Applications on Demand, Supply, and Government Policies

Part II

EE211

Taxes

- The government levies taxes on many goods & services to raise revenue to pay for national defense, public schools, etc.
- The government can make buyers or sellers pay the tax.
- The tax can be a % of the good's price,
  or a specific amount for each unit sold.
  - For simplicity, we analyze per-unit taxes only.

The Economics of Taxes: A Preliminary View

- An **excise tax** is a tax on sales of a good or service.

Excise taxes:

- raise the price paid by buyers and
- reduce the price received by sellers and drive a **wedge** between the two.

Ex.: For example, there are excise taxes on gasoline, cigarettes, and foreign-made trucks, and many local governments impose excise taxes on services such as hotel room rentals.

Suppose that the supply and demand for hotel rooms in the city A shown in Fig 1.

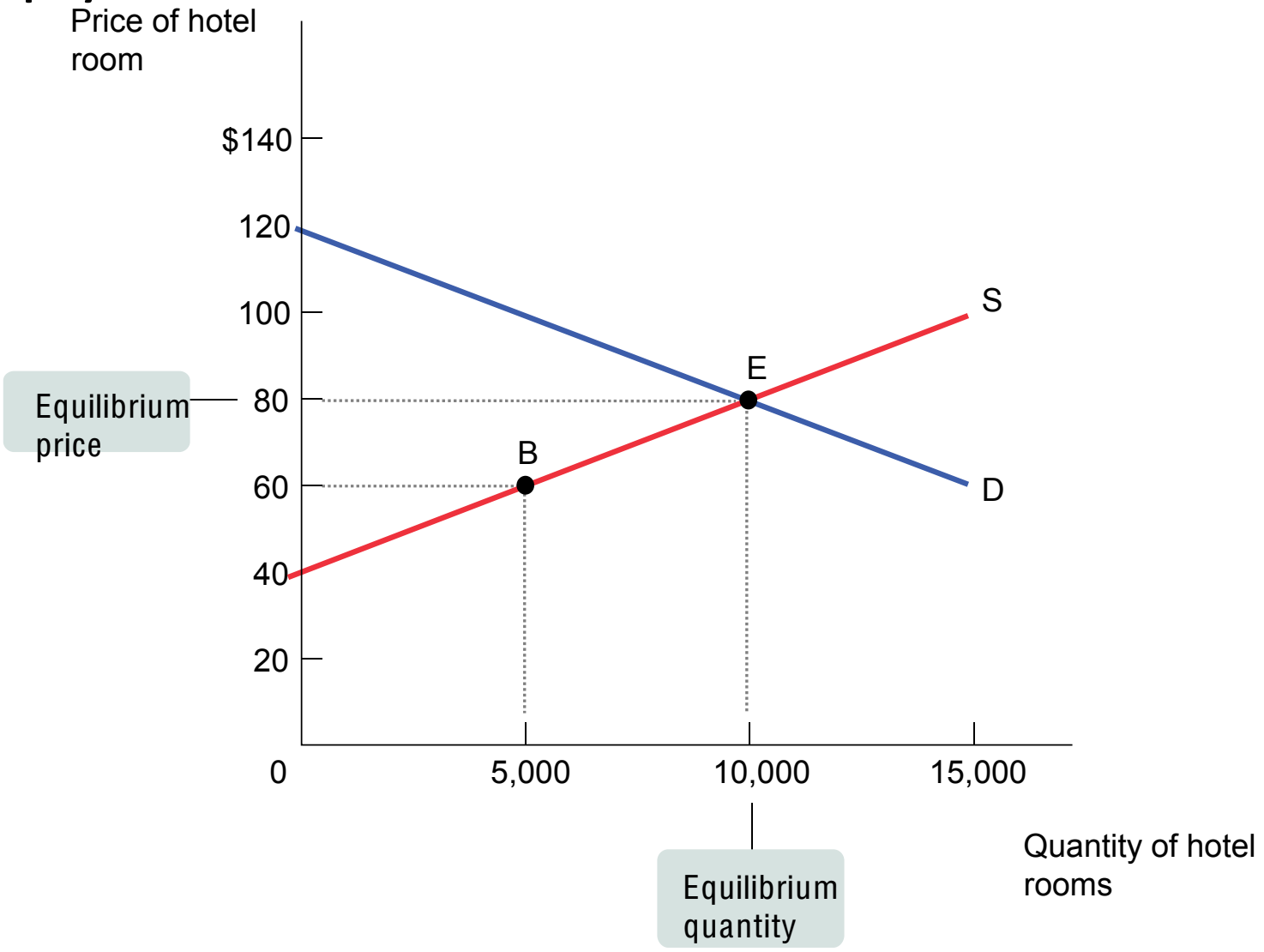
Assume that all hotel rooms are the same

In the absence of taxes, the equilibrium price of a room is $80 per night and the equilibrium quantity of hotel rooms rented is 10,000 per night.

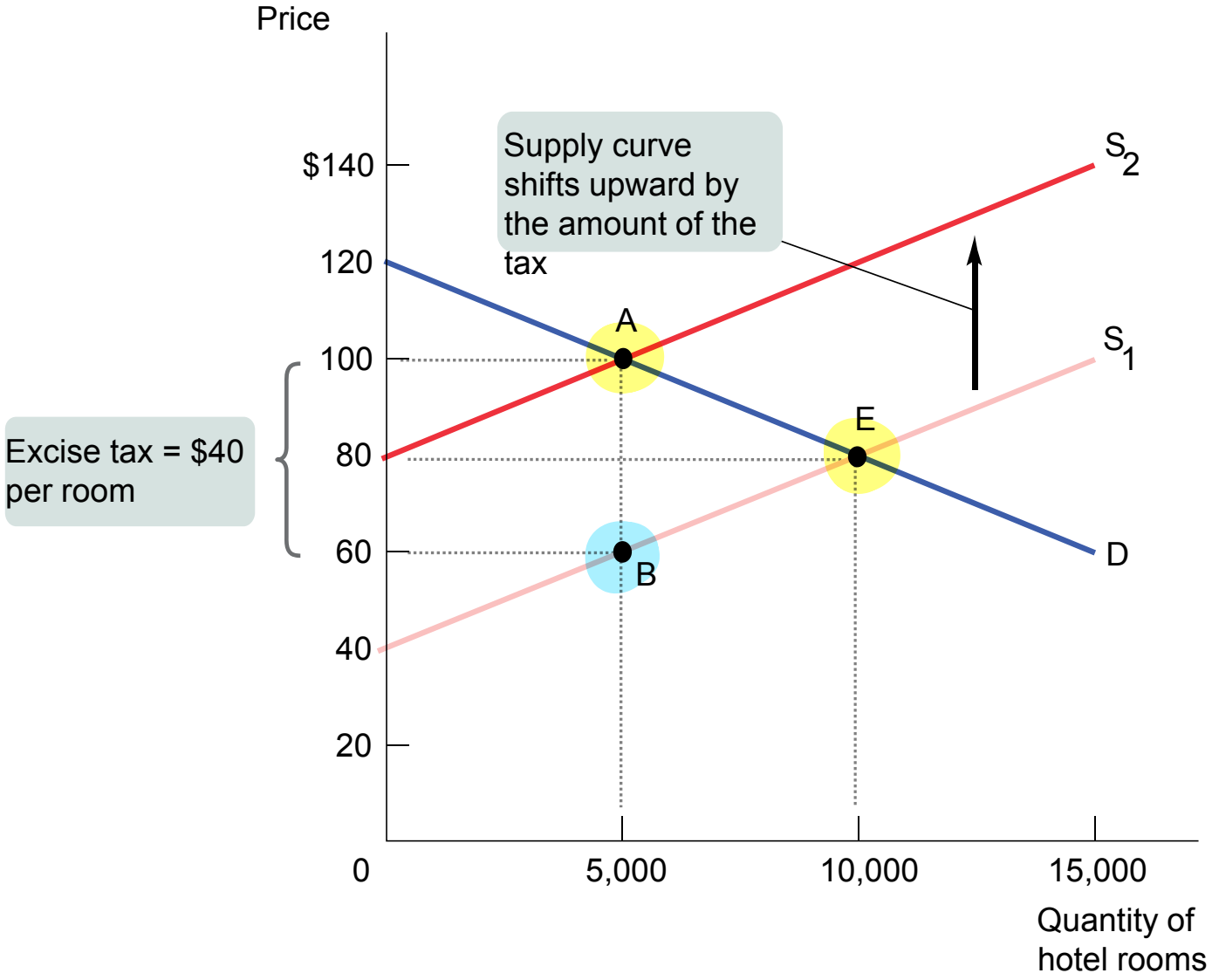
Now suppose the government imposes an excise tax of $40 per night on hotel rooms.

