taxation

types of taxation

fairness of tax systems

tax incidence

tax inefficiencies and optimal taxation

taxation

Types of Taxation

- **Taxes on Earnings**

  - **Payroll tax:** A tax levied on income earned on one's job.

- **Taxes on Individual Income**

  - **Individual income tax:** A tax paid on individual income accrued during the year.

  - **Capital gains:** Earnings from selling capital assets, such as stocks, paintings, and houses.

taxation

Types of Taxation

- **Taxes on Corporate Income**

  - **Corporate income tax:** Tax levied on the earnings of corporations.

- **Taxes on Wealth**

  - **Wealth taxes:** Taxes paid on the value of the assets held by a person or family.

  - **Property taxes:** A form of wealth tax based on the value of real estate.

  - **Estate taxes:** A form of wealth tax based on the value of the estate left behind when one dies.

taxation

Taxes on Consumption

- **Consumption tax:** A tax paid on individual or household consumption of goods (and sometimes services).

- **Sales taxes:** Taxes paid by consumers to vendors at the point of sale.

- **Excise tax:** A tax paid on the sales of particular goods, for example, cigarettes or gasoline.

taxation

Tax Revenue by Type of Tax in the United States (2010, % of Total Tax Revenue)

	Federal	State and Local	Total
Individual income taxes	42%	20%	34%
Social insurance contributions (payroll tax)	35	0	24
Corporate taxes	13	4	10
Consumption tax	3	34	14
Property tax	0	33	11
Other	7	9	7

taxation

Taxation Around the World

	Norway	Denmark	OECD Average
Individual income taxes	24%	55%	25%
Social insurance contributions (payroll tax)	23	2	27
Corporate taxes	22	5	8
Consumption tax	26	30	31
Property tax	3	4	5
Other	2	4	4

taxation

Measuring the Fairness of Tax Systems

- Two key features of any tax system:

  o **Marginal tax rate:** The percentage that is paid in taxes of the next dollar earned.

  o **Average tax rate:** The percentage of total income that is paid in taxes.

- In the United States, the marginal tax rate rises with income, from 10% to 35%.

taxation

Vertical and Horizontal Equity

Two goals are in measuring tax fairness:

- **Vertical equity:** The principle that groups with more resources should pay higher taxes than groups with fewer resources.

- **Horizontal equity:** The principle that similar individuals who make different economic choices should be treated similarly by the tax system.

taxation

Measuring Vertical Equity

Vertical equity likely requires progressive taxation.

- **Progressive:** Tax systems in which effective average tax rates rise with income.

- **Proportional:** Tax systems in which effective average tax rates do not change with income so that all taxpayers pay the same proportion of their income in taxes.

- **Regressive:** Tax systems in which effective average tax rates fall with income.

taxation

Tax Deductions versus Tax Credits

- Tax subsidies can be offered as deductions or credits.

- **Tax deductions:** Amounts by which taxpayers are allowed to reduce their taxable income through spending on items such as charitable donations or home mortgage interest.

- *Tax credits* allow taxpayers to reduce the *amount of tax they owe* to the government by a certain amount (e.g., the amount they spend on child care).

- How should the government decide which to use?

taxation

Efficiency Considerations

Consider replacing charitable giving deduction with a tax credit for up to $1,000.

- For people giving less than $1,000, the credit provides a much stronger incentive to increase giving up

- Once a person gives more than $1,000, there is no more benefit from the tax credit.

- Policy preference depends on:

    o The nature of the demand for the subsidized good.

    o How important it is to achieve some minimal level of the behavior.

taxation

Equity Considerations

- On vertical equity grounds, tax credits are more equitable than deductions.

- The value of a deduction rises with one's tax rate, making deductions *regressive*.

- Credits, on the other hand, are available equally to all incomes so that they are *progressive*.

taxation

Tax Incidence

- **Statutory incidence:** The burden of a tax borne by the party that sends the check to the government.

- **Economic incidence:** The burden of taxation measured by the change in the resources available to any economic agent as a result of taxation.

- Economic incidence includes tax payments paid and any price changes caused by the tax.

taxation

The Statutory Burden of a Tax Does Not Describe Who Really Bears the Tax

- The tax burden for consumers is:

Consumer tax burden =

  (post-tax price – pre-tax price) + per-unit consumer tax

- For producers the tax burden is

Producer tax burden =

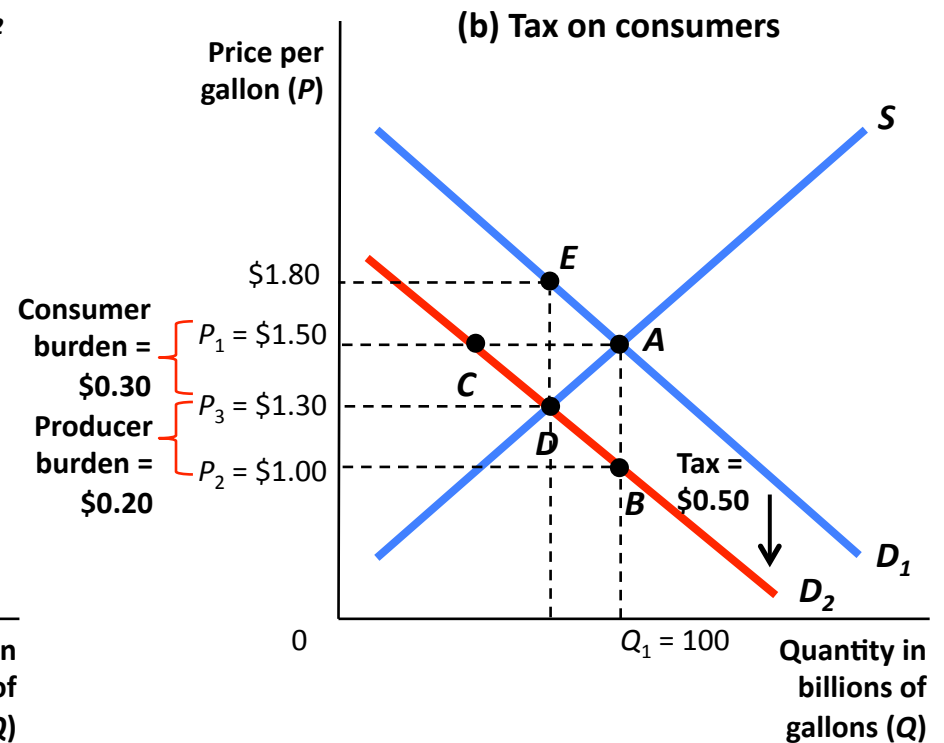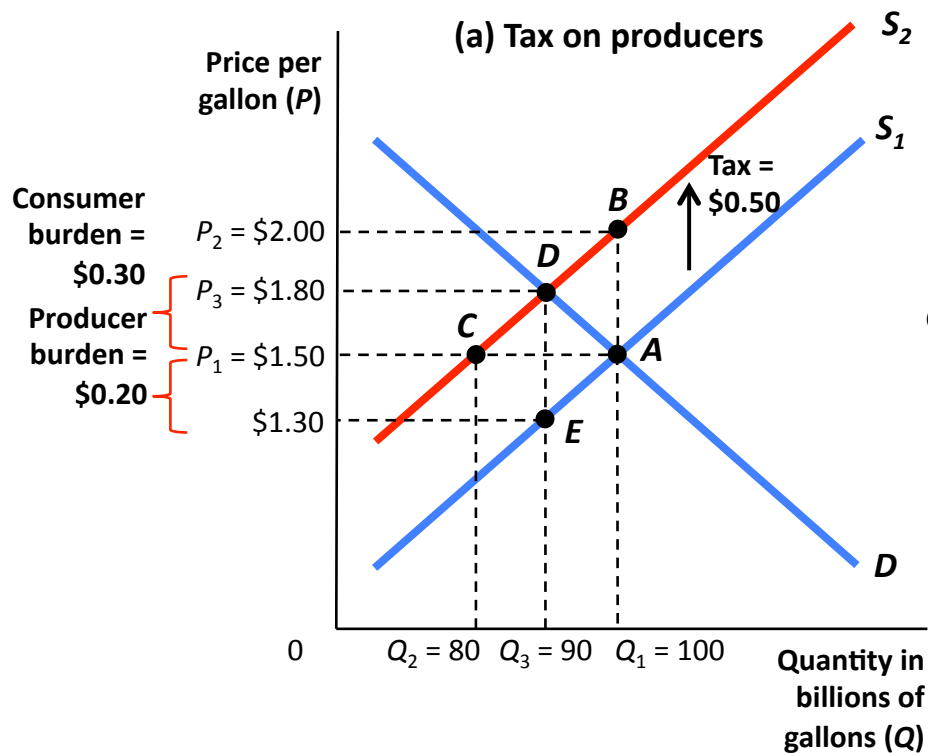 (pre-tax price – post-tax price) + per-unit producer tax

taxation

Burden of the Tax on Consumers and Producers

- **Tax wedge:** The difference between what consumers pay and what producers receive (net of tax) from a transaction.

- If the consumer burden is $0.30 and the producer burden is $0.20, the tax wedge is $0.50.

taxation

The Statutory Burden of a Tax Does Not Describe Who Really Bears the Tax, and Is Irrelevant to the Tax Burden

(a) Tax on producers

Price per gallon (P)

Consumer burden = $0.30

Producer burden = $0.20

$P_2 = 2.00
$P_3 = 1.80
$P_1 = 1.50
$1.30

S_2
S_1

Tax = $0.50

B
D
C
A
E

D

$Q_2 = 80$ $Q_3 = 90$ $Q_1 = 100$

0

Quantity in billions of gallons (Q)

(b) Tax on consumers

Price per gallon (P)

Consumer burden = $0.30

Producer burden = $0.20

$1.80
$P_1 = 1.50
$P_3 = 1.30
$P_2 = 1.00

S

E
A
C
D
B

Tax = $0.50

D_1
D_2

$Q_1 = 100$

0

Quantity in billions of gallons (Q)

taxation

Gross versus After-Tax Prices

- **Gross price:** The price in the market.

- **After-tax price:** The gross price minus the amount of the tax (if producers pay the tax) or plus the amount of the tax (if consumers pay the tax).

- Different statutory rules produce different gross prices for the same after-tax price.

taxation

Parties with Inelastic Supply or Demand Bear Taxes; Parties with Elastic Supply or Demand Avoid Them

- The economic incidence of taxation does not depend on the statutory incidence.

