Application: The Costs of Taxation
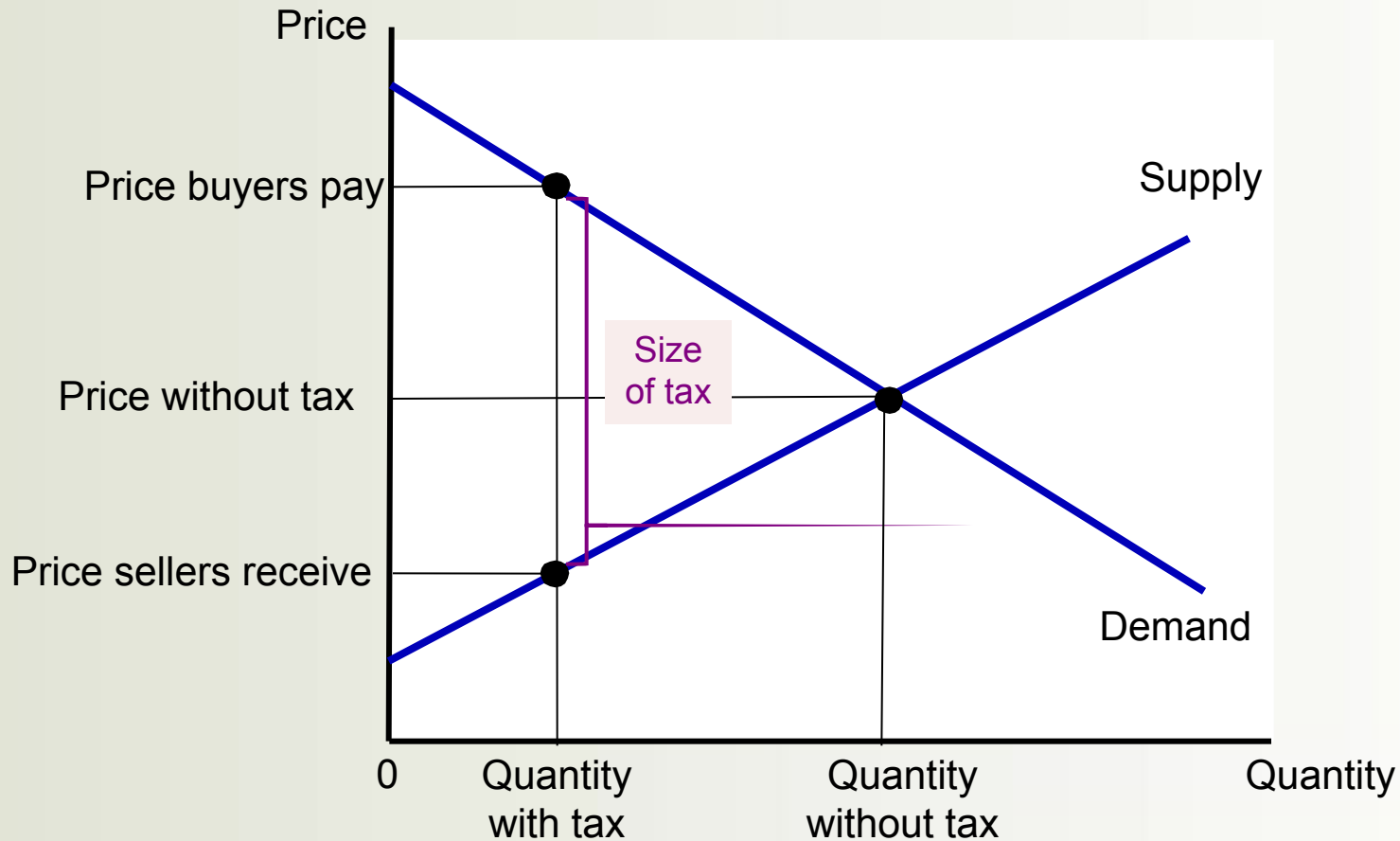
The Deadweight Loss of Taxation

- Tax on a good
  - Levied on buyers
    - Demand curve shifts downward by the size of tax
  - Levied on sellers
    - Supply curve shifts upward by the size of tax
  - Same outcome: price wedge
    - Price paid by buyers – rises
    - Price received by sellers – falls
    - Lower quantity sold

The Deadweight Loss of Taxation

- Tax burden
  - Distributed between producers and consumers
  - Determined by elasticities of supply and demand
- Market for the good - smaller

Figure 1

The effects of a tax

A tax on a good places a wedge between the price that buyers pay and the price that sellers receive. The quantity of the good sold falls.