Fig 1.

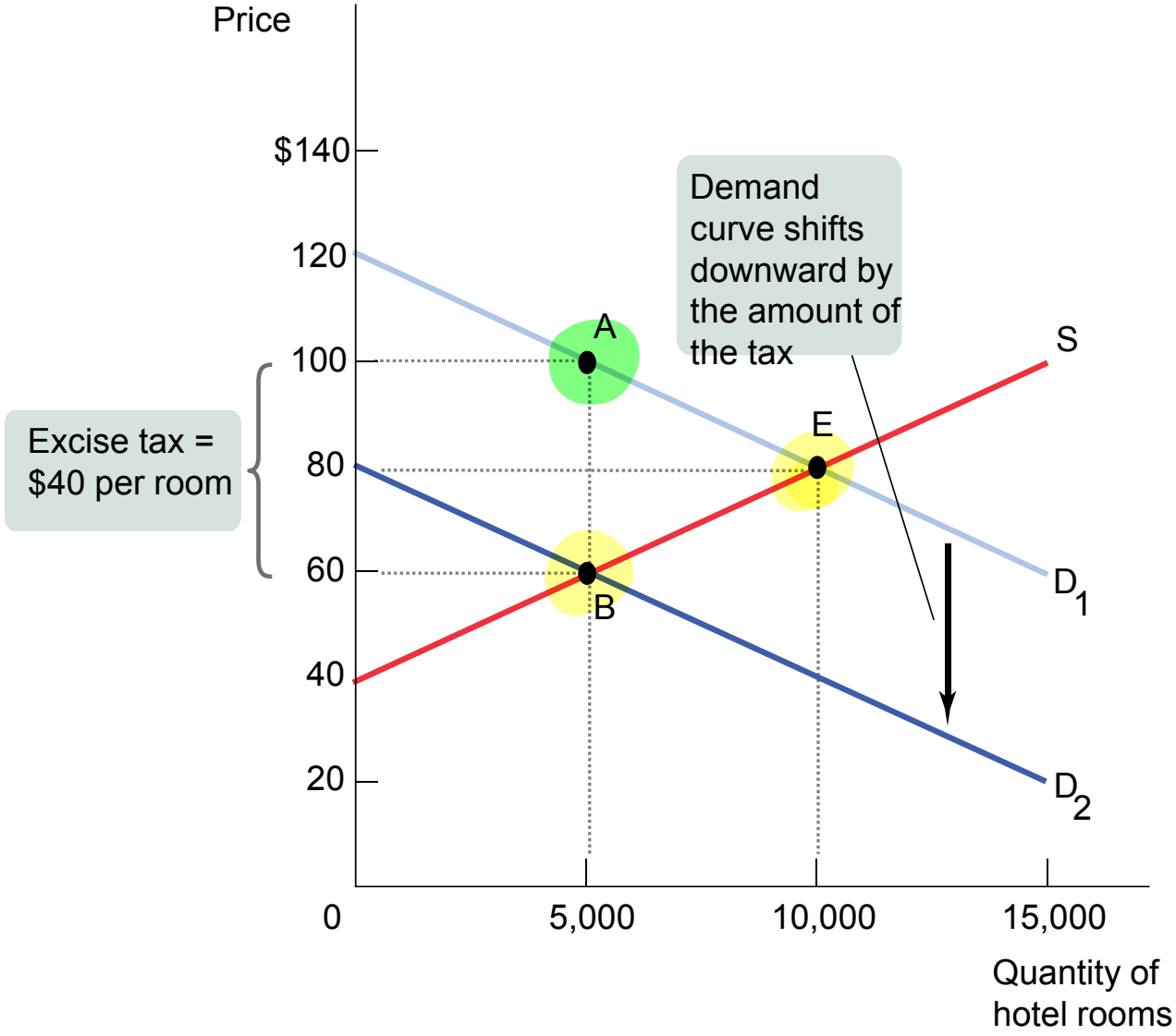
Supply and Demand for Hotel Rooms



An Excise Tax Imposed on Hotel Owners



An Excise Tax Imposed on Hotel Guests



Tax Incidence

The **incidence** of a tax is a measure of who really pays it.

Who really bears the tax burden (higher prices to consumers and lower prices to sellers) does not depend on who officially pays the tax. ***Depending on the shapes of supply and demand curves, the incidence of an excise tax may be divided differently.***

The wedge between the demand price and supply price becomes the government's "***tax revenue***".

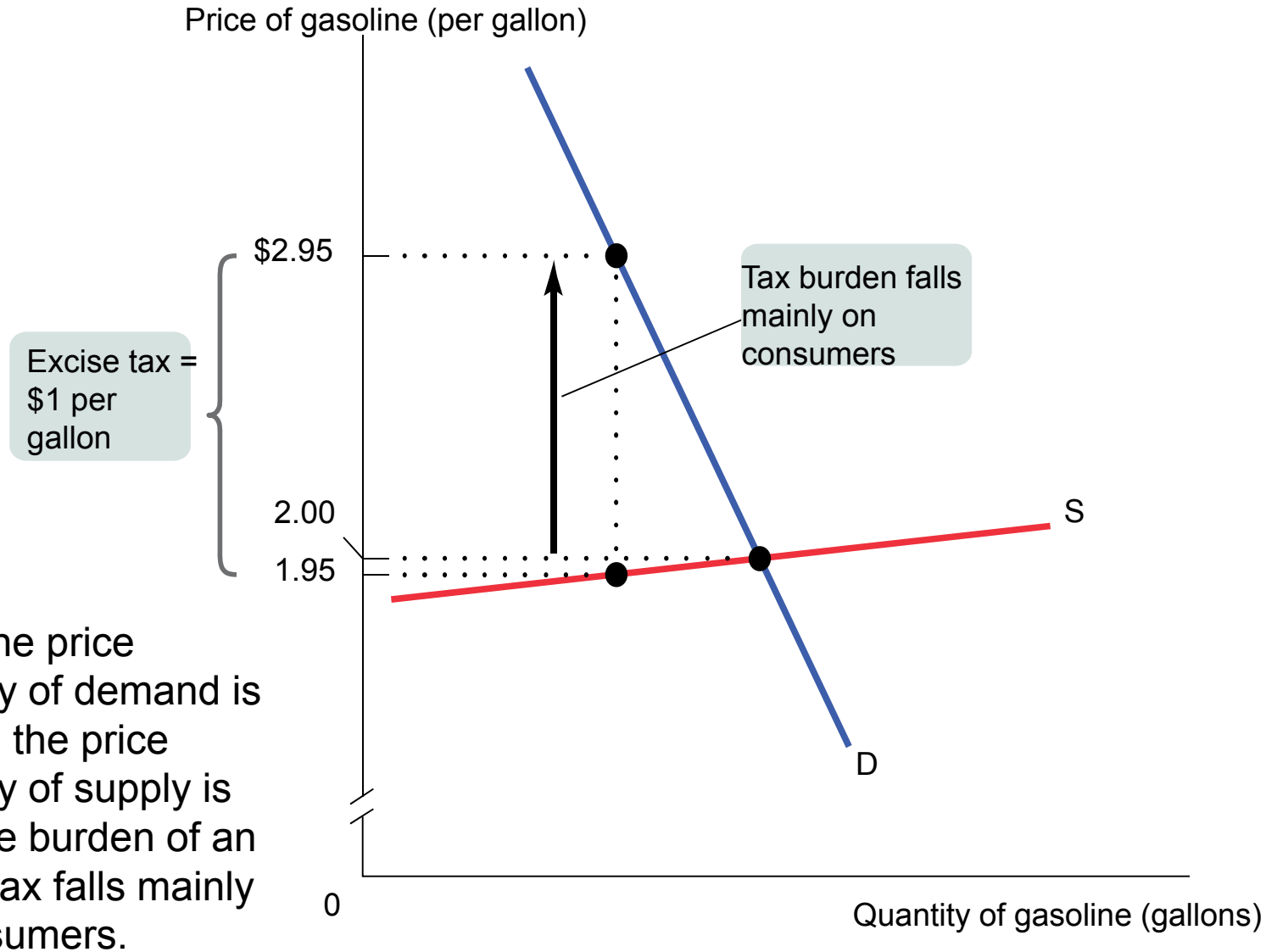
When an Excise Tax is paid mainly by consumers

Two key assumptions are reflected in the shapes of the supply and demand curves in the example:

- The price elasticity of demand for gasoline is assumed to be very low, so the demand curve is relatively steep

- The price elasticity of supply for gasoline is assumed to be very high, to the supply curve is relatively flat

An Excise Tax Paid Mainly By Consumers



When the price elasticity of demand is low and the price elasticity of supply is high, the burden of an excise tax falls mainly on consumers.