- It is ultimately determined by the *elasticities of supply and demand*, that is, how responsive the quantity supplied or demanded is to price changes.

- If one side of the market is perfectly inelastic, then it bears there is full shifting of the tax burden to it.

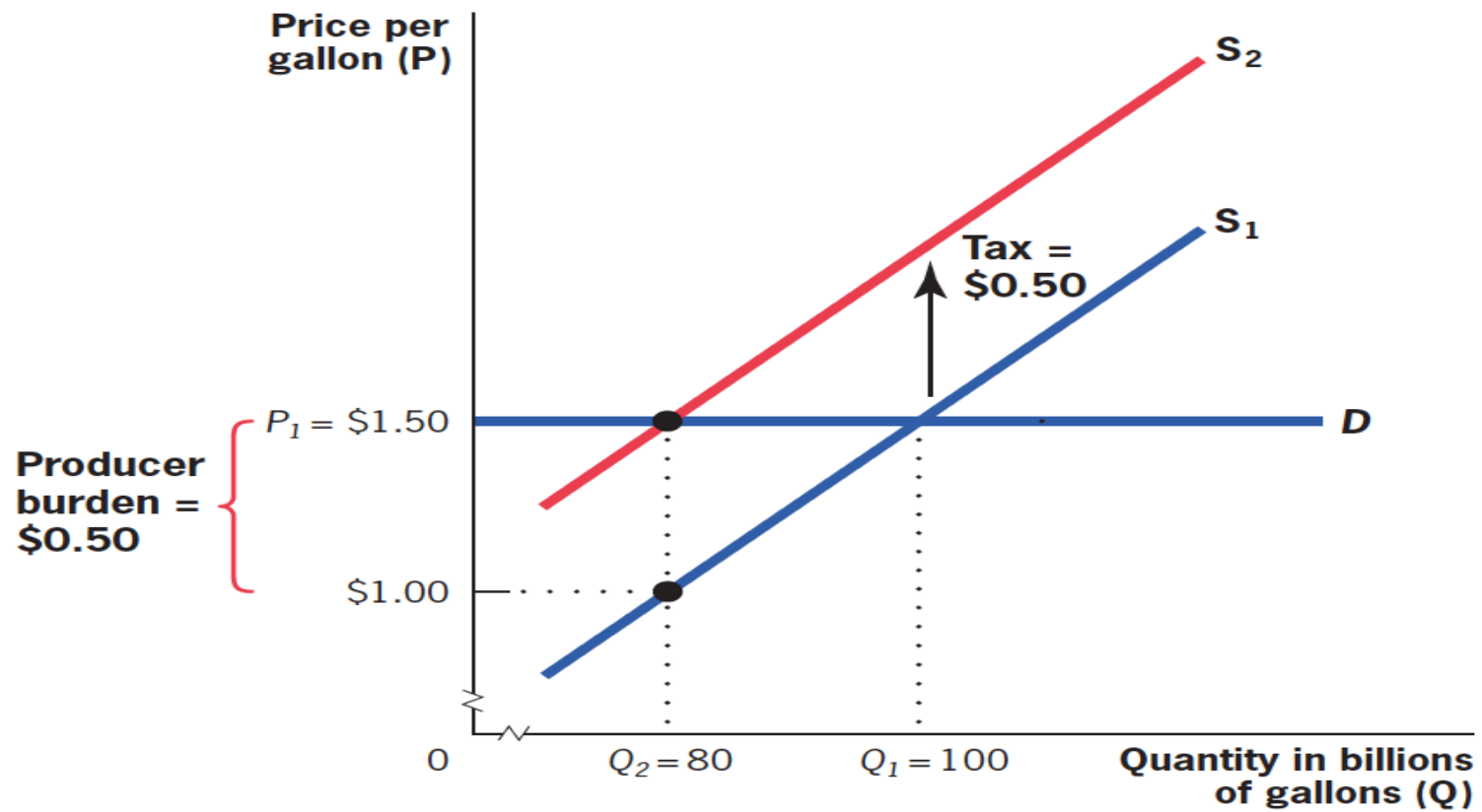 - **Full shifting:** When one party in a transaction bears all of the tax burden.

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Perfectly Inelastic Demand
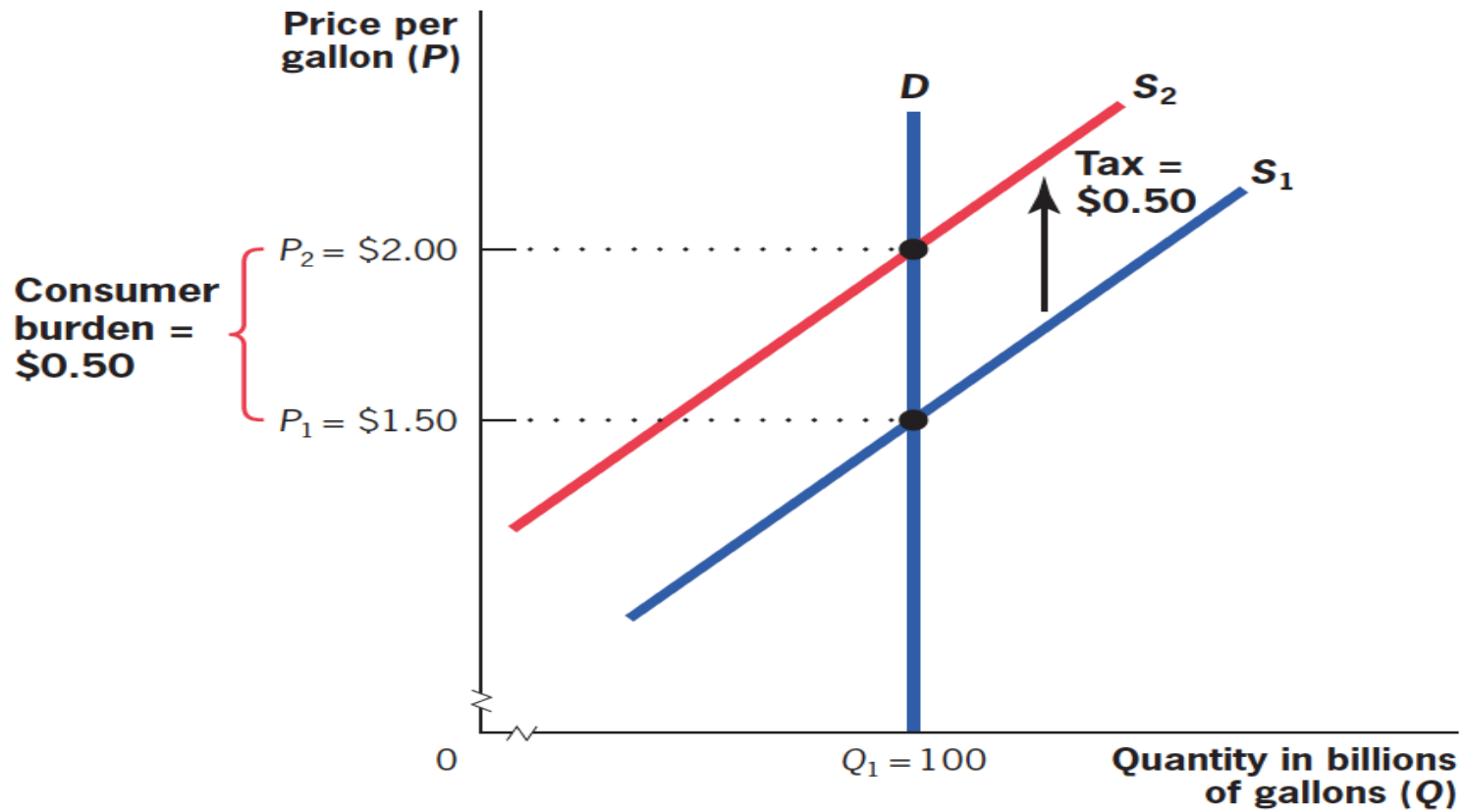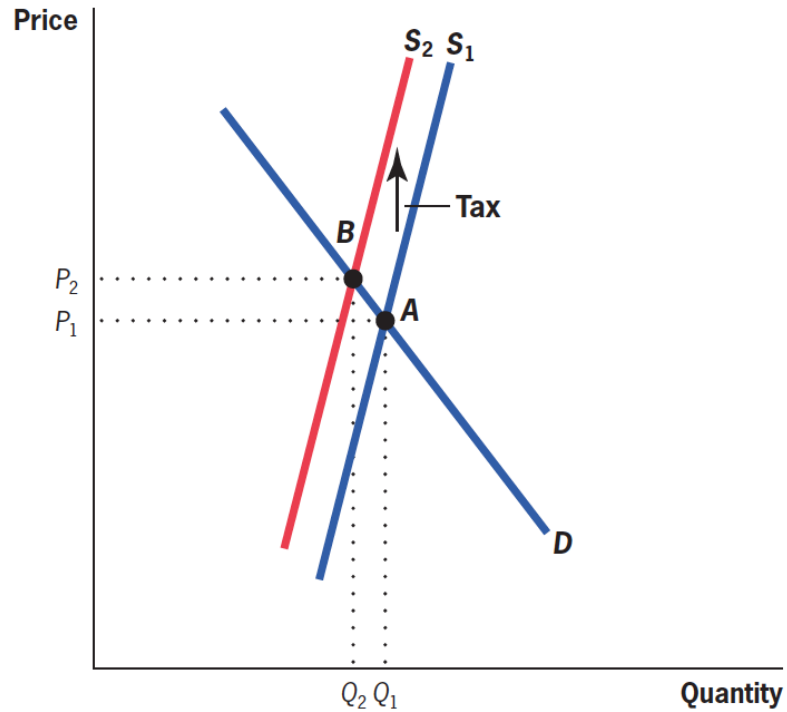
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Perfectly Elastic Demand

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General Case

- In general, the less elastic is demand relative to supply, the larger share of the incidence falls on demand.

- Demand for goods is more elastic when there are many substitutes.