The Deadweight Loss of Taxation

- **How a tax affects market participants**
- Gains and losses from a tax on a good
  - Buyers: consumer surplus
  - Sellers: producer surplus
  - Government: total tax revenue
    - Tax times quantity sold
    - Public benefit from the tax
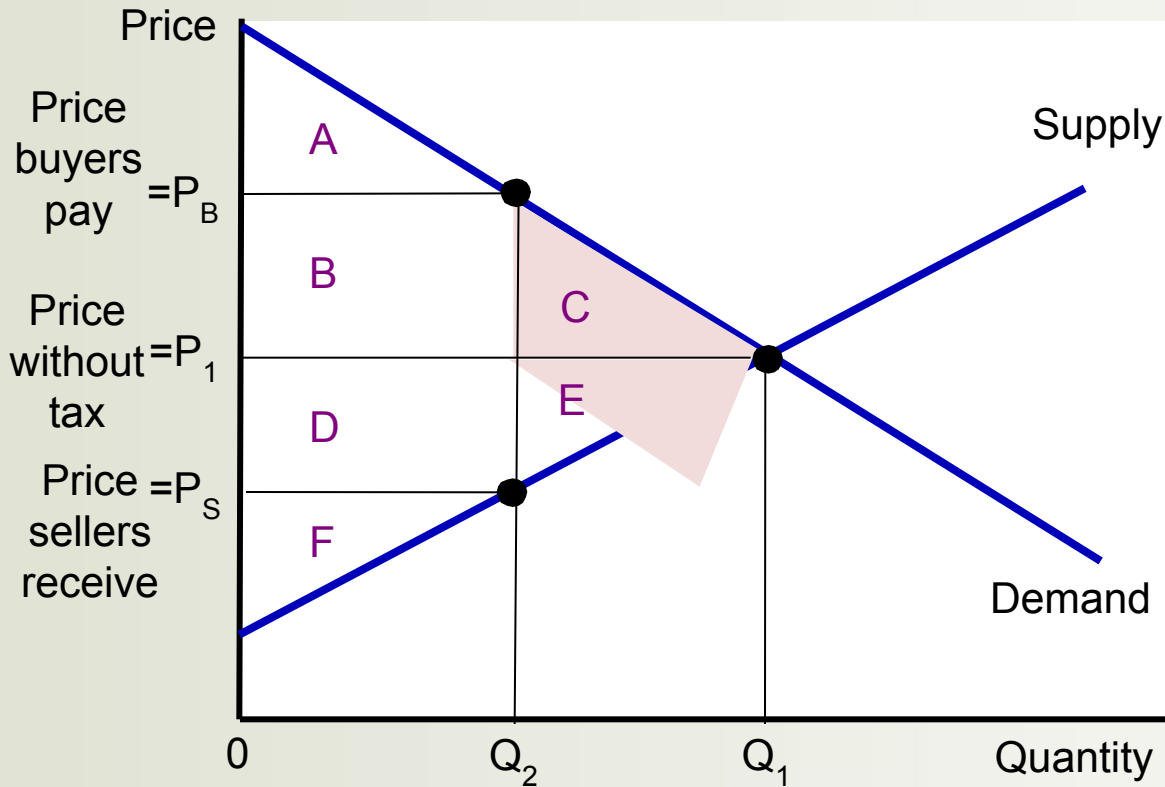
Figure 2