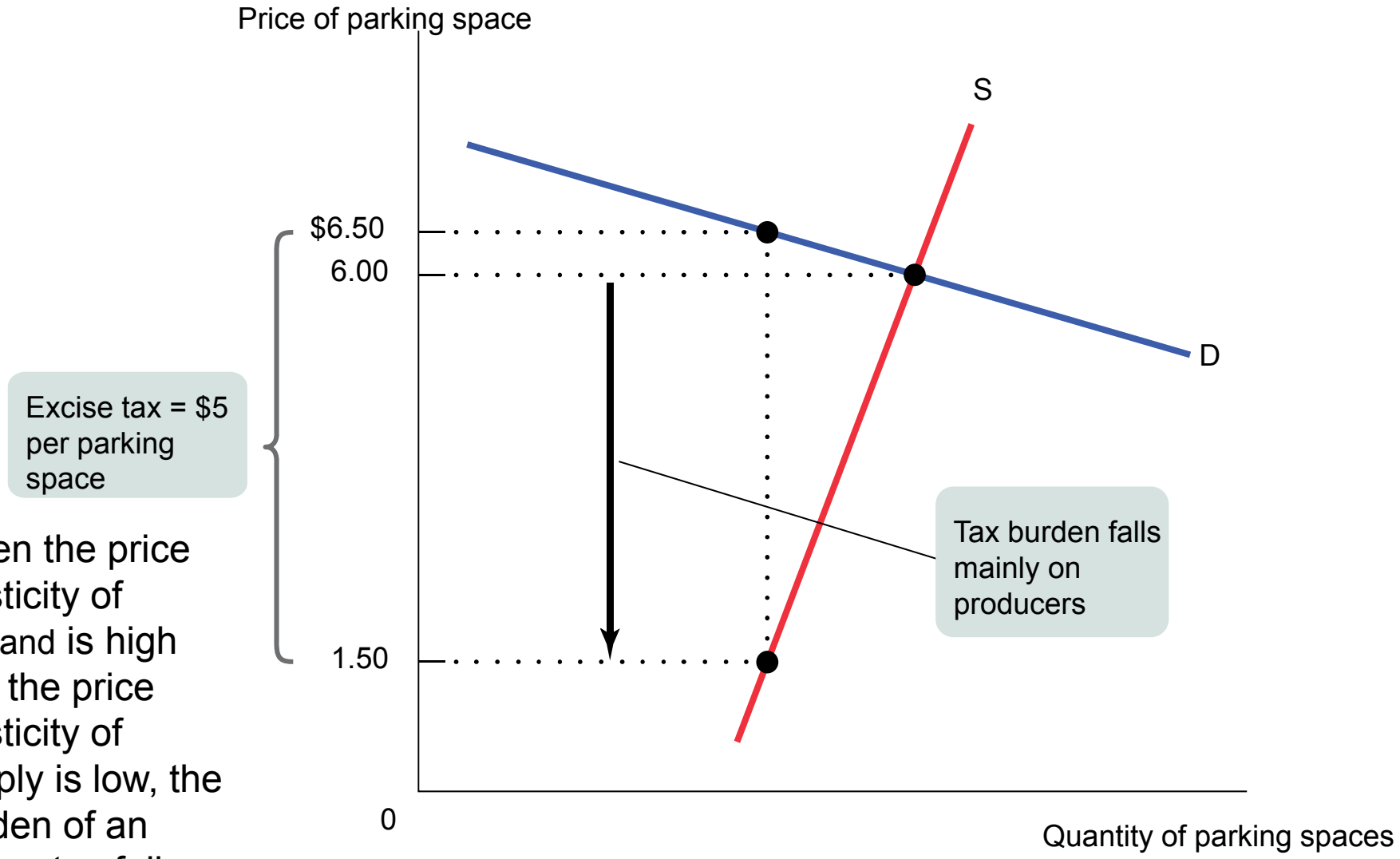
When an Excise Tax is paid mainly by producers

Two key assumptions are reflected in the shapes of the supply and demand curves in the example:

- The price elasticity of supply for parking is assumed to be very low, so the supply curve is relatively steep

- The price elasticity of demand for parking is assumed to be very high, to the demand curve is relatively flat

An Excise Tax Paid Mainly by Producers



When the price elasticity of demand is high and the price elasticity of supply is low, the burden of an excise tax falls mainly on producers.

Tax Incidence – Putting it together

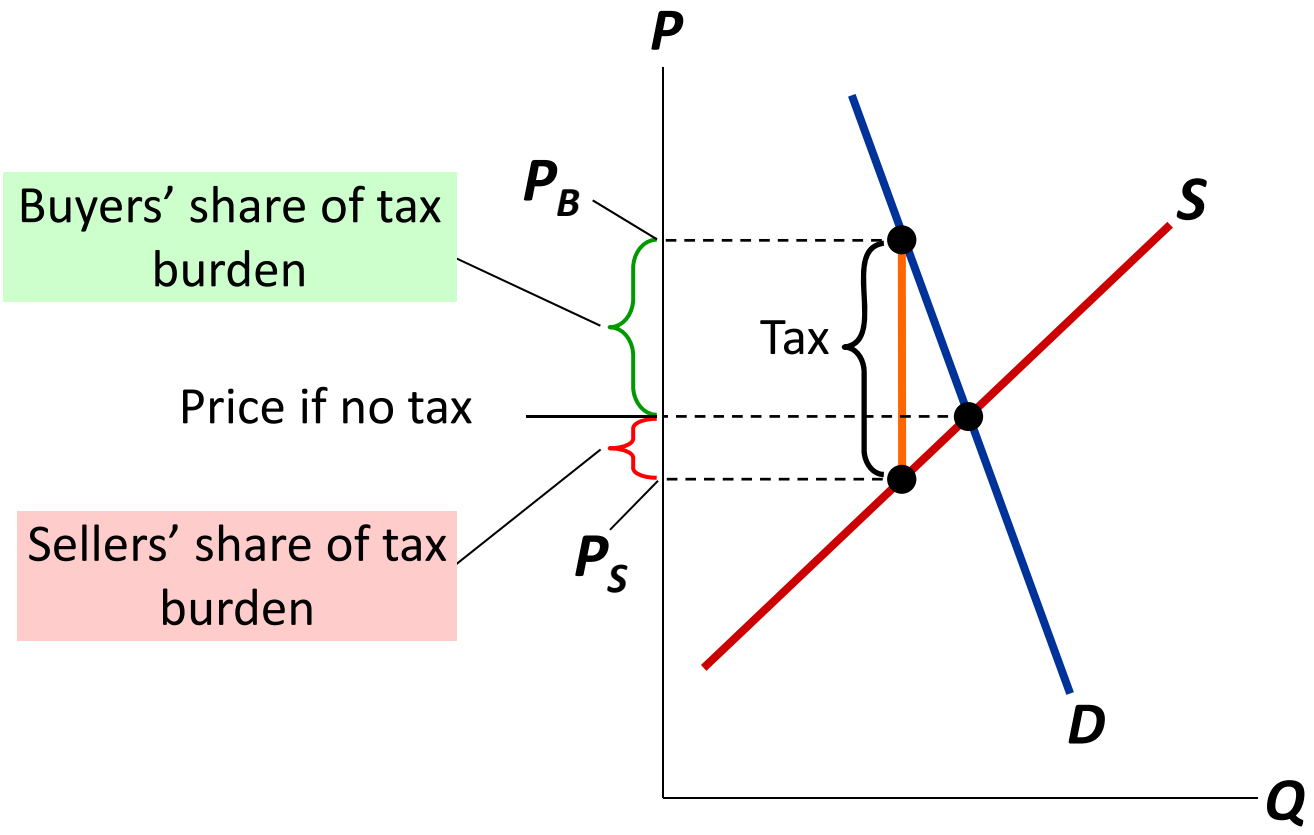
When the price elasticity of demand is higher than the price elasticity of supply, an excise tax falls mainly on producers.