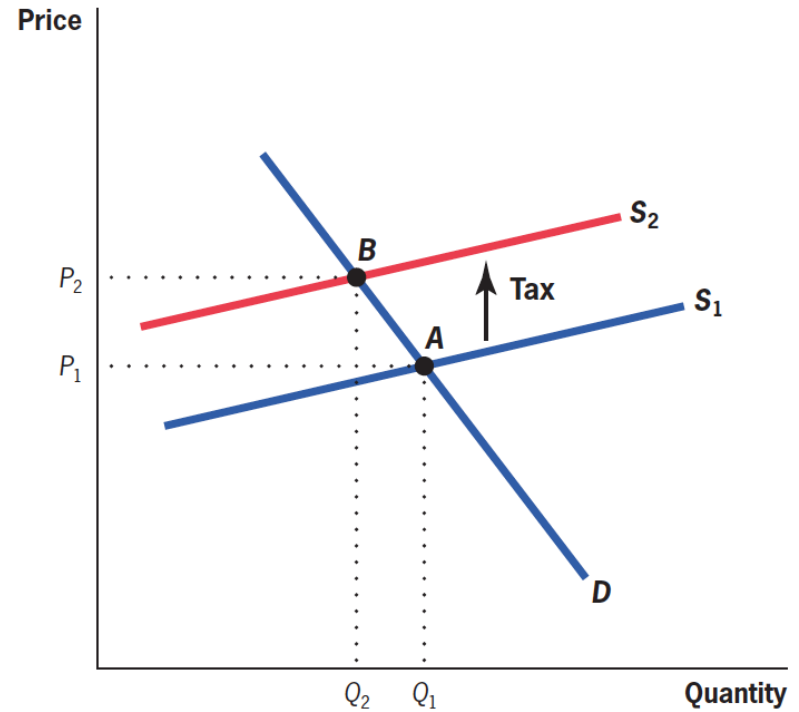- For products with an inelastic demand, the burden of the tax is borne almost entirely by the consumer.

taxation

Supply Elasticities

(a) Tax on steel producers (inelastic supply)

Price

S_2 S_1

Tax

B

P_2

P_1 A

D

Q_2 Q_1 Quantity

(b) Tax on sidewalk vendors (elastic supply)

Price

B

S_2

P_2 Tax

A S_1

P_1

D

Q_2 Q_1 Quantity

taxation

Reminder: Tax Incidence Is About Prices, Not Quantities

- When the demand for gas is perfectly elastic, consumers bear none of the burden of taxation, yet the quantity of gas consumed fell dramatically.

- Doesn't this fall in consumption hurt consumers?

- If so, shouldn't tax incidence take that into account?

- Perfectly elastic demand means consumers are indifferent between the gas and other goods, so they are not hurt by the fall in gas consumption.
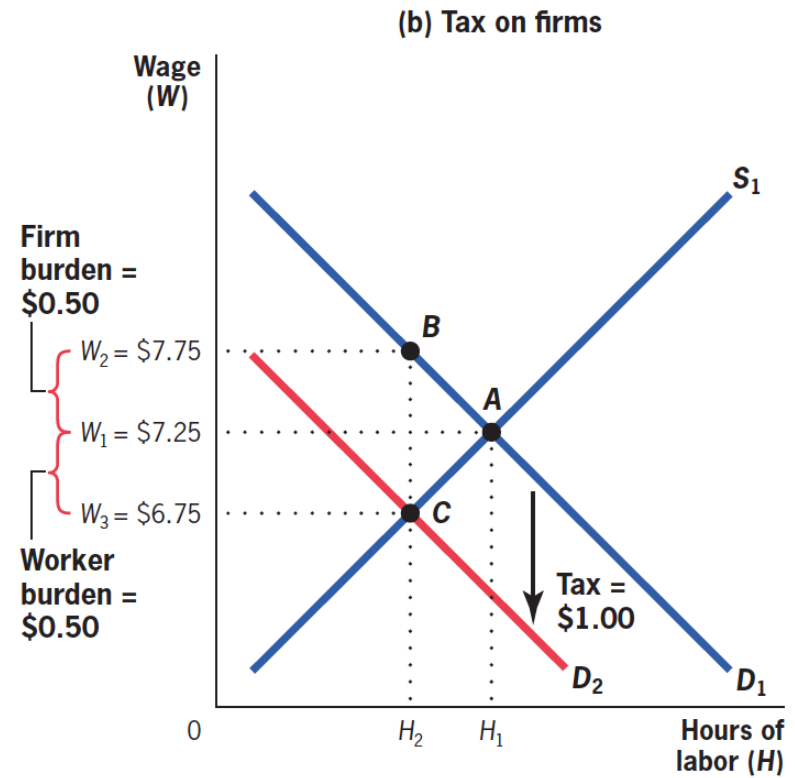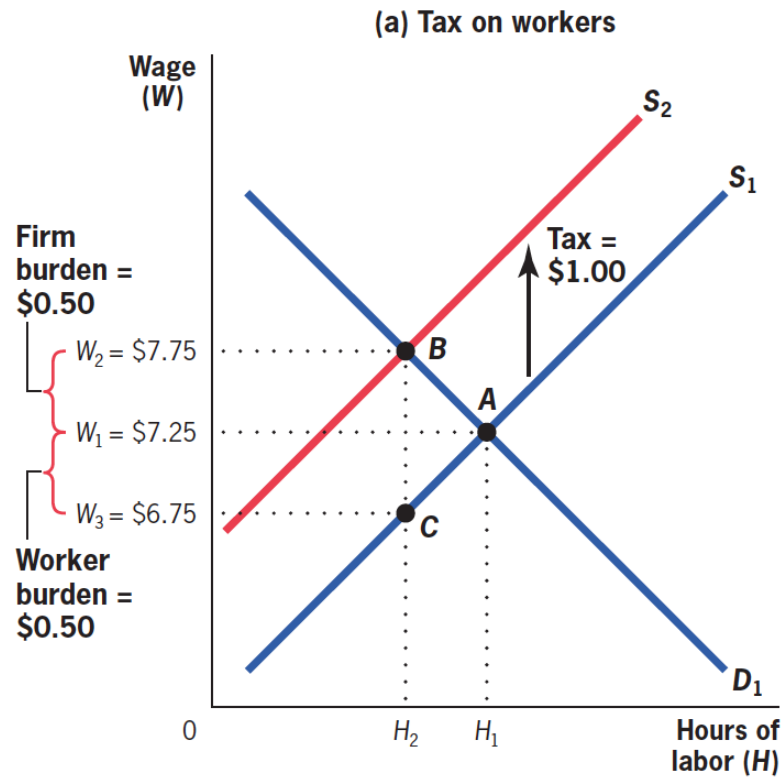
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Tax Incidence Extensions

To recap:

- The statutory burden of a tax does not describe who really bears the tax.

- The side of the market on which the tax is imposed is irrelevant to the distribution of tax burdens.

- Parties with inelastic supply or demand bear taxes; parties with elastic supply or demand avoid them.

taxation

Tax Incidence in Factor Markets

(a) Tax on workers

Wage (W)

Firm burden = $0.50

$W_2 = \$7.75$ B

A

$W_1 = \$7.25$

$W_3 = \$6.75$ C

Worker burden = $0.50

S_2

S_1

Tax = $1.00

D_1

0   H_2 H_1 Hours of labor (H)

(b) Tax on firms

Wage (W)

Firm burden = $0.50

$W_2 = \$7.75$ B

A

$W_1 = \$7.25$

$W_3 = \$6.75$ C

Worker burden = $0.50

S_1

Tax = $1.00

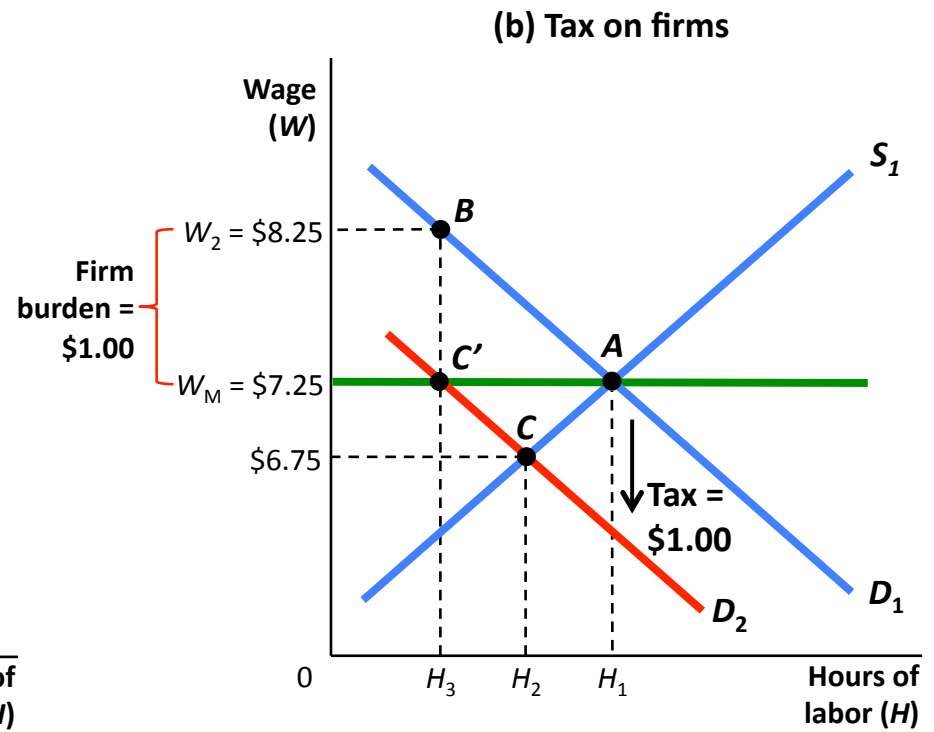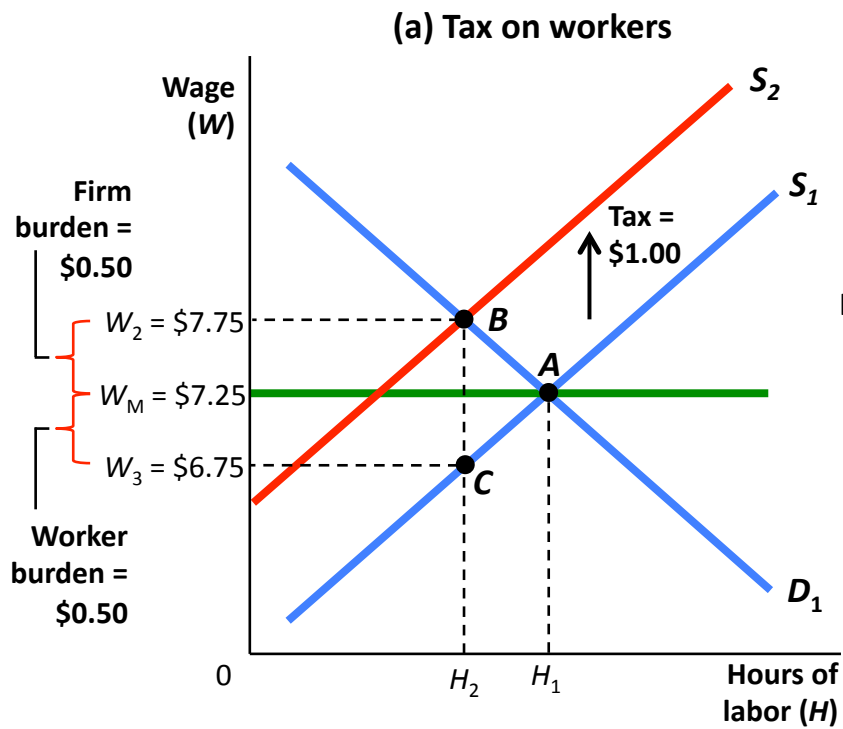D_2 D_1

0   H_2 H_1 Hours of labor (H)

taxation

Impediments to Wage Adjustment

- Tax incidence analysis assumes that prices can freely adjust.

