Lecture 7:
Types of taxes and tax incidence

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Types of Taxation: Taxes on Earnings and Individual Income

- **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.

Types of Taxation: Taxes on Corporate Income and Wealth

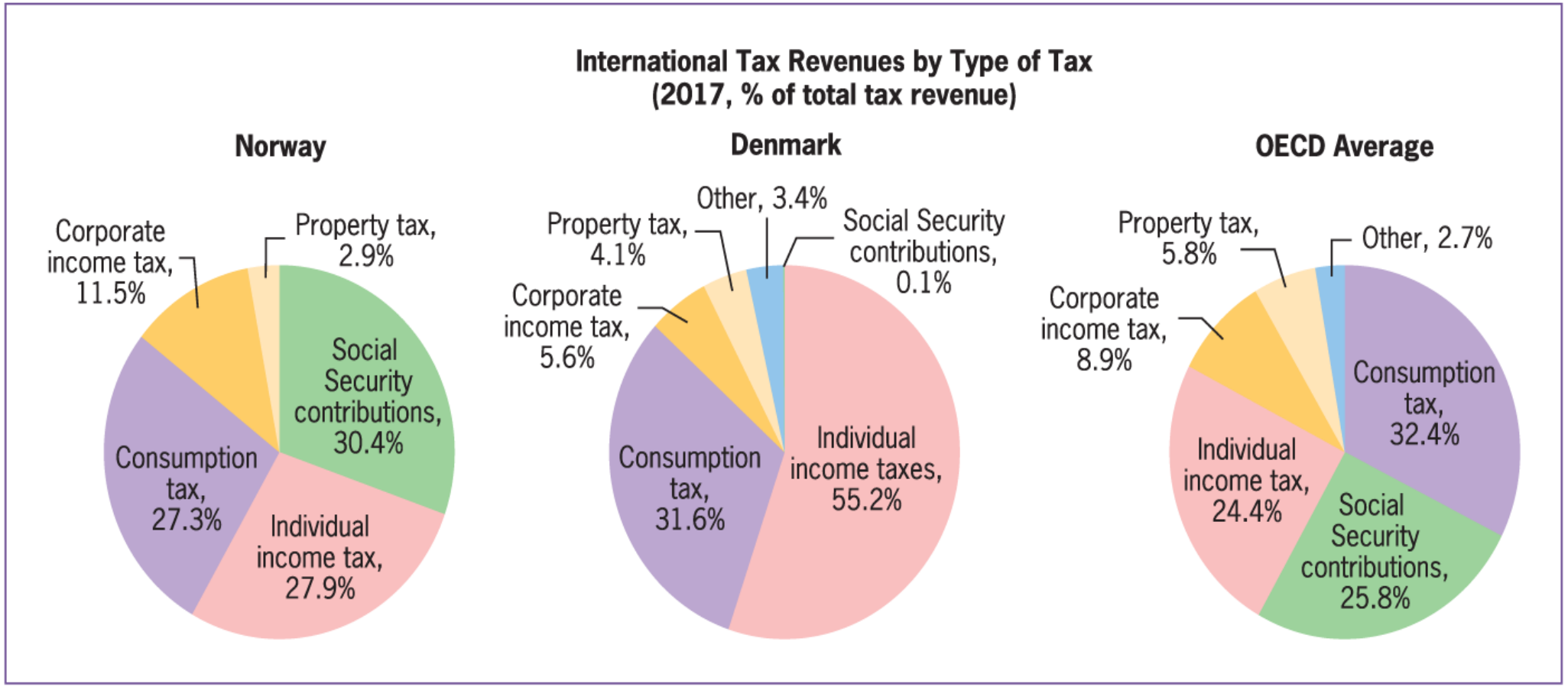
- **Taxes on Corporate Income**
  - **Corporate income tax:** Tax levied on the earnings of corporations.

- **Taxes on Wealth**
  - **Wealth taxes:** Taxes paid on the value of the assets, such as real estate or stocks, held by a person or family.
  - **Property taxes:** A form of wealth tax based on the value of real estate, including the value of the land and any structures built on the land.
  - **Estate taxes:** A form of wealth tax based on the value of the estate left behind when one dies.

Taxes on Consumption

- **Taxes on Consumption:**
  - **Sales taxes:** Taxes paid by consumers to vendors at the point of sale.
  - **Excise tax:** A tax paid on the sales of particular goods, such as cigarettes or gasoline.