When the price elasticity of supply is higher than the price elasticity of demand, an excise tax falls mainly on consumers.

So elasticity—not who officially pays the tax—determines the incidence of an excise tax.

Elasticity and Tax Incidence

CASE 1: Supply is more elastic than demand

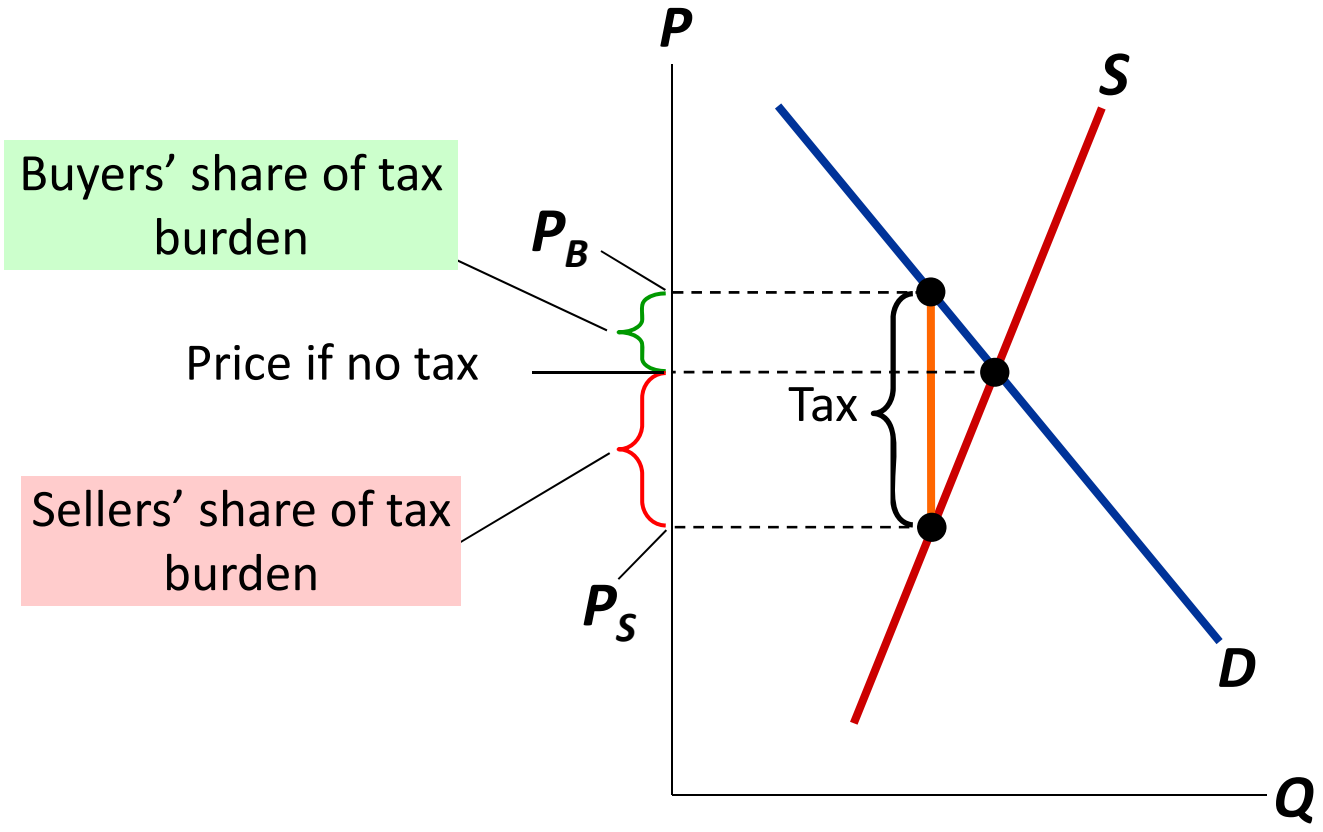


It's easier for sellers than buyers to leave the market.

So buyers bear most of the burden of the tax.

Elasticity and Tax Incidence

CASE 2: Demand is more elastic than supply



It's easier for buyers than sellers to leave the market.

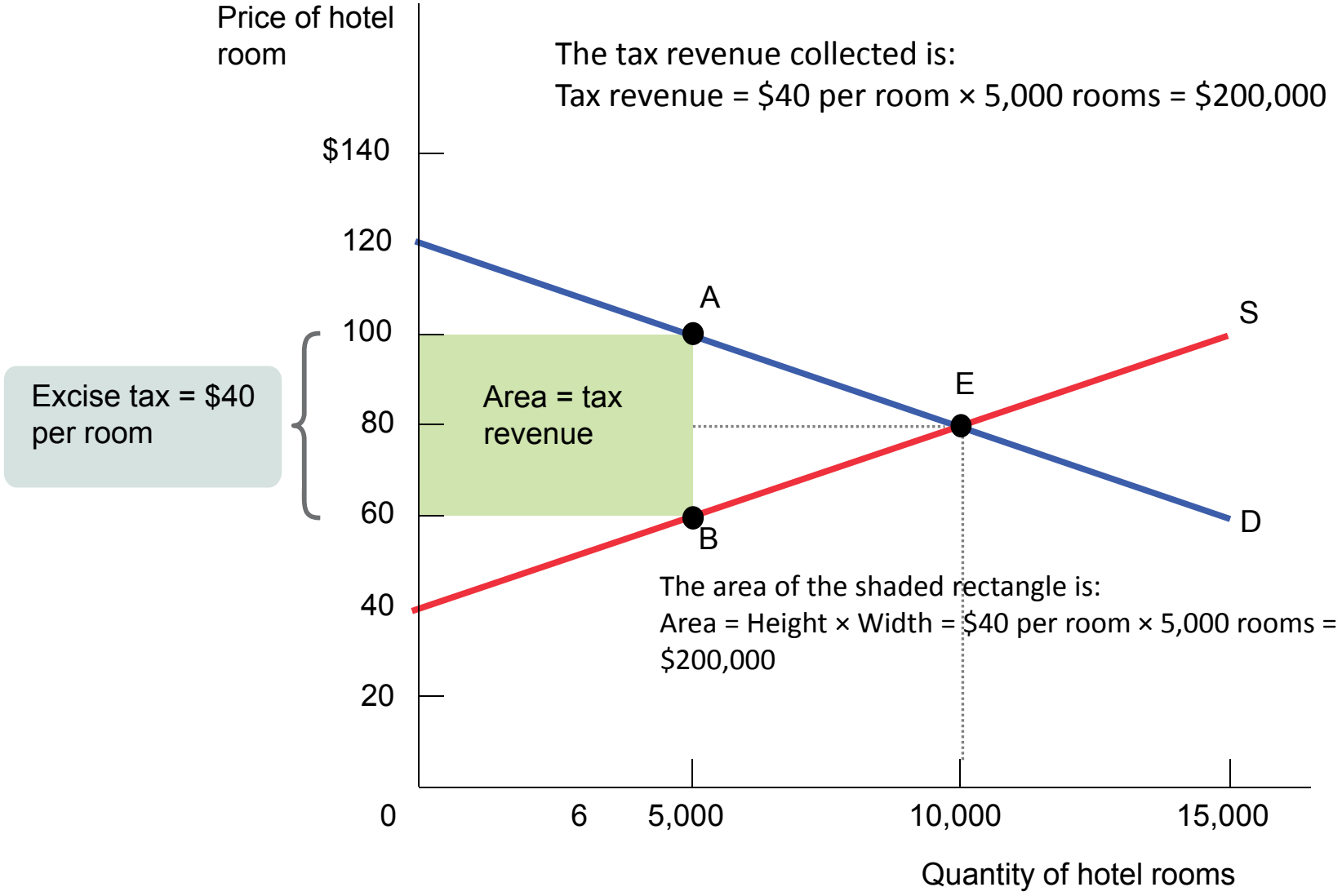
Sellers bear most of the burden of the tax.