- But wages cannot fall below the minimum wage.

  - **Minimum wage:** Legally mandated minimum amount that workers must be paid for each hour of work.

- Barriers to price adjustment change the incidence.
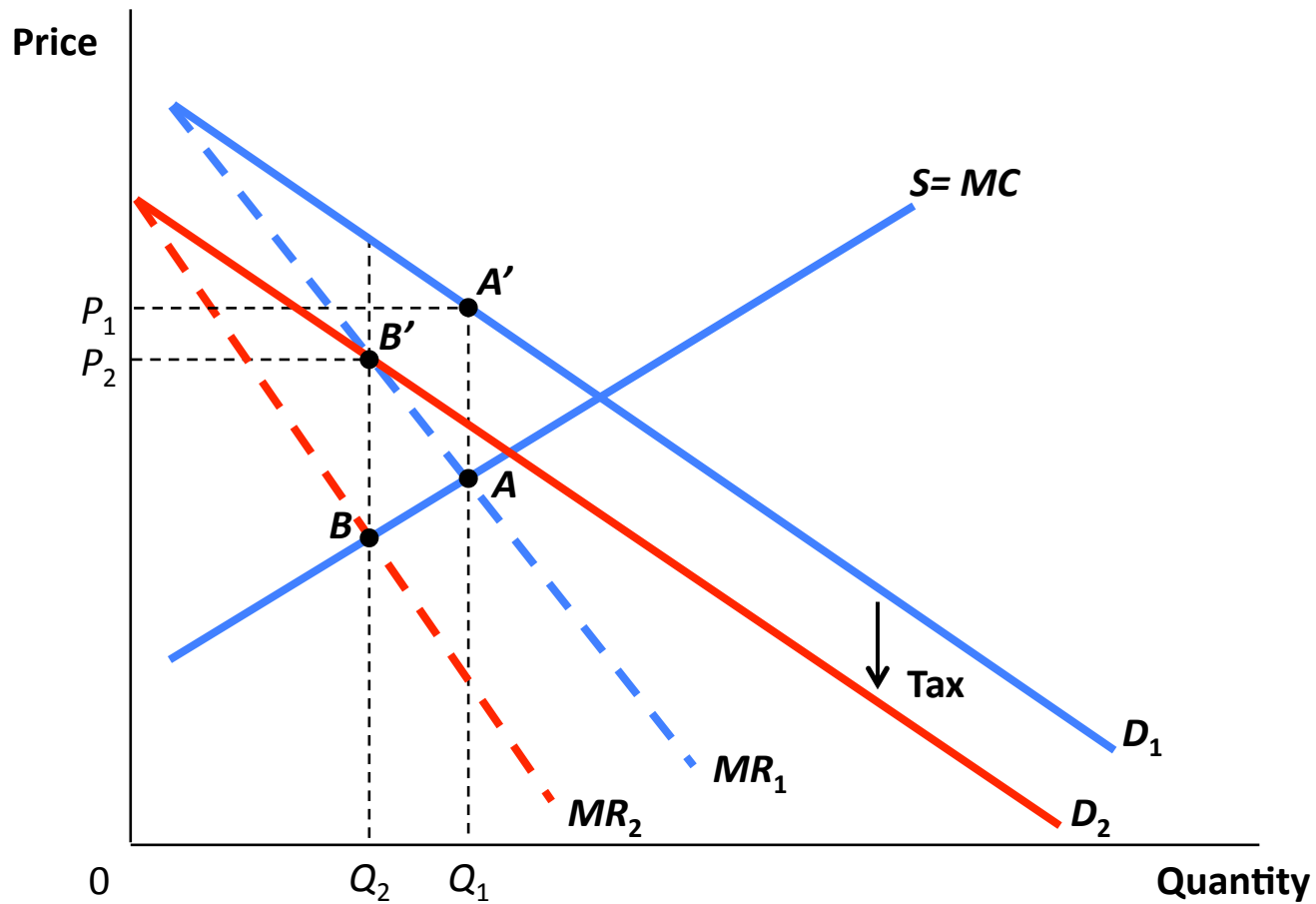
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Impediments to Wage Adjustment

(a) Tax on workers

Wage (W)

Firm burden = $0.50

$W_2 = \$7.75$

$W_M = \$7.25$

$W_3 = \$6.75$

Worker burden = $0.50

S_2

S_1

Tax = $1.00

B

A

C

D_1

0   H_2 H_1 Hours of labor (H)

(b) Tax on firms

Wage (W)

S_1

$W_2 = \$8.25$

Firm burden = $1.00

$W_M = \$7.25$

6.75

B

C'

A

C

Tax = $1.00

D_2

D_1

0   H_3 H_2 H_1 Hours of labor (H)

taxation

Tax Incidence in Imperfectly Competitive Markets

- Monopoly markets are an extreme case of imperfectly competitive markets.

  o **Monopoly markets:** Markets in which there is only one supplier of a good.

  o For price-taking firms, marginal revenue (MR) is equal to price.

  o Monopolists must lower the price to sell more, though, so marginal revenue falls faster than price.

  o Monopolist produces such that $MR = MC$.

taxation

Background: Equilibrium in Monopoly Markets

taxation

Tax Incidence in Imperfectly Competitive Markets

- Even in monopoly markets, a tax on either side of the market results in the same sharing of the tax burden.

- Monopolists cannot "exploit their market power" to avoid the rules of tax incidence.

- Economists tend to assume that the same rules of incidence apply in more general oligopoly markets.

  o **Oligopoly markets:** Markets in which firms have some market power in setting prices, but not as much as a monopolist.

taxation

Balanced Budget Tax Incidence

- Tax incidence analysis typically only accounts for who pays the tax.

- **Balanced budget incidence:** Tax incidence analysis that accounts for both the tax and the benefits it brings.

- Balanced budget incidence is difficult because it is hard to determine who benefits from a given tax increase.
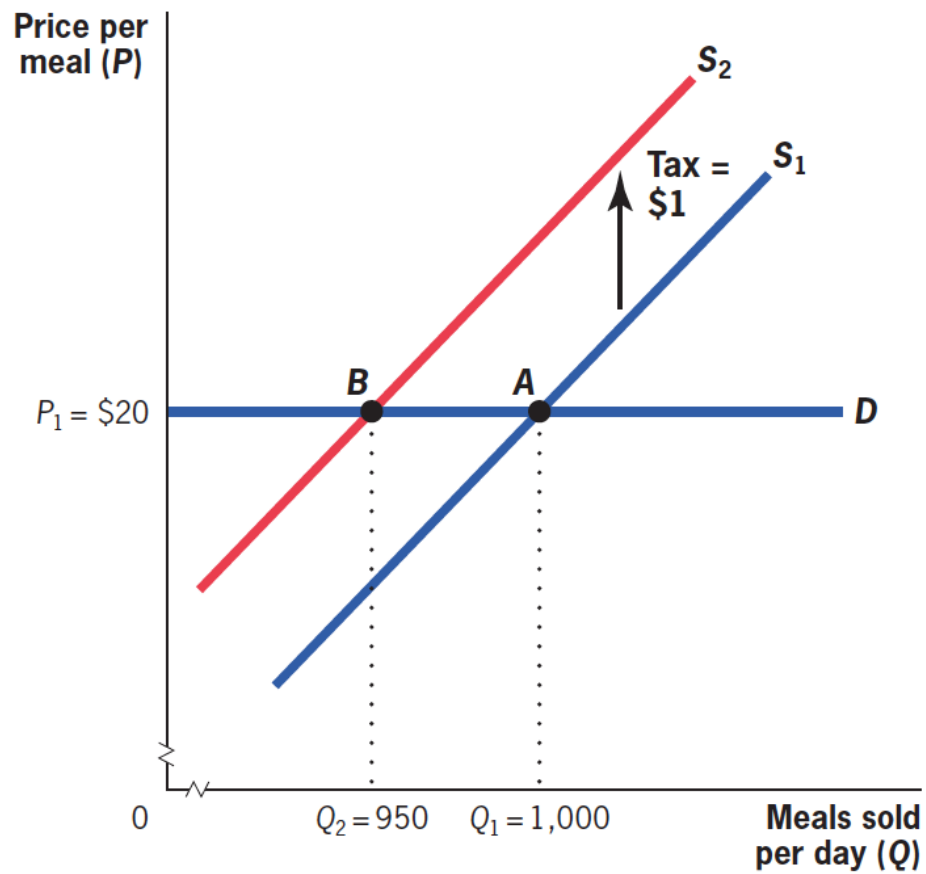
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General Equilibrium Tax Incidence

- So far, we have considered incidence in only a single market, such as the gas market.

- **Partial equilibrium tax incidence:** Analysis that considers the impact of a tax on a market in isolation.

- **General equilibrium tax incidence:** Analysis that considers the effects on related markets of a tax imposed on one market.

