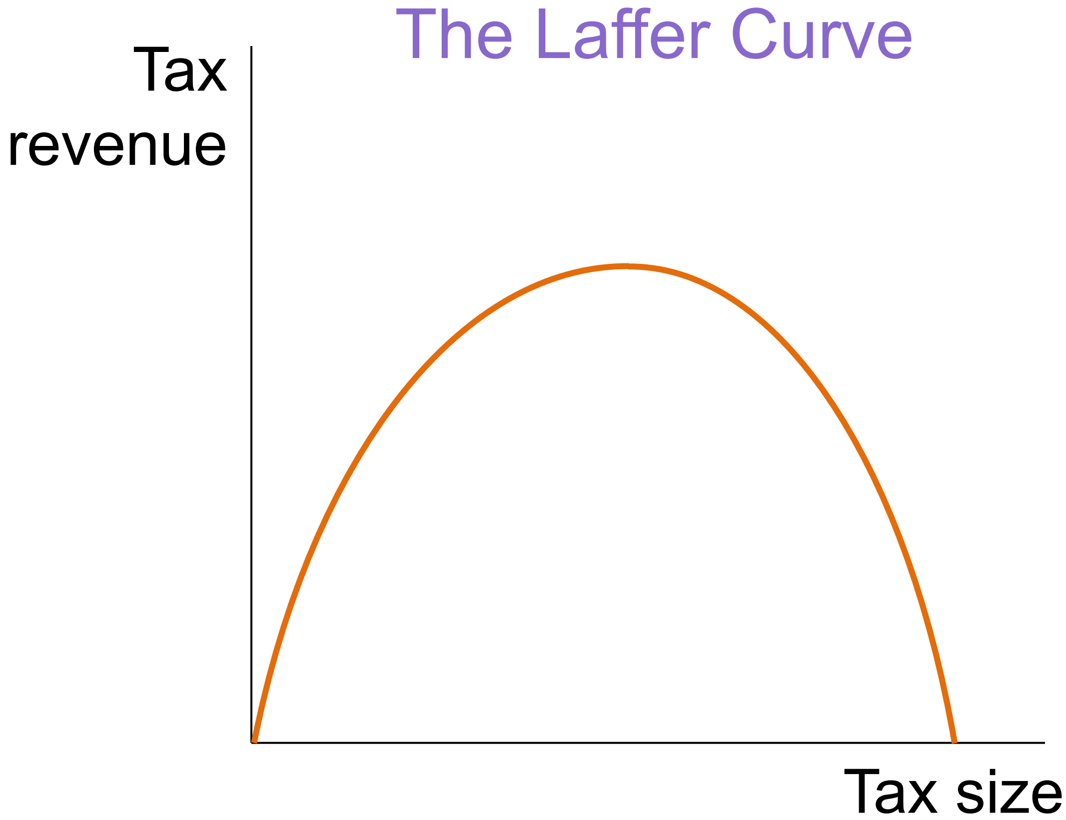
XI. Revenue and the Size of the Tax

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



XI. Revenue and the Size of the Tax

The Laffer curve shows the relationship between the size of the tax and tax revenue.



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.

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.