The Benefits and Costs of Taxation

The Revenue from an Excise Tax

The general principle is:

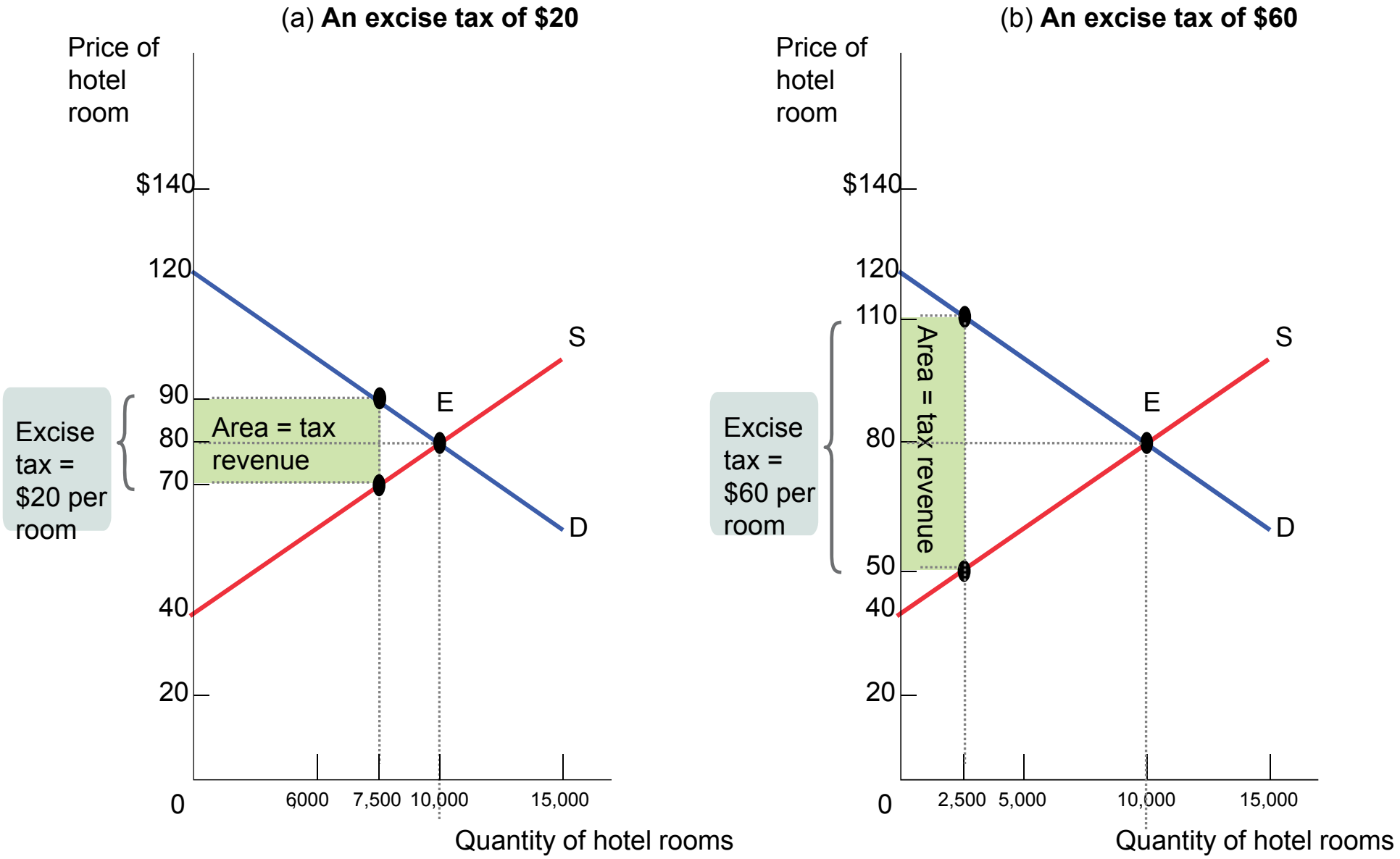
- The revenue collected by an excise tax is equal to the area of the rectangle whose height is the tax wedge between the supply and demand curves and whose width is the quantity transacted under the tax.


Price of hotel room
The tax revenue collected is:
Tax revenue = $40 per room × 5,000 rooms = $200,000
$140
120
100
80
60
40
20
0
6
5,000
10,000
15,000
Quantity of hotel rooms
A
B
E
S
D
Excise tax = $40 per room
Area = tax revenue
The area of the shaded rectangle is:
Area = Height × Width = $40 per room × 5,000 rooms = $200,000

Tax Rates and Revenue

- A **tax rate** is the amount of tax people are required to pay per unit of whatever is being taxed.

Tax Rates and Revenue



The tax revenue collected is:

- Tax revenue = $20 per room × 7500 rooms = $150,000
  - Reducing the tax rate by 50% lower the tax revenue by 25%

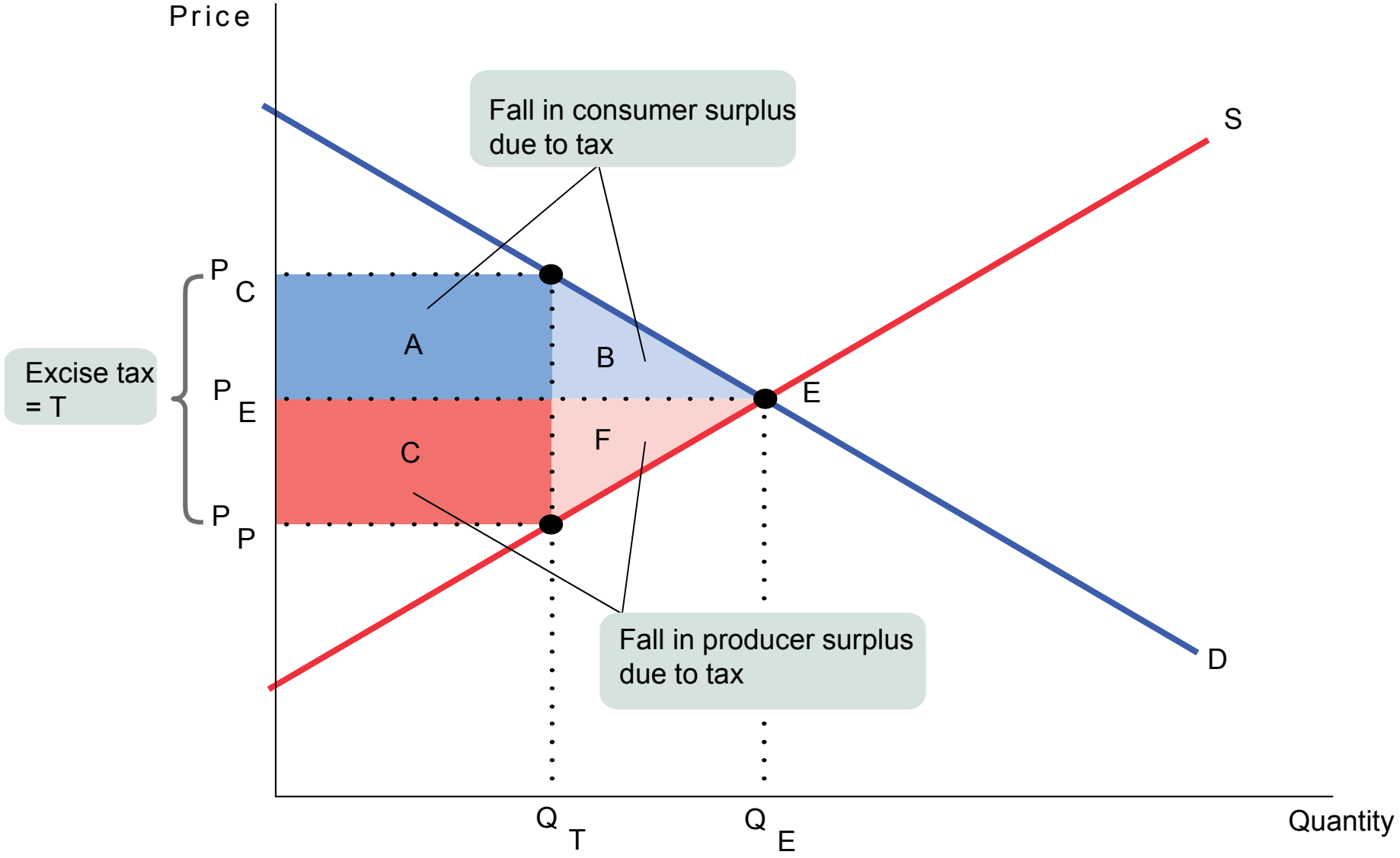
- Tax revenue = $60 per room × 2500 rooms = $150,000
  - Raising the tax rate by 50% lowers the tax revenue by 25% ((150000-200000)/200000 x 100 = -25%)