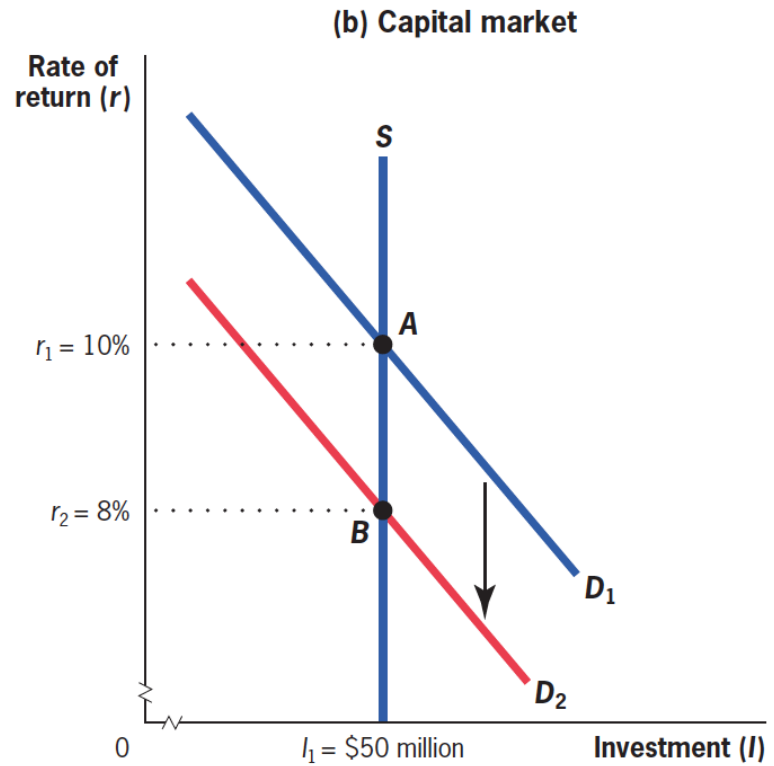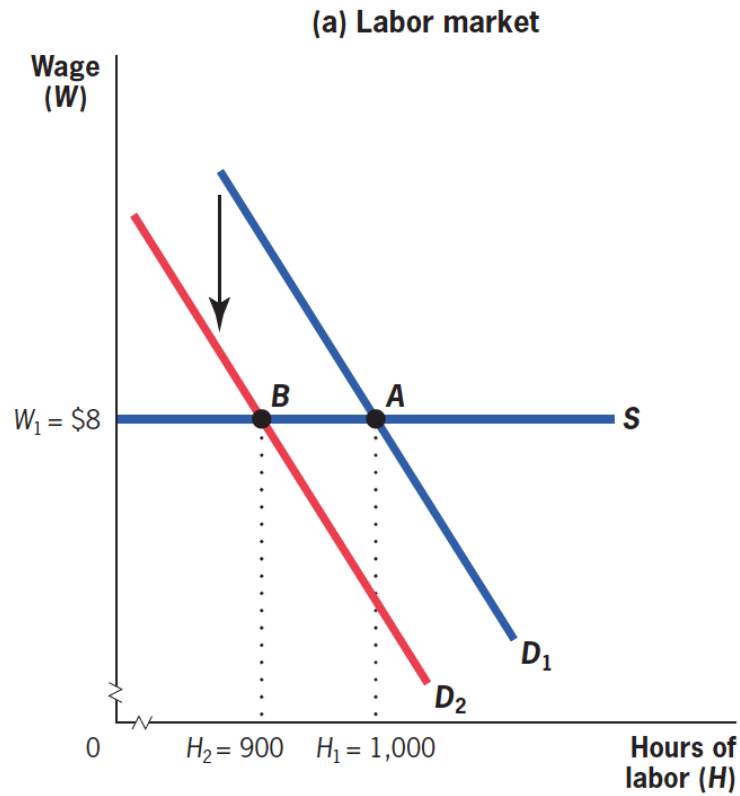- Taxes in one market affect prices in others, complicating the analysis.

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Effects of a Restaurant Tax: A General Equilibrium Example

taxation

General Equilibrium Tax Incidence

(a) Labor market

Wage (W)

$W_1 = \$8$

B   A   S

D₁

D₂

0    $H_2 = 900$ $H_1 = 1{,}000$ Hours of labor (H)

(b) Capital market

Rate of return (r)

S

$r_1 = 10\%$ A

$r_2 = 8\%$ B

D₁

D₂

0    $I_1 = \$50$ million   Investment (I)

taxation

Effect of Time Period on Tax Incidence: Short Run versus Long Run

- Factors that are inelastically demanded or supplied in both the short and long run bear taxes in the long run.

- Investments are irreversible, so the supply of capital is inelastic in the short run.

- Investors have many opportunities, so in the long run, elasticity of capital may be high.

taxation

Effect of Tax Scope on Tax Incidence

- Tax incidence depends on how broadly the tax is applied.

- Taxes that are broader based are harder to avoid than taxes that are narrower, so the response of producers and consumers to the tax will be smaller and more inelastic.

- A tax on local restaurants has a different incidence than a tax on all restaurants.

taxation

Spillovers between Product Markets

Consider a tax on restaurant. A higher after-tax price has three effects on other goods as well:

1. Income effect from lower real income.

2. Substitution effect toward goods that are substitutes for restaurants.

3. Complementary effect: Consumers may reduce their consumption of goods or services that are complements to restaurant meals.

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EVIDENCE: The Incidence of Excise Taxation

- Excises tax on cigarettes varies widely across the United States.

  o Low of $0.025/pack per pack in VA.

  o High of $1.51/pack in CT and MA.

  o Since 1990, NJ increased its tax rate nearly sixfold.

  o Arizona has increased its tax nearly eightfold.

- Many studies examine how taxes affect prices.

- These studies uniformly conclude that the price of cigarettes rises by the full amount of the excise tax.

taxation

Conclusion

- The "fairness" of any tax reform is one of the primary considerations in policy makers' positions on tax policy.

- Therefore, it is crucial for public finance economists to have a deep understanding of who really bears the burden of taxation so that we can best inform these distributional debates over the fairness of a proposed or existing tax.
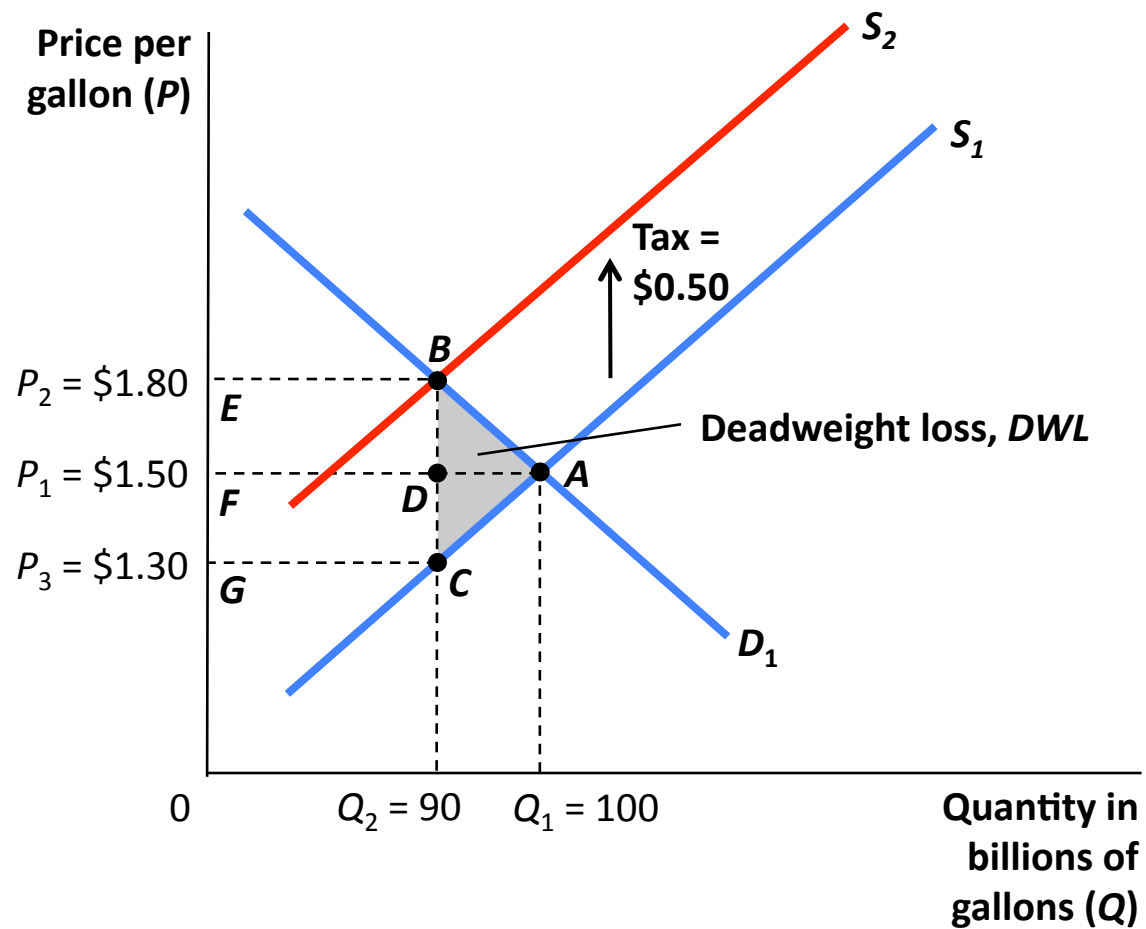
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Tax Inefficiencies and Their Implications for Optimal Taxation

- Usually, the market produces efficient outcomes.

- Taxes interfere in the market and reduce efficiency.

- People substitute away from the taxed product, using less-efficient alternatives.

  - Eight-person motorcycles in Indonesia

- Some taxes have much larger efficiency costs than others.