International Tax Revenues by Type of Tax



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Cross-country comparison of taxes on consumption

VAT	Ireland	Greece	Germany
Statutory Rate (%)	23	24	19
Reduced Rates (%)	Books: 0, 9, 13.5 Food: 13.5 Pharma: 13.5 Water Sup: n.a	Books: 24 Food: 13 Pharma: 6 Water Sup: 13	Books: 7, 19 Food: 7 Pharma: n.a Water Sup: 7
Super-Reduced Rates (%)	4.8	n.a	n.a
τ^c (%)	20.1	15.5	16.4

Effective tax rates

- Due to significant differences in the national tax systems, e.g. different statutory rates, tax credits and deduction schemes, an international comparison is not informative and might be misleading.

- We need to construct aggregate tax measures that can provide a good approximation of the total tax burden imposed and allow comparisons across countries.

Definition

The effective tax rates are computed as the ratio:

$$\tau = \frac{tax\ revenues}{tax\ base}$$

National accounts data published by international databases like Eurostat or OECD can be used to find tax revenues and the associated tax base for each tax category.

Types of effective tax rates

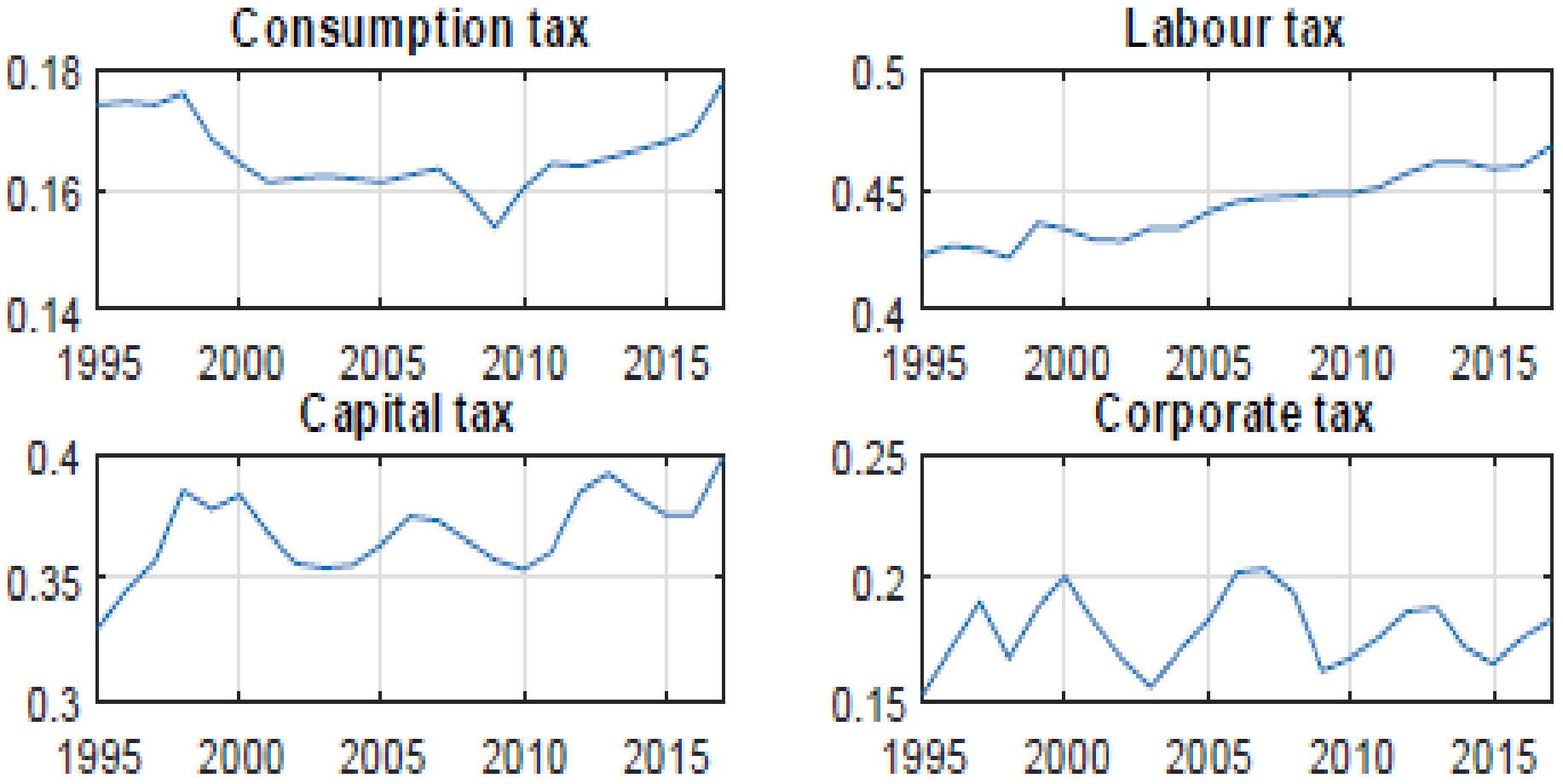
- Consumption
- Labour
- Capital
- Corporate