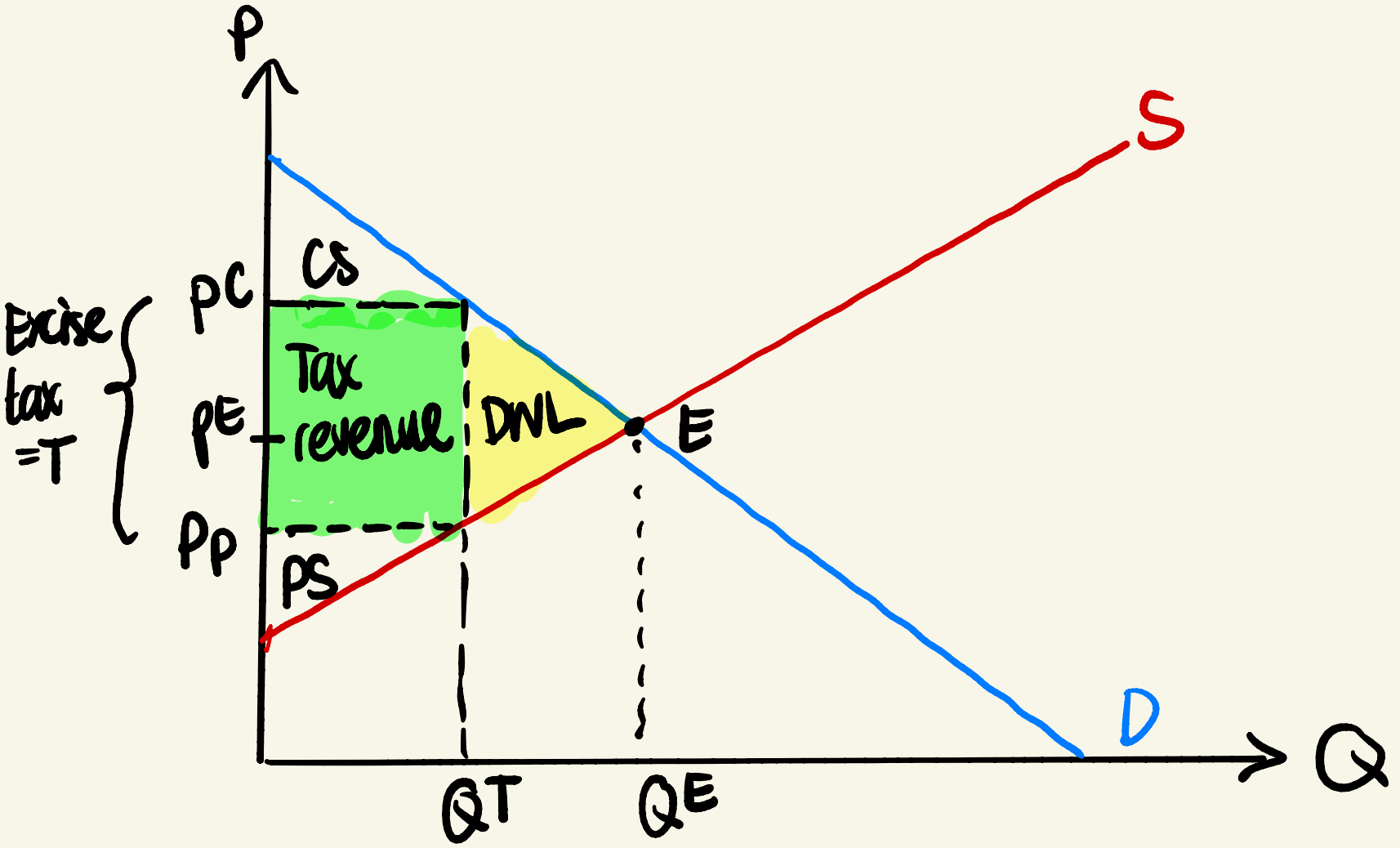
A Tax Reduces Consumer and Producer Surplus

- A fall in the price of a good generates a gain in consumer surplus.
- Similarly, a price increase causes a loss to consumers.
- So it's not surprising that in the case of an excise tax, the rise in the price paid by consumers causes a loss.
- Meanwhile, the fall in the price received by producers leads to a fall in producer surplus.