Tax revenue
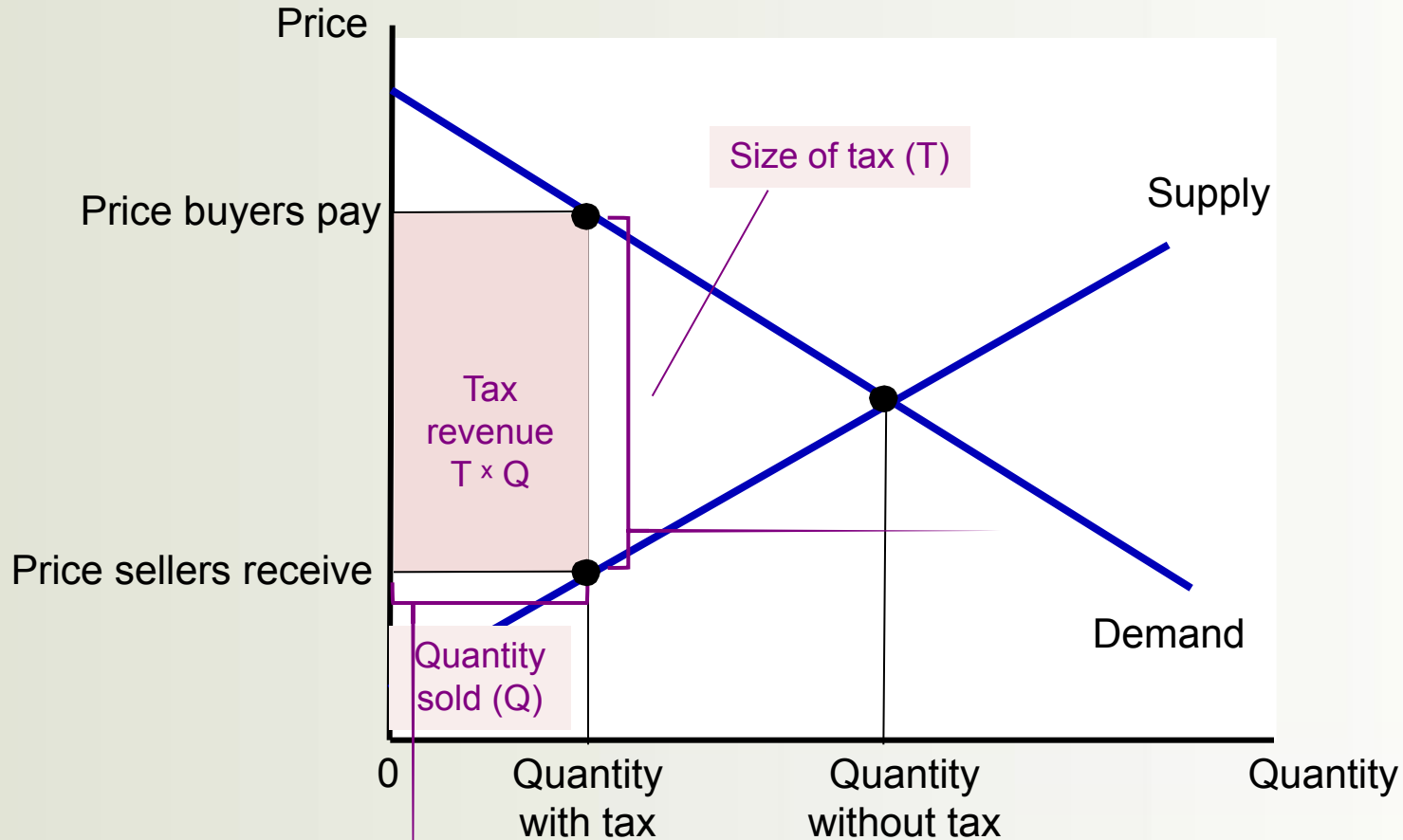
The tax revenue that the government collects equals T × Q, the size of the tax T times the quantity sold Q. Thus, tax revenue equals the area of the rectangle between the supply and demand curves

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The Deadweight Loss of Taxation

- Welfare without a tax
  - Consumer surplus
  - Producer surplus
  - Total tax revenue = 0
- Welfare with tax
  - Smaller consumer surplus
  - Smaller producer surplus
  - Total tax revenue
  - Smaller overall welfare

Figure 3

How a tax affects welfare

Price

Price buyers pay $=P_B$

A

Supply

B

C

Price without tax $=P_1$

E

D

Price sellers receive $=P_S$

F

Demand

0   Q_2 Q_1 Quantity

A tax on a good reduces consumer surplus (by the area B + C) and producer surplus (by the area D + E). Because the fall in producer and consumer surplus exceeds tax revenue (area B + D), the tax is said to impose a deadweight loss (area C + E).

	Without Tax	With Tax	Change
Consumer Surplus	A+B+C	A	-(B+C)
Producer Surplus	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)