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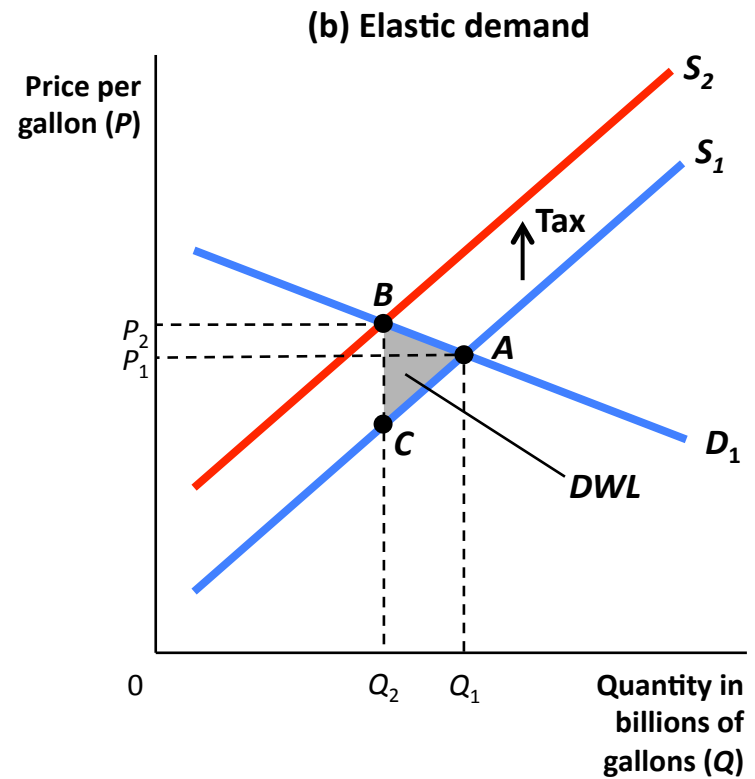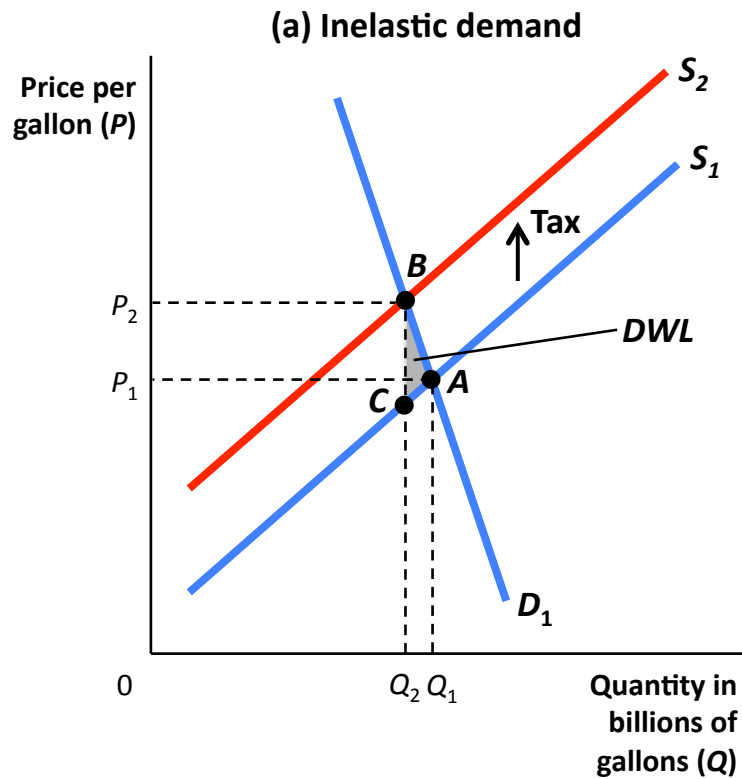## Taxation and Economic Efficiency: Graphical Approach

taxation

Taxation and Economic Efficiency

- Absent taxes:

  price = social marginal benefit = social marginal cost

- The tax drives a wedge between *SMB* and *SMC*, preventing mutually beneficial trades from occurring.

- The units between 90 and 100 would have generated a consumer and producer surplus.

- The foregone surplus from taxation is called the deadweight loss (*DWL*).

- The size of the *DWL* depends on elasticities.

taxation

Elasticities Determine Tax Inefficiency

(a) Inelastic demand

Price per gallon (P)

S_2

S_1

Tax

B

P_2

DWL

P_1

C A

D_1

0

Q_2 Q_1

Quantity in billions of gallons (Q)

(b) Elastic demand

Price per gallon (P)

S_2

S_1

Tax

B

P_2
P_1

A

C

D_1

DWL

0

Q_2 Q_1

Quantity in billions of gallons (Q)

taxation

Elasticities Determine Tax Inefficiency

- Deadweight loss is caused by individuals and firms making inefficient consumption and production choices in order to avoid taxation.

- The inefficiency of any tax is determined by the extent to which consumers and producers change their behavior to avoid the tax.

- The more elastic is demand or supply, the larger the *DWL*.

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APPLICATION: Tax Avoidance in Practice

Keynes: "The avoidance of taxes is the only pursuit that still carries any reward." Some examples of avoidance:

1. The Papal States taxed salt heavily, so Tuscan bakers stopped using it. Even today, Tuscan bread is saltless.

2. In the early 1980s, Cyprus's building tax applied to *finished* structures. Homeowners put steel bars jutting out from their roofs to avoid the tax.

3. Thailand taxes business signs on the outside, with higher taxes for English-only signs. So many signs have a bit of Thai writing in the corner, or are hung on curtains inside the shop.
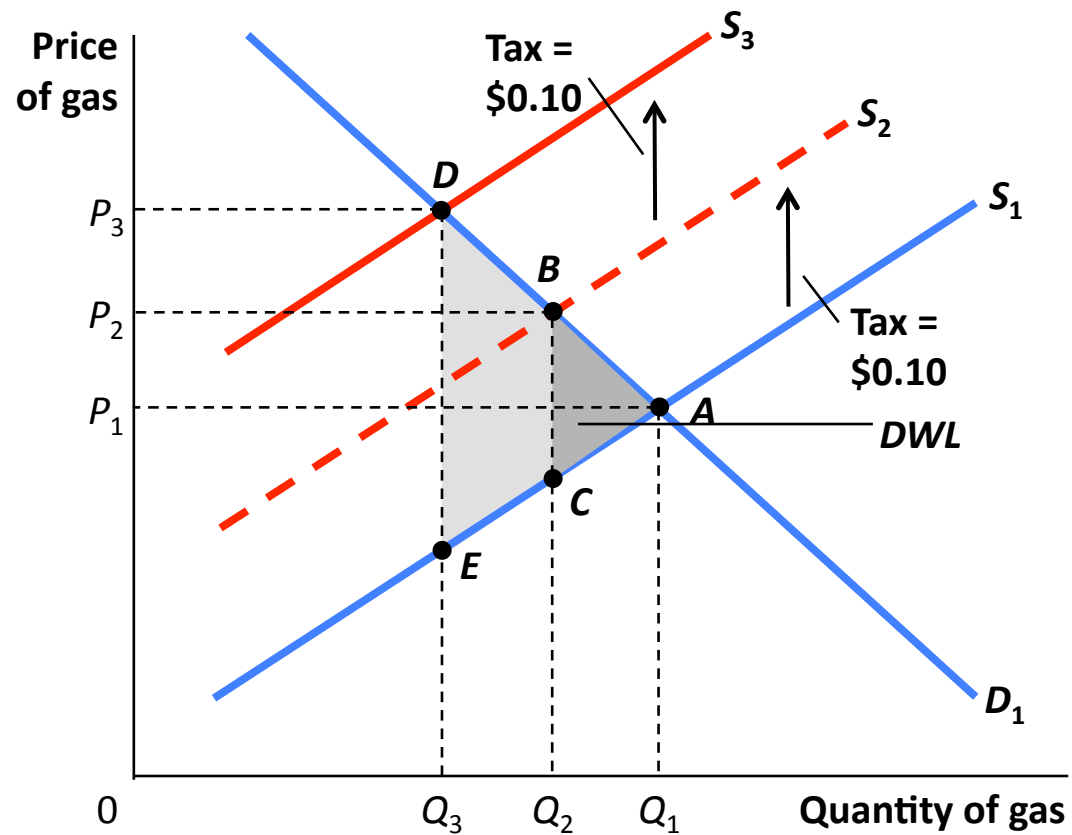
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Determinants of Deadweight Loss

- The formula for *DWL* is

$$DWL = -\frac{\eta_s \eta_d}{2(\eta_s - \eta_d)} \times \tau^2 \frac{Q}{P}$$

  - η_s and η_d are the elasticity of supply and demand, τ is the tax rate, *Q* and *P* are the quantity and price.

- *DWL* rises with the *square* of the tax, so marginal *DWL* rises with the tax rate.

  - **Marginal deadweight loss:** The increase in deadweight loss per unit increase in the tax.