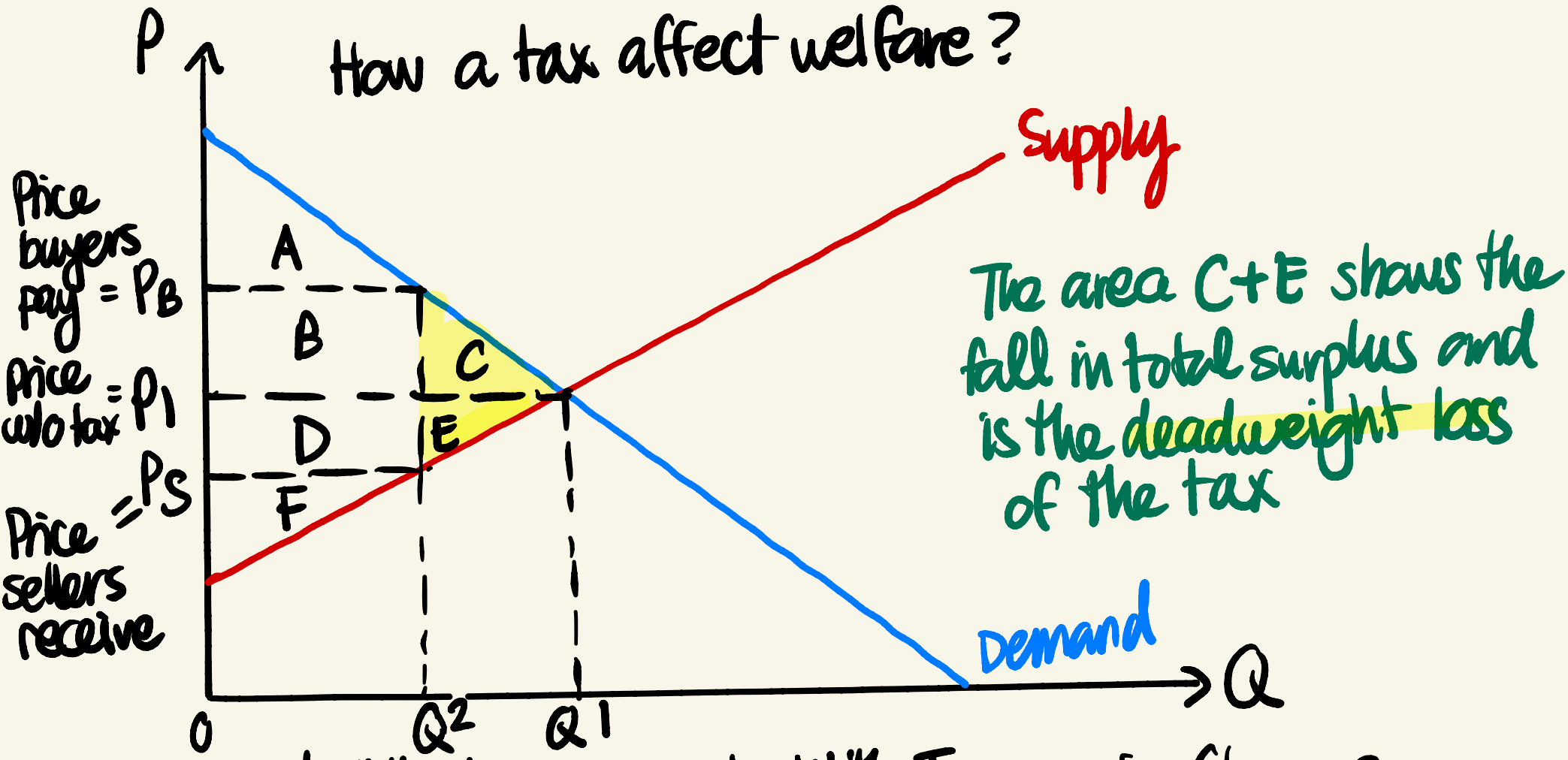
→ A tax reduces both, the CS and the PS

A Tax Reduces Consumer and Producer Surplus



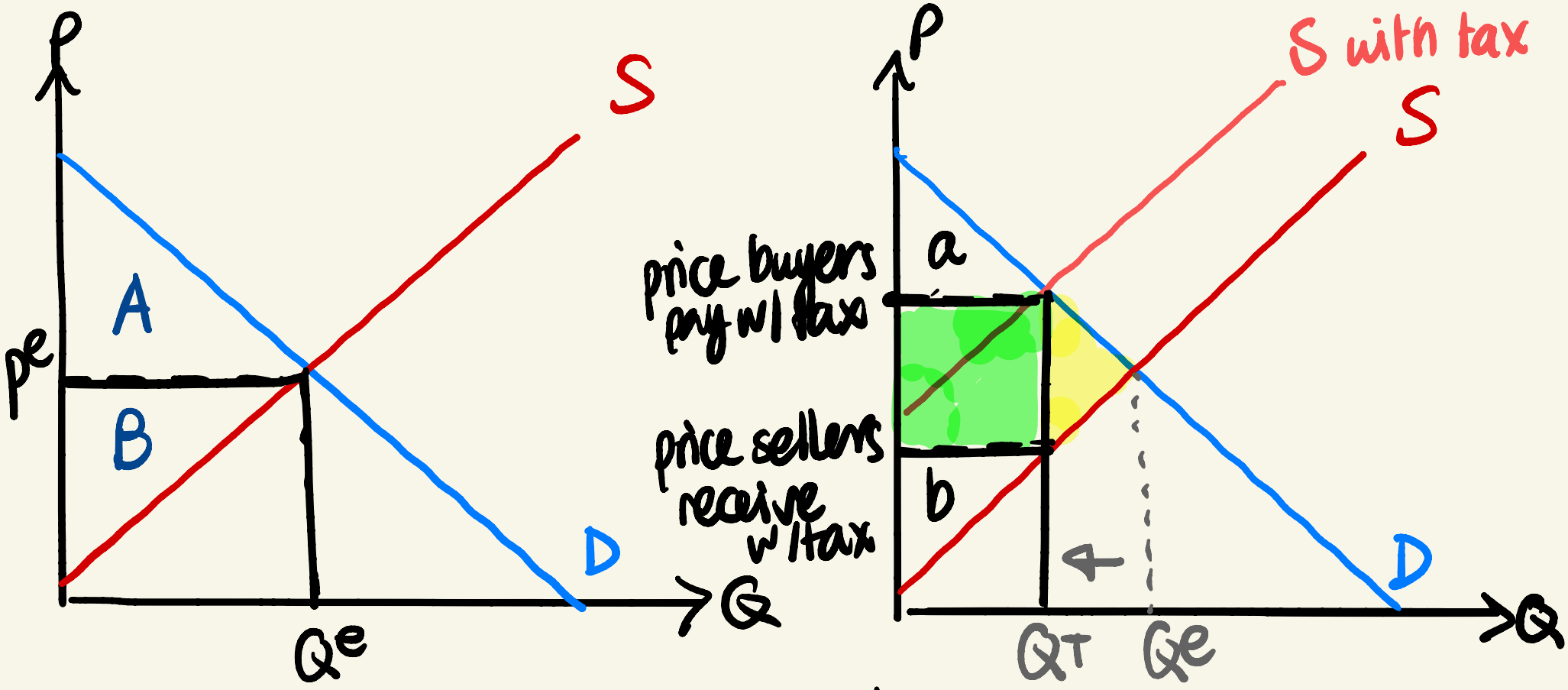

P
S
CS
PC
Excise tax =T
Tax revenue
DWL
PE
E
PP
PS
D
Q
QT
QE

How a tax affect welfare?

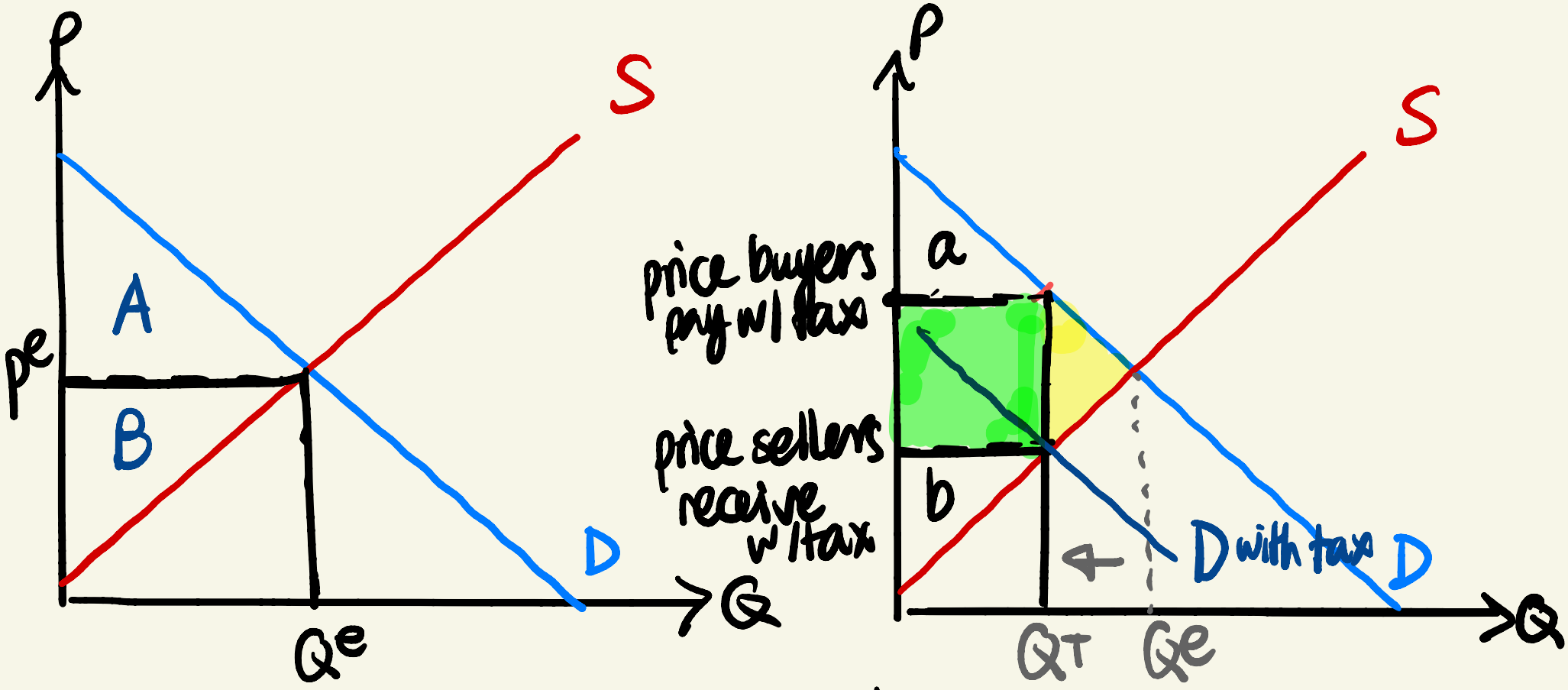


The area C+E shows the fall in total surplus and is the deadweight loss of the tax

	Without Tax	With Tax	Change
CS	A+B+C	A	-(B+C)
PS	D+E+F	F	-(D+E)
Tax revenue	None	B+D	+(B+D)
Total surplus	A+B+C+D+E+F	A+B+D+F	-(C+E)



	Before tax	After tax
Consumer surplus	A	a
Producer surplus	B	b
Tax revenue	∅	
Dead weight loss	∅	