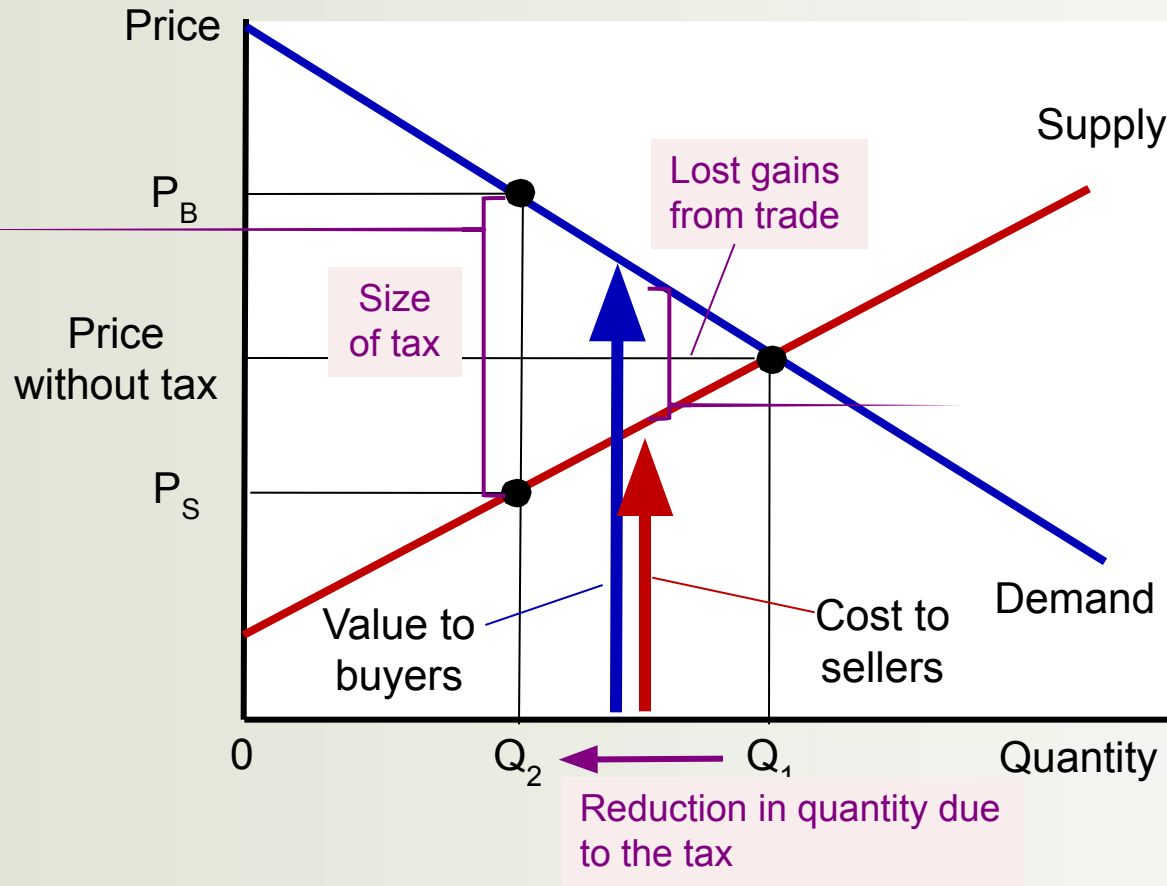The area C + E shows the fall in total surplus and is the deadweight loss of the tax

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The Deadweight Loss of Taxation

- Losses of surplus to buyers and sellers from a tax
  - Exceed the revenue raised by the government
- Deadweight loss
  - Fall in total surplus that results from a market distortion, such as a tax
- Taxes distort incentives
  - Markets allocate resources inefficiently

The Deadweight Loss of Taxation

- Deadweight losses and the gains from trade
  - Taxes cause deadweight losses
    - Prevent buyers and sellers from realizing some of the gains from trade
  - The gains from trade
    - Difference between buyers' value and sellers' cost
    - Less than the tax
    - Once the tax is imposed
      - Trades are not made
      - Deadweight loss

Figure | 4

The deadweight loss

Price

P_B

Price without tax

P_S

Supply

Lost gains from trade

Size of tax

Value to buyers

Cost to sellers

Demand

0   Q_2 Q_1 Quantity

Reduction in quantity due to the tax

When the government imposes a tax on a good, the quantity sold falls from Q_1 to Q_2. At every quantity between Q_1 and Q_2, the potential gains from trade among buyers and sellers are not realized. These lost gains from trade create the deadweight loss.
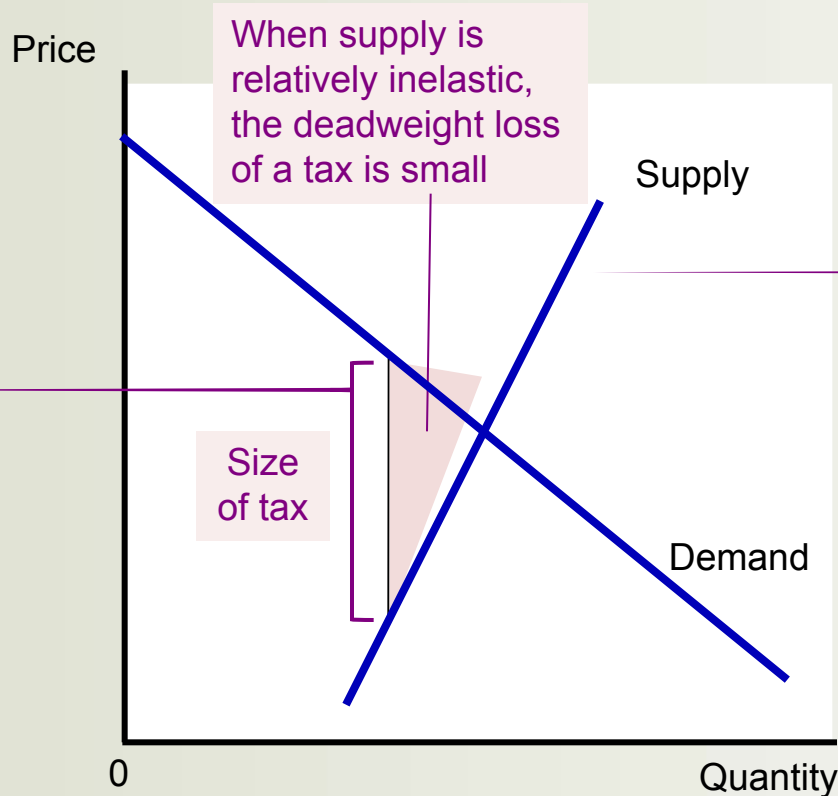
Determinants of the Deadweight Loss