Effective tax rates cross-country comparison 1995-2017 average

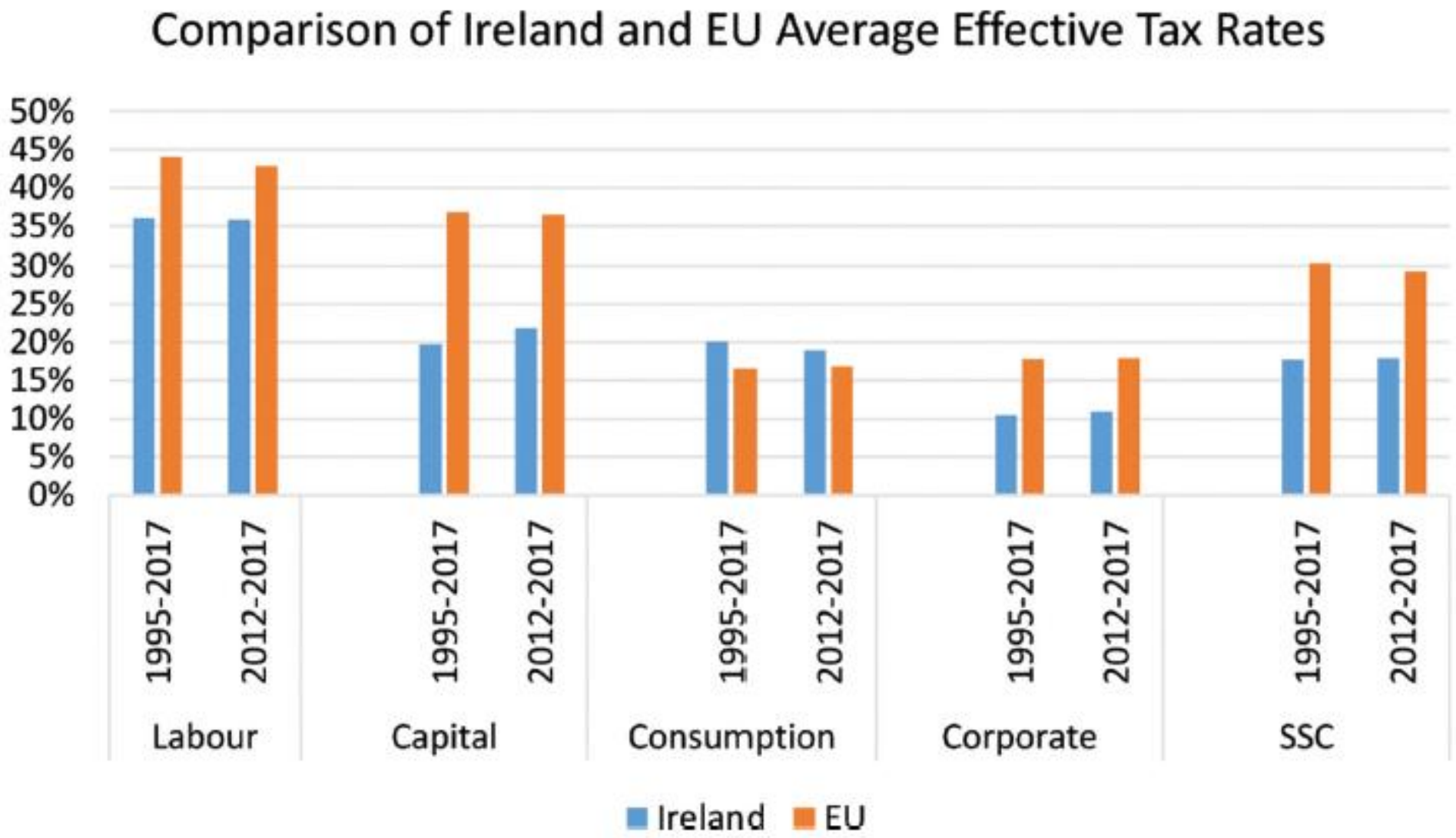
Country	Consumption	Labour	Capital
EU average	0.165	0.443	0.368
Austria	0.180	0.476	0.393
Belgium	0.176	0.298	0.130
Bulgaria	0.188	0.25	0.298
Cyprus	0.166	0.45	0.208
Czech	0.184	0.550	0.409
Denmark	0.260	0.372	0.134
Estonia	0.203	0.372	0.134
Finland	0.216	0.496	0.307
France	0.178	0.463	0.598
Germany	0.164	0.499	0.236
Greece	0.156	0.387	0.217
Hungary	0.250	0.423	0.235
Ireland	0.201	0.360	0.198
Italy	0.162	0.512	0.465