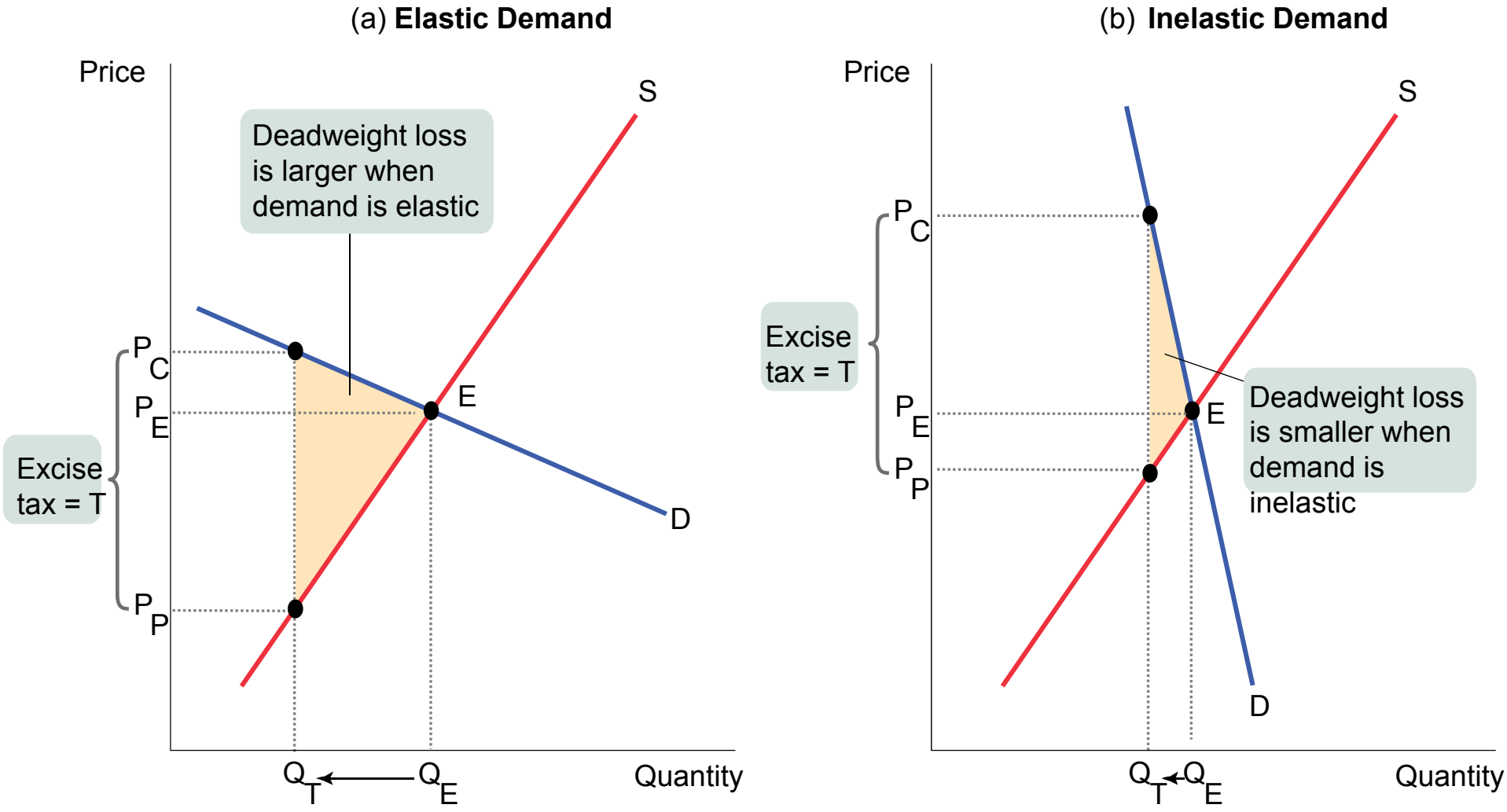
	Before tax	After tax
Consumer surplus	A	a
Producer surplus	B	b
Tax revenue	∅	
Dead weight loss	∅	

The Deadweight Loss of a Tax

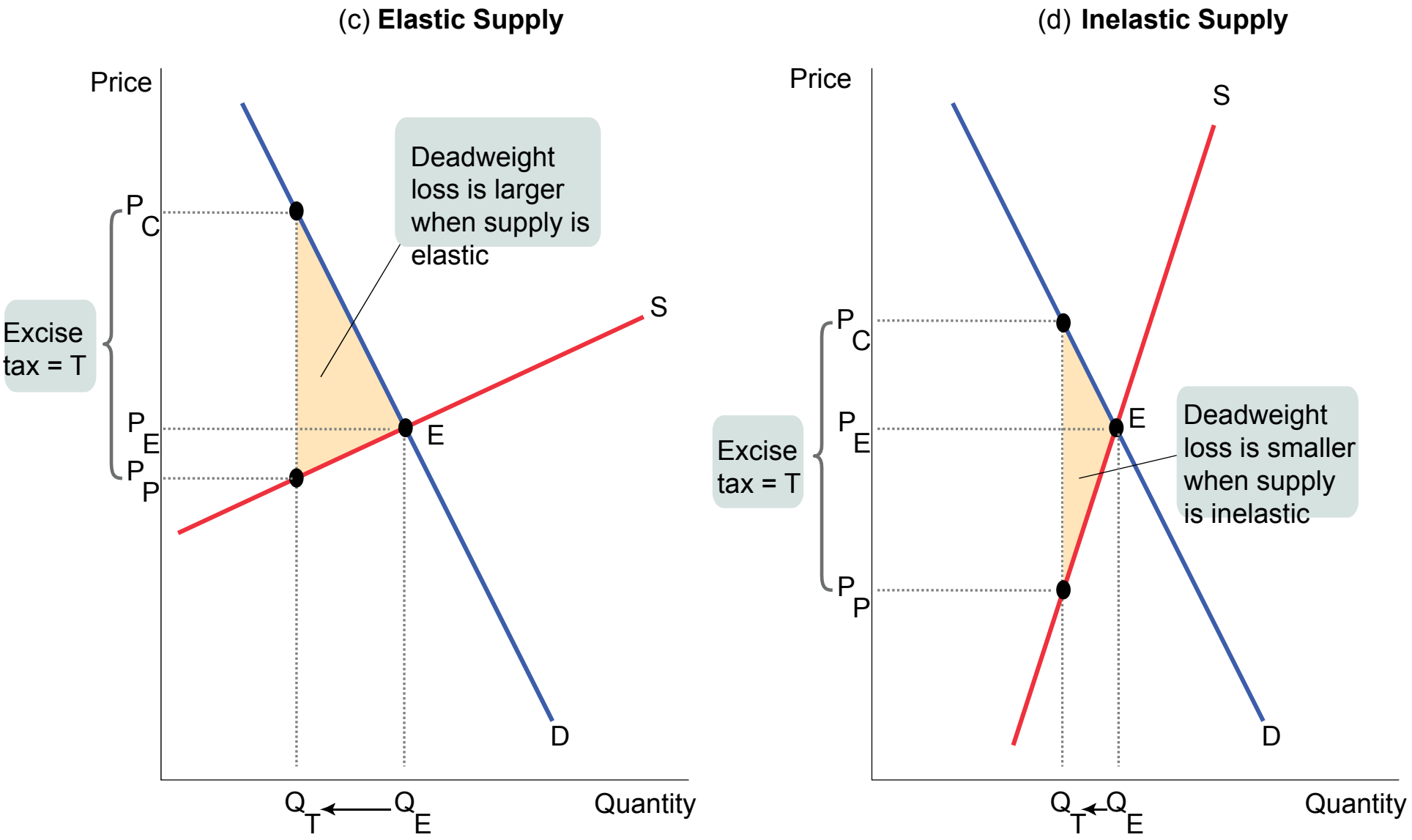
- The deadweight loss caused by the tax represents the total surplus lost to society because of the tax—that is, the amount of surplus that would have been generated by transactions that now do not take place because of the tax.

Elasticities and the Deadweight loss of a Tax

Deadweight Loss and Elasticities



Deadweight Loss and Elasticities



Deadweight Loss and Elasticities

- To minimize the efficiency costs of taxation, one should **choose to tax only those goods for which demand or supply, or both, is relatively inelastic**.
- For such goods, a tax has little effect on behavior because behavior is relatively unresponsive to changes in the price.

Deadweight Loss and Elasticities

- In the extreme case in which demand is perfectly inelastic (a vertical demand curve), the quantity demanded is unchanged by the imposition of the tax. As a result, the tax imposes no deadweight loss.

- Similarly, if supply is perfectly inelastic (a vertical supply curve), the quantity supplied is unchanged by the tax and there is also no deadweight loss.

Deadweight Loss and Elasticities

- If the goal in choosing whom to tax is to **minimize deadweight loss**, then taxes should be imposed on goods and services that have **the most inelastic** response—that is, goods and services for which consumers or producers will change their behavior the least in response to the tax.

Sources:

- Krugman, P. and Robin Wells (2008)
- Lipsey, Ragan, and Storer (2008)