- Price elasticities of supply and demand
  - Supply curve - more elastic
    - Deadweight loss – larger
  - Demand curve – more elastic
    - Deadweight loss – larger
- The greater the elasticities of supply and demand
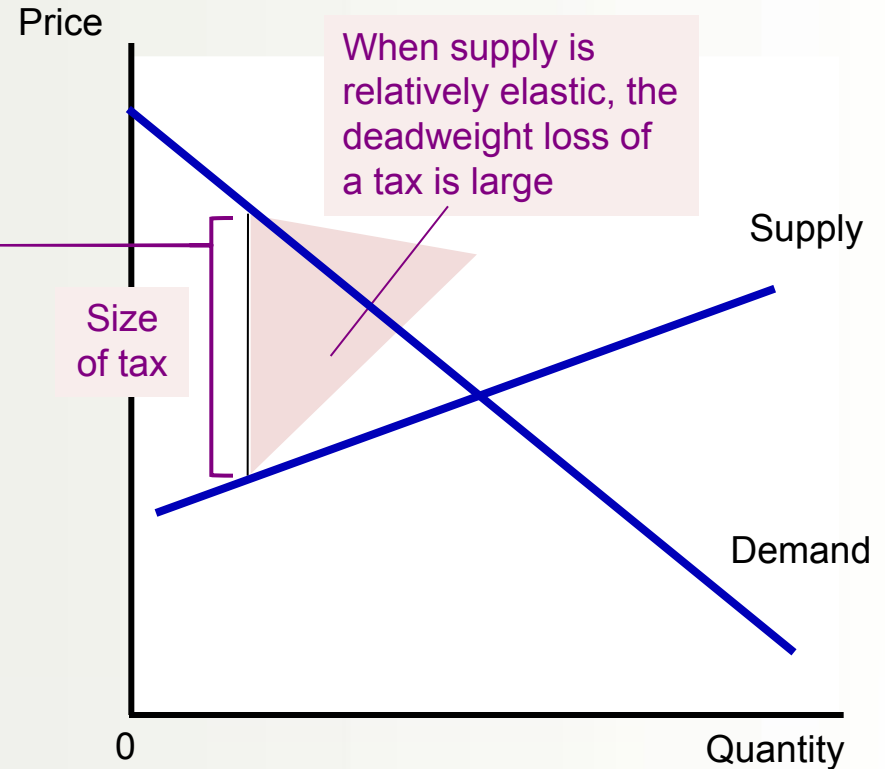 - The greater the deadweight loss of a tax