Source: Table taken from Kostarakos and Varthalitis (2020).

Effective tax rates in the European Union over 1995-2017



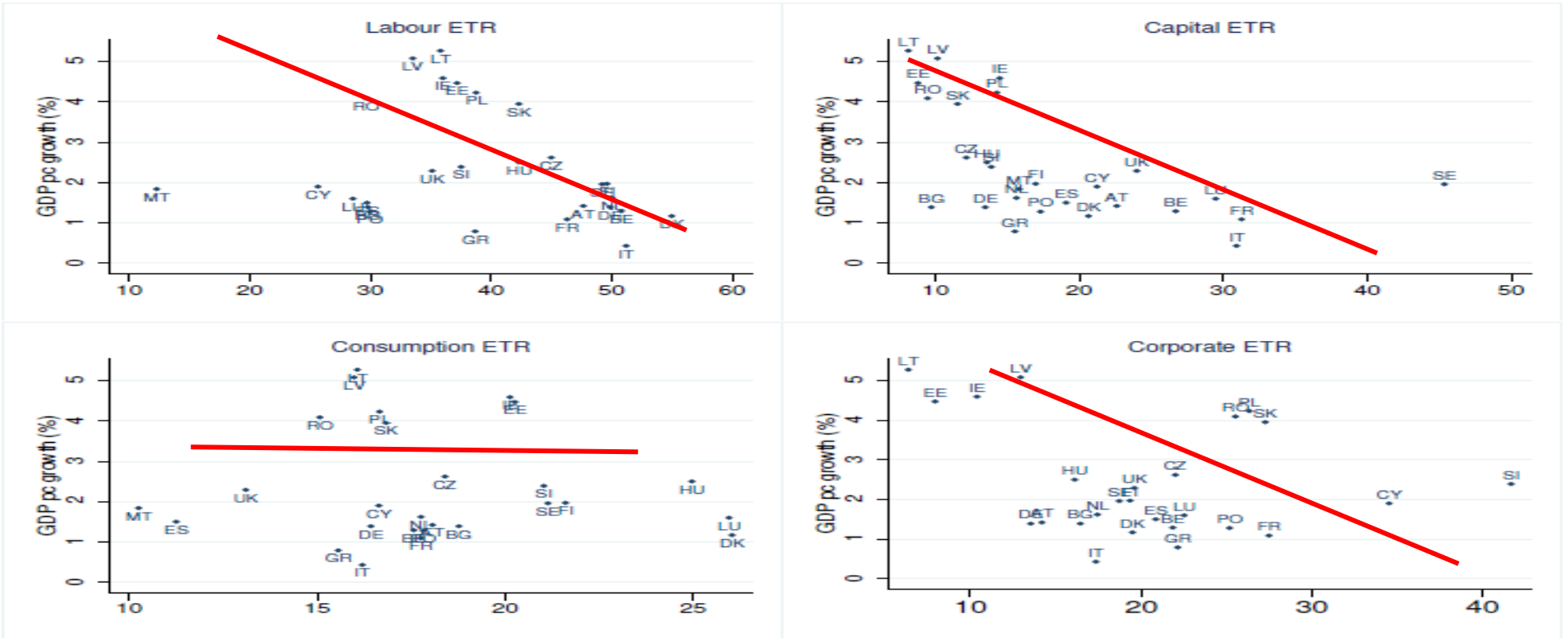
Source: Figure taken from Kostarakos and Varthalitis (2020).