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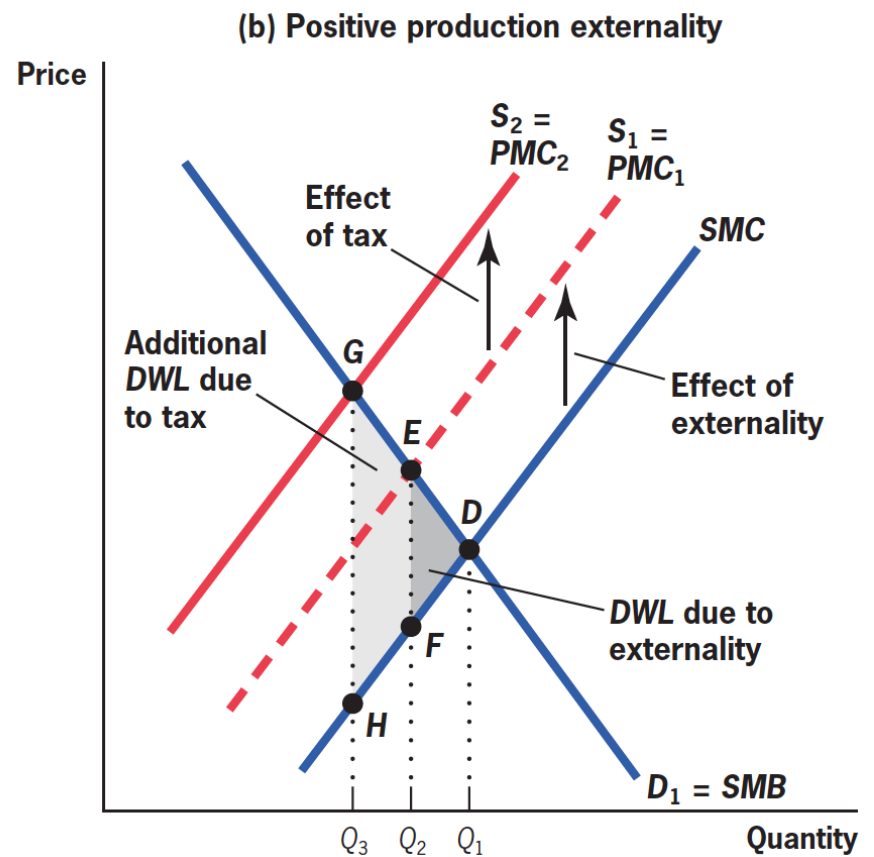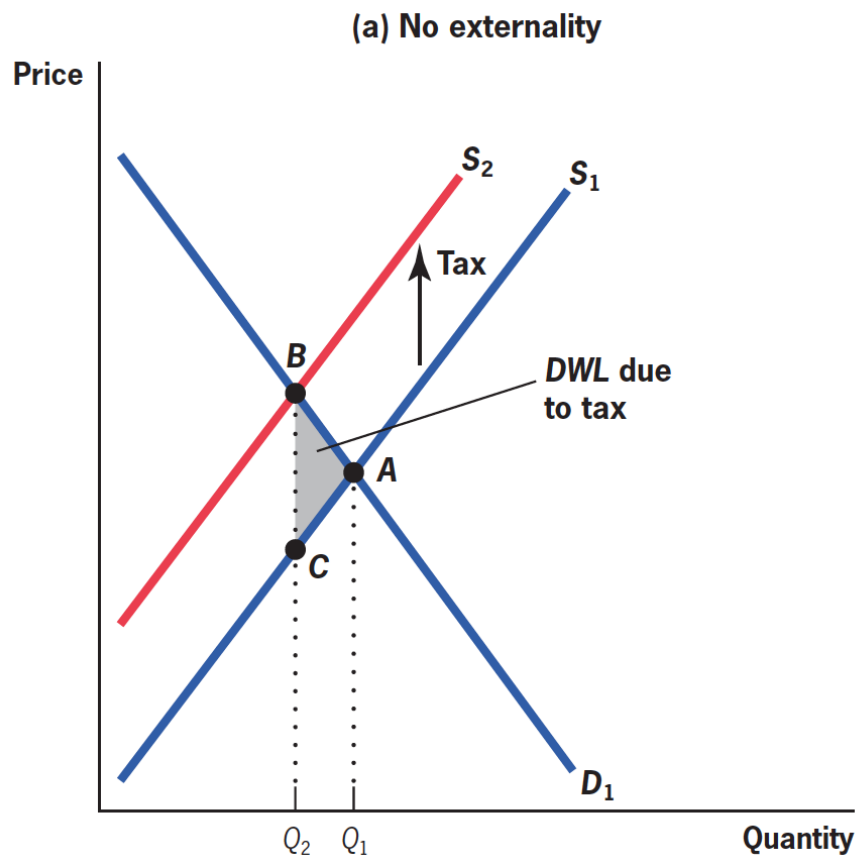
Marginal DWL Rises with Tax Rate

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A Tax System's Efficiency Is Affected by a Market's Preexisting Distortions

- Since marginal *DWL* rises with the tax rate, pre-existing distortions affect the efficiency of a new tax.

  - **Preexisting distortions:** Market failures, such as externalities or imperfect competition, that are in place before any government intervention.

  - Externalities, Imperfect competition, existing taxes.

taxation

A Tax System's Efficiency Is Affected by a Market's Preexisting Distortions

(a) No externality

Price

S_2 S_1

Tax

B

DWL due to tax

A

C

D_1

Q_2 Q_1 Quantity

(b) Positive production externality

Price

$S_2 = PMC_2$ $S_1 = PMC_1$

Effect of tax

SMC

Additional DWL due to tax

G

E

Effect of externality

D

DWL due to externality
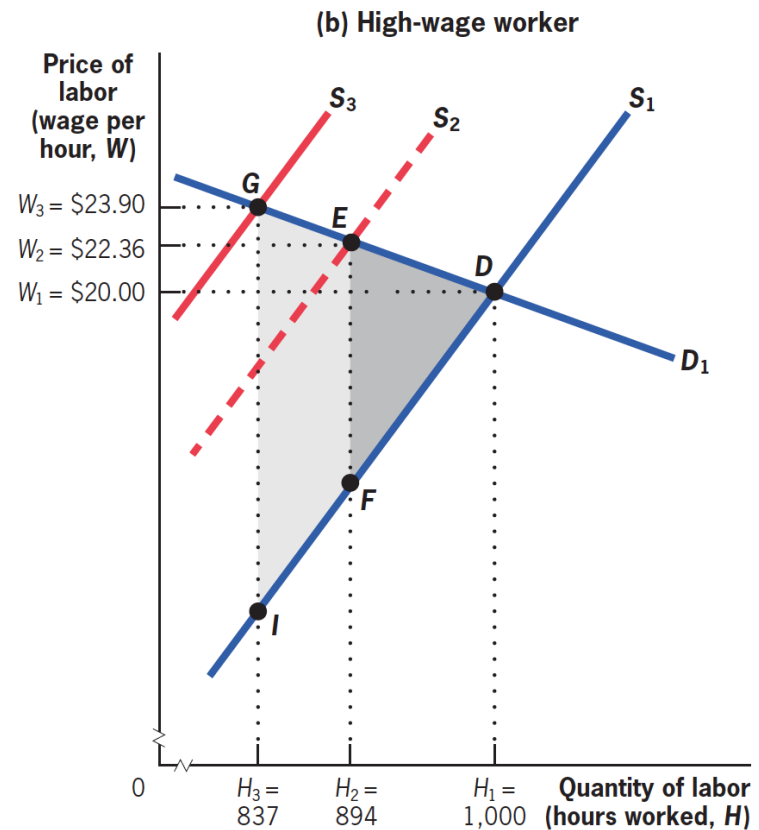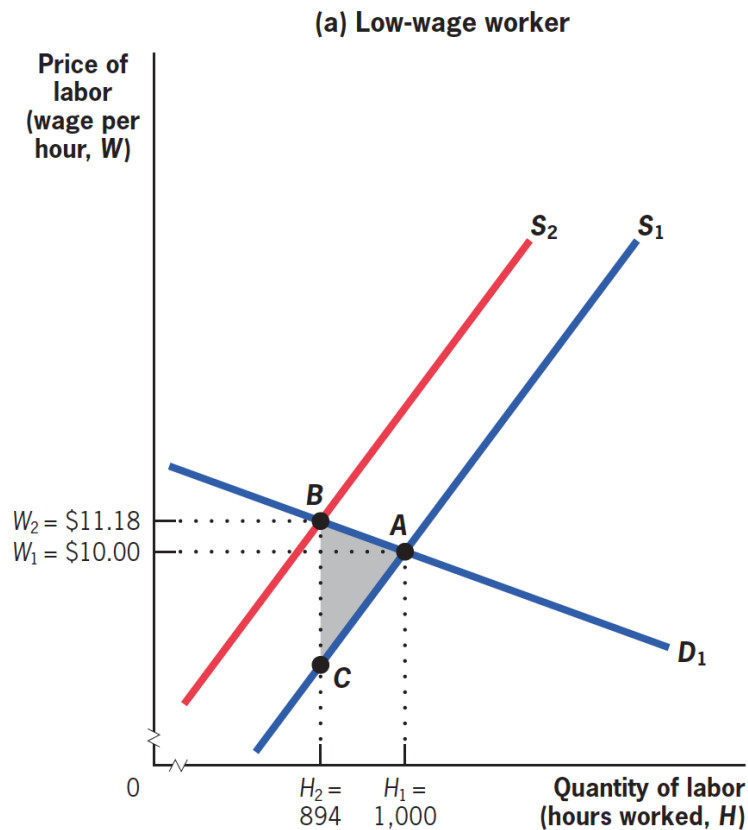
F

H

$D_1 = SMB$

Q_3 Q_2 Q_1 Quantity

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Progressive Tax Systems Can Be Less Efficient

- Because the DWL rises with τ^2, progressive tax systems can be less efficient than proportional ones.

- Example:

  - Suppose there are two people, one with a wage of $10/hour and one with a wage of $20/hour.

  - For both, a 10% rise in wages leads them to supply 10% more labor (elasticity of labor supply = 1).

  - Elasticity of labor demand is also one.

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Progressive Tax Systems Can Be Less Efficient: Graphical Approach

(a) Low-wage worker

Price of labor (wage per hour, W)

S_2 S_1

$W_2 = \$11.18$
$W_1 = \$10.00$

B A

C

D_1

0

$H_2 = 894$ $H_1 = 1,000$ Quantity of labor (hours worked, H)

(b) High-wage worker

Price of labor (wage per hour, W)

S_3 S_2 S_1

$W_3 = \$23.90$
$W_2 = \$22.36$
$W_1 = \$20.00$

G E D

D_1

F

I

0

$H_3 = 837$ $H_2 = 894$ $H_1 = 1,000$ Quantity of labor (hours worked, H)

taxation

Progressive Tax Systems Can Be Less Efficient

	No Tax	Proportional Tax	Progressive Tax
Tax rate below $10,000	0	20%	0%
Tax rate above $10,000	0	20%	60%
Low wage hours	1,000	864	1,000
Low wage *DWL*	0	$115.7	0
High wage hours	1,000	864	837
High wage *DWL*	0	$231.4	$566.8
Total *DWL*	0	$347.1	$566.8

taxation

Progressive Tax Systems Can Be Less Efficient

Why is the deadweight loss larger for the higher-wage worker despite the same reduction in hours worked?

- In a competitive labor market, wage equals the marginal product of labor, so the high-wage worker has a higher marginal product of labor.

- Society loses twice as much when the high-wage worker reduces her hours than when the low-wage worker reduces her hours.

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Governments Should "Smooth" Tax Rates Over Time

- Government efficiency in taxation over time is maximized by *tax smoothing*, by having a relatively constant tax rate over time rather than high taxes in some periods and low taxes in others.

- High-then-low tax rates produce a larger *DWL* then steady medium tax rates.

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Ramsey Taxation: The Theory of Optimal Commodity Taxation

- **Optimal commodity taxation**: Choosing the tax rates across goods to minimize deadweight loss for a given government revenue requirement.

- **Ramsey Rule**: To minimize the deadweight loss of a tax system while raising a fixed amount of revenue, taxes should be set across commodities so that the ratio of the marginal deadweight loss to marginal revenue raised is equal across commodities, that is, $\frac{MDWL_i}{MR_i} = \lambda$.

- **Value of additional government revenues**: The value of having another dollar in the government's hands relative to its next best use in the private sector.

taxation

Inverse Elasticity Rule

- If supply is infinitely elastic, the Ramsey Rule becomes:

$$\tau_i^* = -\frac{1}{\eta_i} \times \lambda$$

  - τ_i^* is the optimal tax, η_i is the elasticity of demand, and λ is some constant.