Figure 5

## Tax distortions and elasticities (a, b)

(a) Inelastic supply

(b) Elastic supply

When supply is relatively inelastic, the deadweight loss of a tax is small

When supply is relatively elastic, the deadweight loss of a tax is large

Price

Supply

Demand

Size of tax

Price

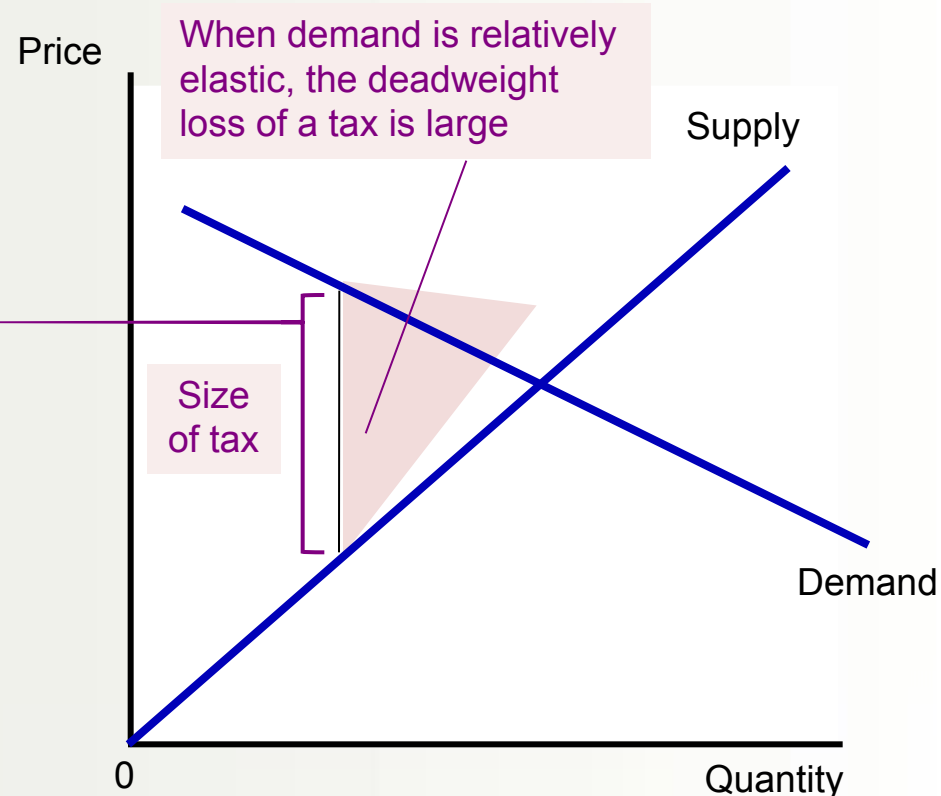Supply

Demand

Size of tax

0

Quantity

0

Quantity

In panels (a) and (b), the demand curve and the size of the tax are the same, but the price elasticity of supply is different. Notice that the more elastic the supply curve, the larger the deadweight loss of the tax.

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Figure 5

Tax distortions and elasticities (c, d)

(c) Inelastic demand
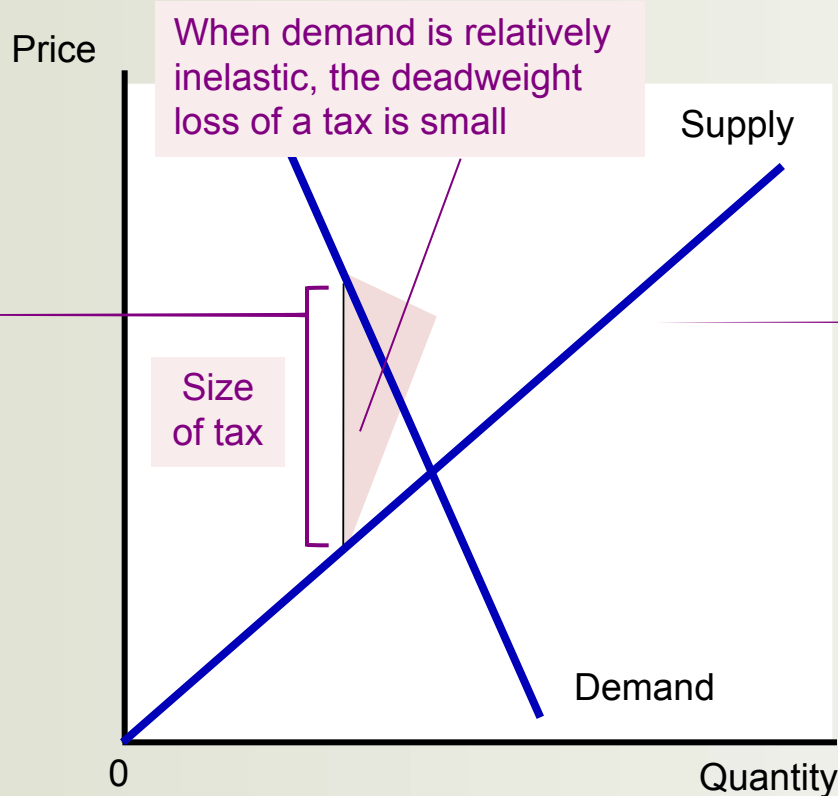
(d) Elastic demand

In panels (c) and (d), the supply curve and the size of the tax are the same, but the price elasticity of demand is different. Notice that the more elastic the demand curve, the larger the deadweight loss of the tax.