Source: Figure taken from Kostarakos and Varthalitis (2020).

Effective Tax Rates and Economic Performance

Figure 7: GDP Growth and ETRs

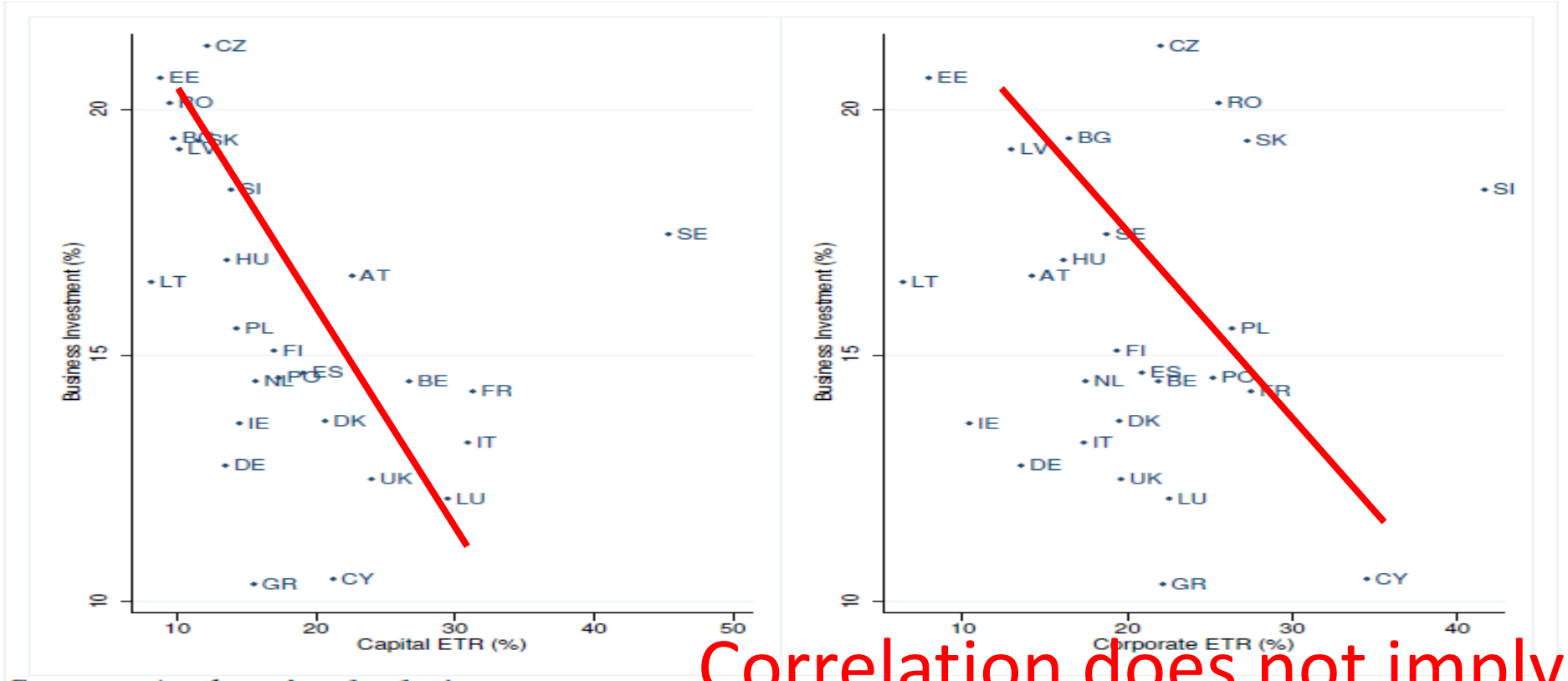


Source: Authors' calculations.

Source: Figure taken from Kostarakos and Varthalitis (2020).