- Optimal taxation therefore balances two rules:

  - Elasticity rule: Lower taxes on goods with more elastic demand.

  - Broad base rule: Better to tax a wide variety of good moderately than few goods heavily.

taxation

Equity Implications of the Ramsey Model

Imagine that the government had only two goods it could tax, cereal and caviar:

- Elasticity of demand for caviar is much higher than that for cereal.

- The inverse elasticity rule would suggest that the government tax cereal much more highly than caviar.

- This means taxing the good consumed by poor people more heavily.

- This might hurt vertical equality.

taxation

Optimal Income Taxes

- Most tax revenue in the United States and other developed countries is from income taxes.

- **Optimal income taxation:** Choosing the tax rates across income groups to maximize social welfare subject to a government revenue requirement.

- Social welfare function guides the trade-off between progressivity and efficiency.

taxation

A Simple Example

1. Everyone in society has the same utility functions:

$$U_1 = U_2 = \ldots = U.$$

2. Diminishing *MU* of income.

3. Total income in society is fixed, not determined by individual choices that might respond to tax rates.

4. Society has an equally-weighted utilitarian social welfare function:

$$V = U_1 + U_2 + \ldots$$

taxation

A Simple Example

Under these assumptions:

- The optimal income tax system is one that leaves everyone with the *same level of post-tax income*.

- People with income below average would receive a transfer to increase their incomes to average.

- The marginal tax rate under this system is 100%.

- If income responds to taxes, the optimal marginal tax rate is lower.

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The Laffer Curve
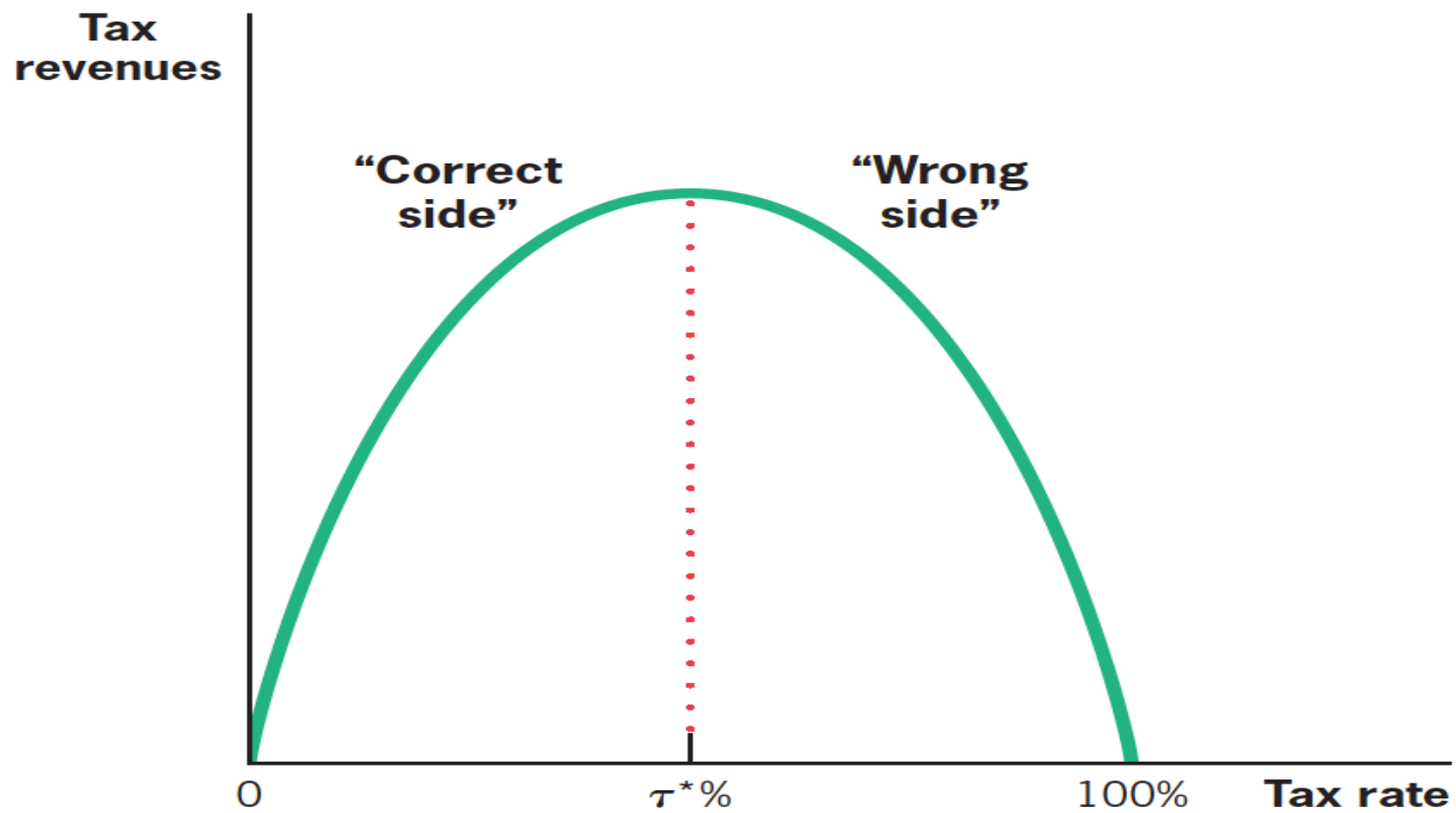
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General Model with Behavioral Effects

- With behavioral effects, taxes reduces hours worked.

  o At high tax rates, tax revenue falls with the tax rate; no one works under a 100% tax rate.

- The optimal tax system trades off the efficiency cost of taxation against the benefits of redistribution.

- The rule is to set the income for group i such that

$$\frac{MU_i}{MR_i} = \lambda$$

- MU_i is MU for group i, MR_i the marginal revenue, and λ is the value of government revenue.
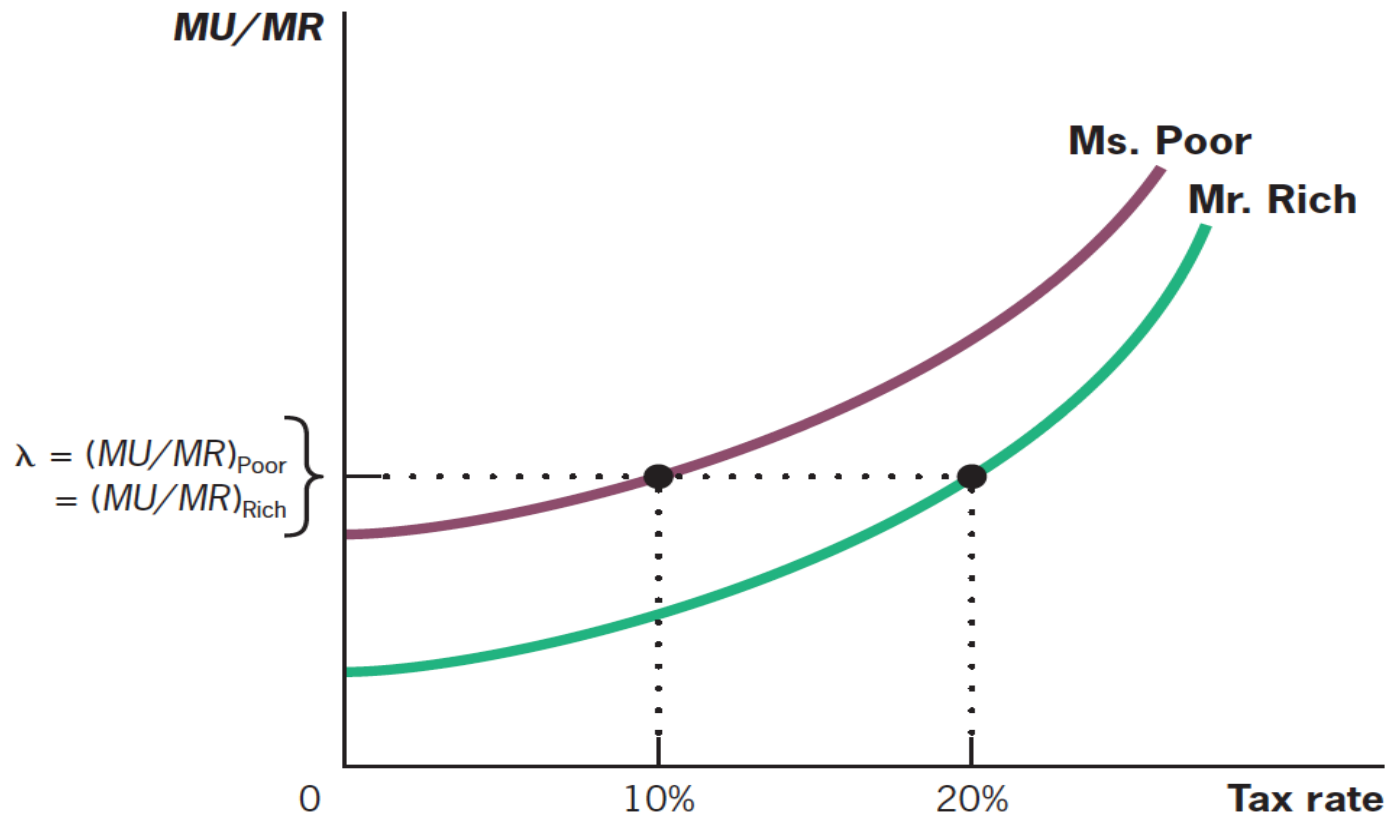
taxation

General Model with Behavioral Effects

Optimal income taxation balances:

- *Vertical equity*: Social welfare is maximized when those who have a high level of consumption, and thus a low marginal utility, are taxed more heavily, and those who have a low level of consumption, and thus a high marginal utility, are taxed less heavily.

- *Behavioral responses*: As taxes rise on any one group, individuals in that group may respond by earning less income.

taxation

An Example: Optimal Income Taxes with Two Types

taxation

Conclusion

- The fundamental issue in designing tax policy is the equity-efficiency trade-off.

- Tax efficiency comes down to two key principles:

  - The more elastically supplied or demanded the good, the larger the deadweight loss from the tax.

  - The higher the tax rate, the larger the incremental deadweight loss of taxation.