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- ## How big should the government be?
  - – The larger the deadweight loss of taxation
    - The larger the cost of any government program
  - – If taxes - large deadweight losses
    - These losses - strong argument for a leaner government
      - – Does less and taxes less
  - – If taxes - small deadweight losses
    - Government programs - less costly

- How big are the deadweight losses of taxation?
  - Economists disagree
  - Tax on labor
    - Social Security tax, Medicare tax, federal income tax
    - Places a wedge between the wage that firms pay and the wage that workers receive
    - Marginal tax rate on labor income = 40%

- 40% labor tax - Small or large deadweight loss?
  - Labor supply - fairly inelastic
    - Almost vertical
    - Tax on labor - small deadweight loss
  - Labor supply - more elastic
    - Tax on labor – greater deadweight loss

Deadweight Loss & Tax Revenue as Taxes Vary

- As the tax increases
  - Deadweight loss increases
    - Even more rapidly than the size of the tax
  - Tax revenue
    - Increases initially
    - Then decreases
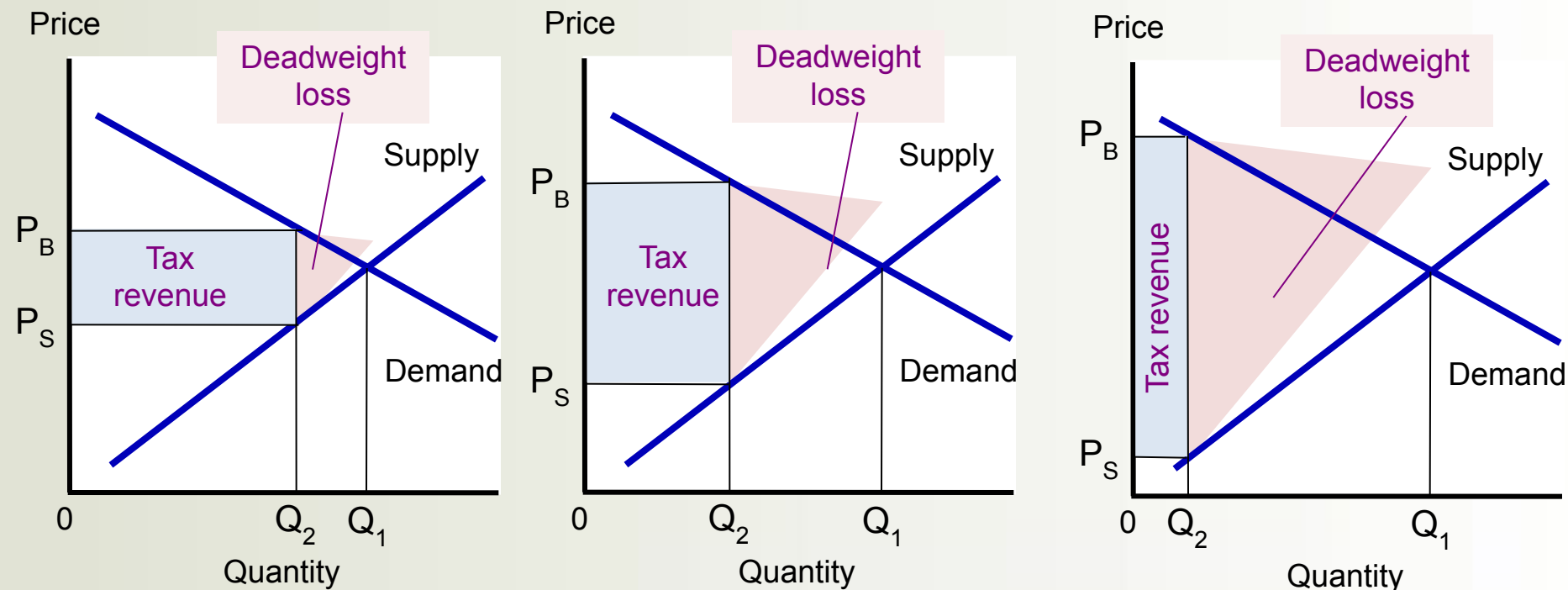   - Higher tax – drastically reduces the size of the market

Figure 6

How deadweight loss and tax revenue vary with the size of a tax (a, b, c)


(a) Small tax

(b) Medium tax

(c) Large tax

The deadweight loss is the reduction in total surplus due to the tax. Tax revenue is the amount of the tax times the amount of the good sold. In panel (a), a small tax has a small deadweight loss and raises a small amount of revenue. In panel (b), a somewhat larger tax has a larger deadweight loss and raises a larger amount of revenue. In panel (c), a very large tax has a very large deadweight loss, but because it has reduced the size of the market so much, the tax raises only a small amount of revenue.
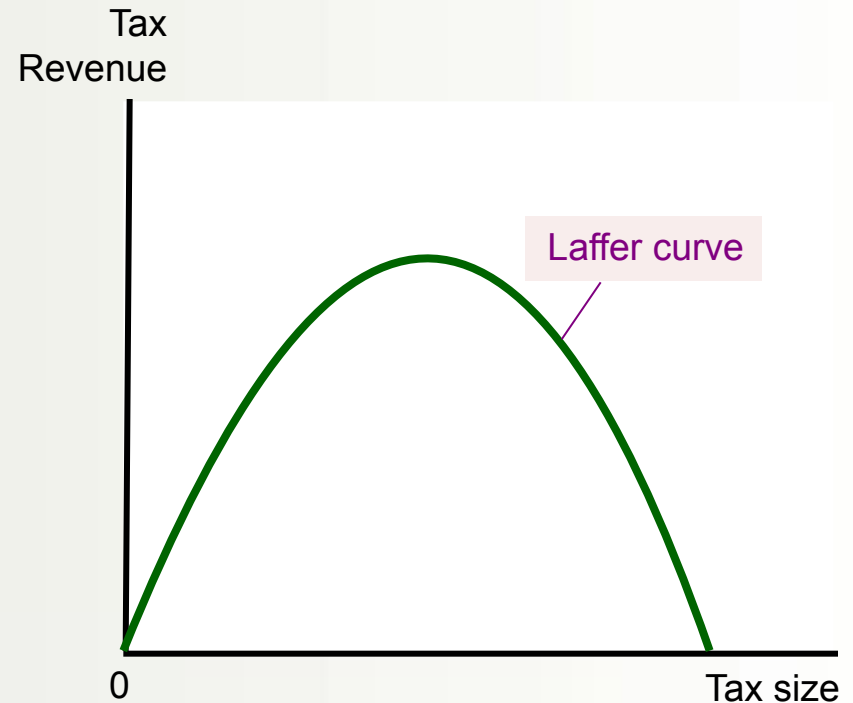
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Figure | 6

How deadweight loss and tax revenue vary with the size of a tax (d, e)

(d) From panel (a) to panel (c), deadweight loss continually increases
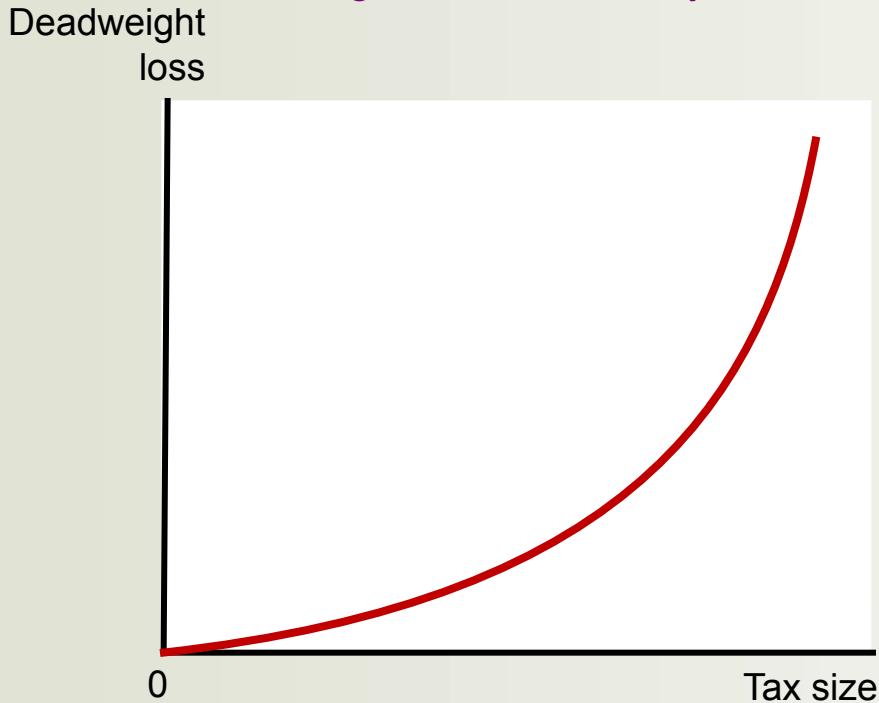
(e) From panel (a) to panel (c), tax revenue first increases, then decreases

Panels (d) and (e) summarize these conclusions. Panel (d) shows that as the size of a tax grows larger, the deadweight loss grows larger. Panel (e) shows that tax revenue first rises and then falls. This relationship is sometimes called the Laffer curve.

The Laffer curve and supply-side economics

- 1974, economist Arthur Laffer
  - Laffer curve
  - Supply-side economics
  - Tax rates were so high
    - Reducing them would actually raise tax revenue
- Ronald Reagan - ran for president in 1980
  - From experience in film industry
    - High tax rates - caused less work
    - Low tax rates - caused more work

- Ronald Reagan - ran for president in 1980
  - Argument
    - Taxes were so high that they were discouraging hard work
    - Lower taxes would give people the proper incentive to work
  - Raise economic well-being
  - Perhaps increase tax revenue
- Economists continue to debate Laffer's argument
- General lesson:
  - Change in tax revenue from a tax change
  - Depends on how the tax change affects people's behavior

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