Effective Tax Rates and Economic Performance

Figure 9: ETRs and Investment



Correlation does not imply causation

Source: Authors' calculations.
Note: In the y-axis business investment is defined as the Gross Fixed Capital Formation of Households and NPISH, Non-Financial and Financial corporations as a share of GDP in each country.

Source: Figure taken from Kostarakos and Varthalitis (2020).

The Three Rules of Tax Incidence

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

Robust conclusions that hold with more complicated models

Rule 1: The Statutory Burden of a Tax Does Not Describe Who Really Bears the Tax

- **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.

Rule 1: 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 tax payments by consumers

- For producers, the tax burden is:

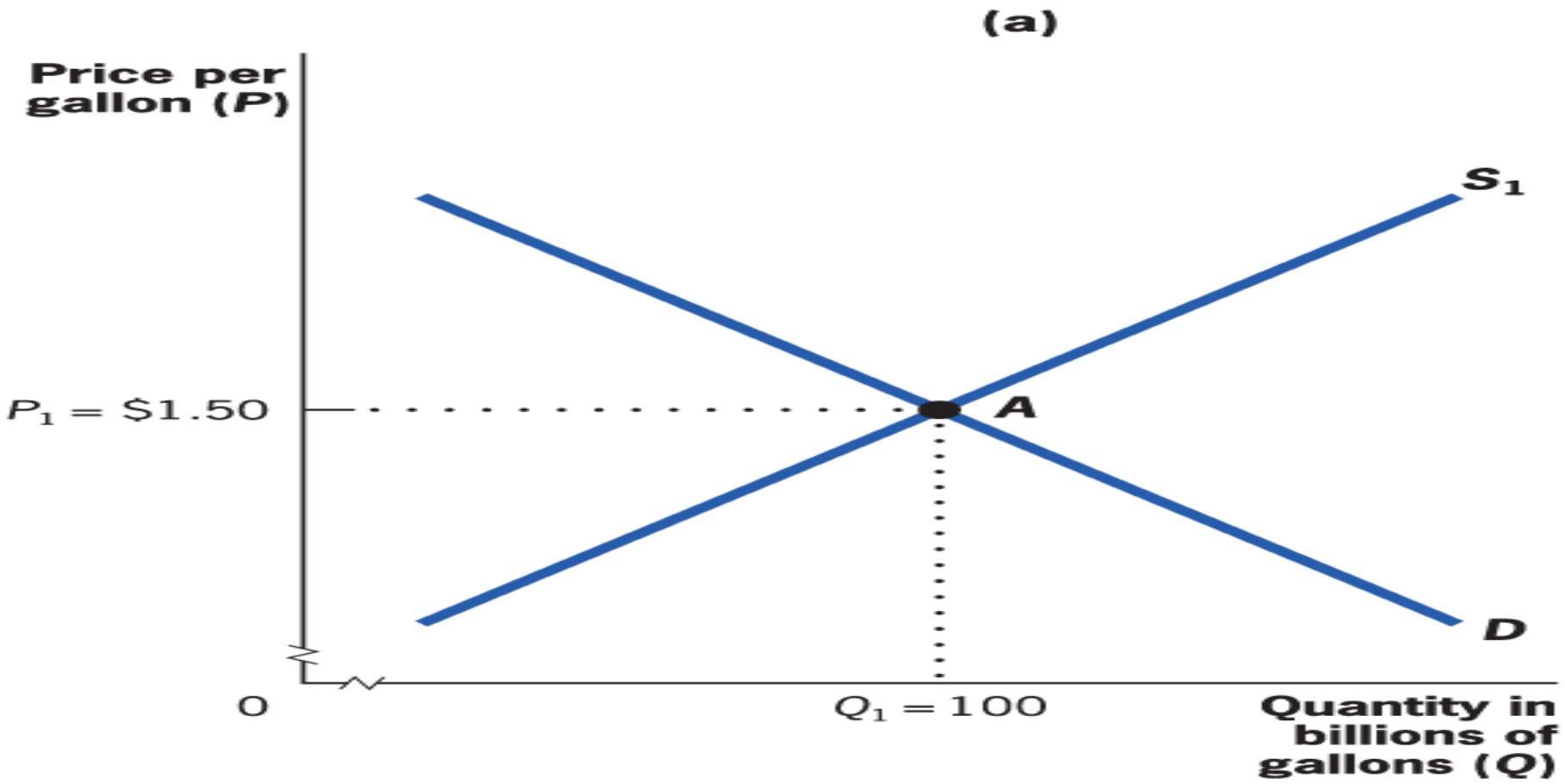
producer tax burden =

(pre-tax price − post-tax price) + per unit tax payments by producers

Example

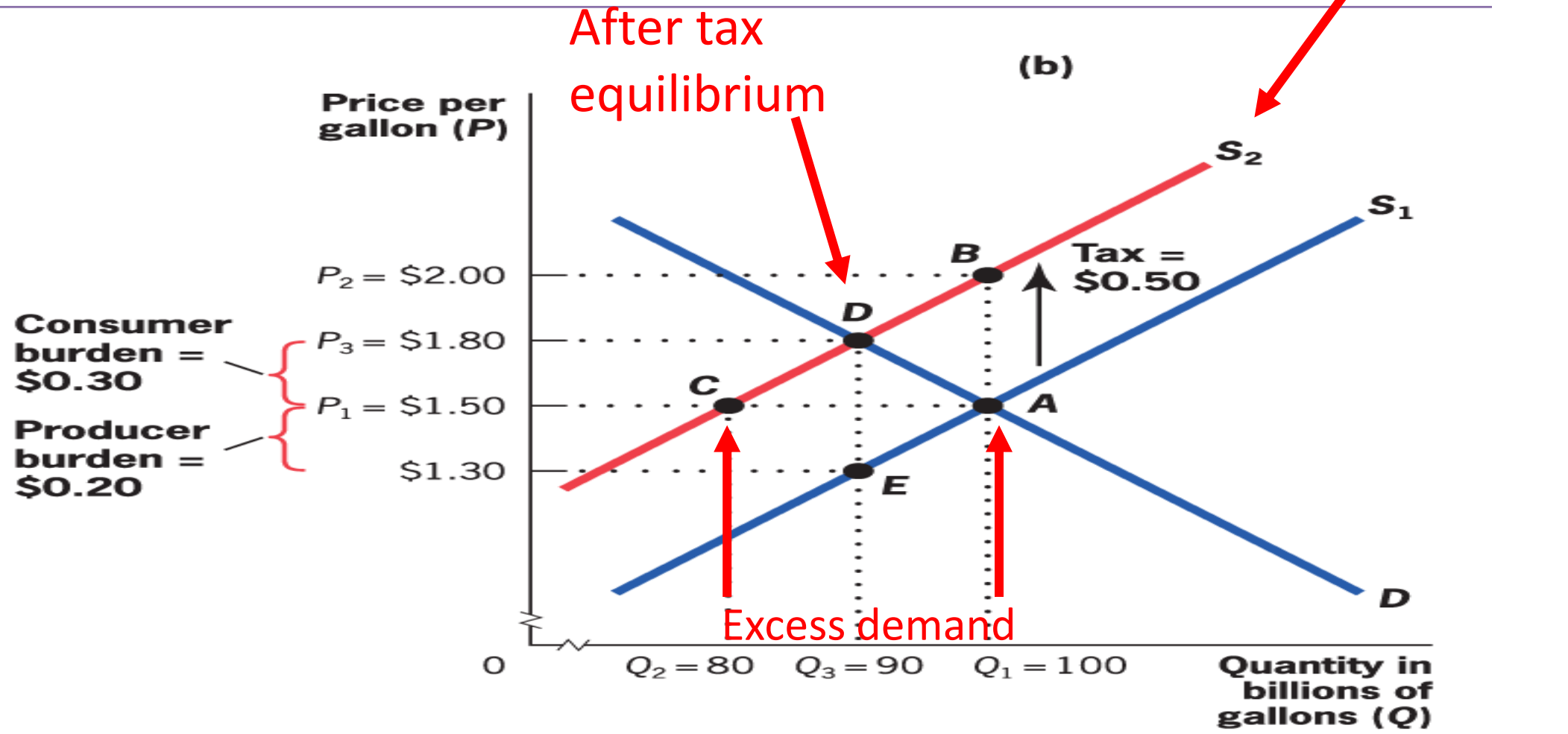
- Gas market: Suppliers and Consumers.
- The Government imposes a tax of 50$ per gallon of gas sold.
- Producers pay the 50$ per gallon to the Government.

Equilibrium before tax

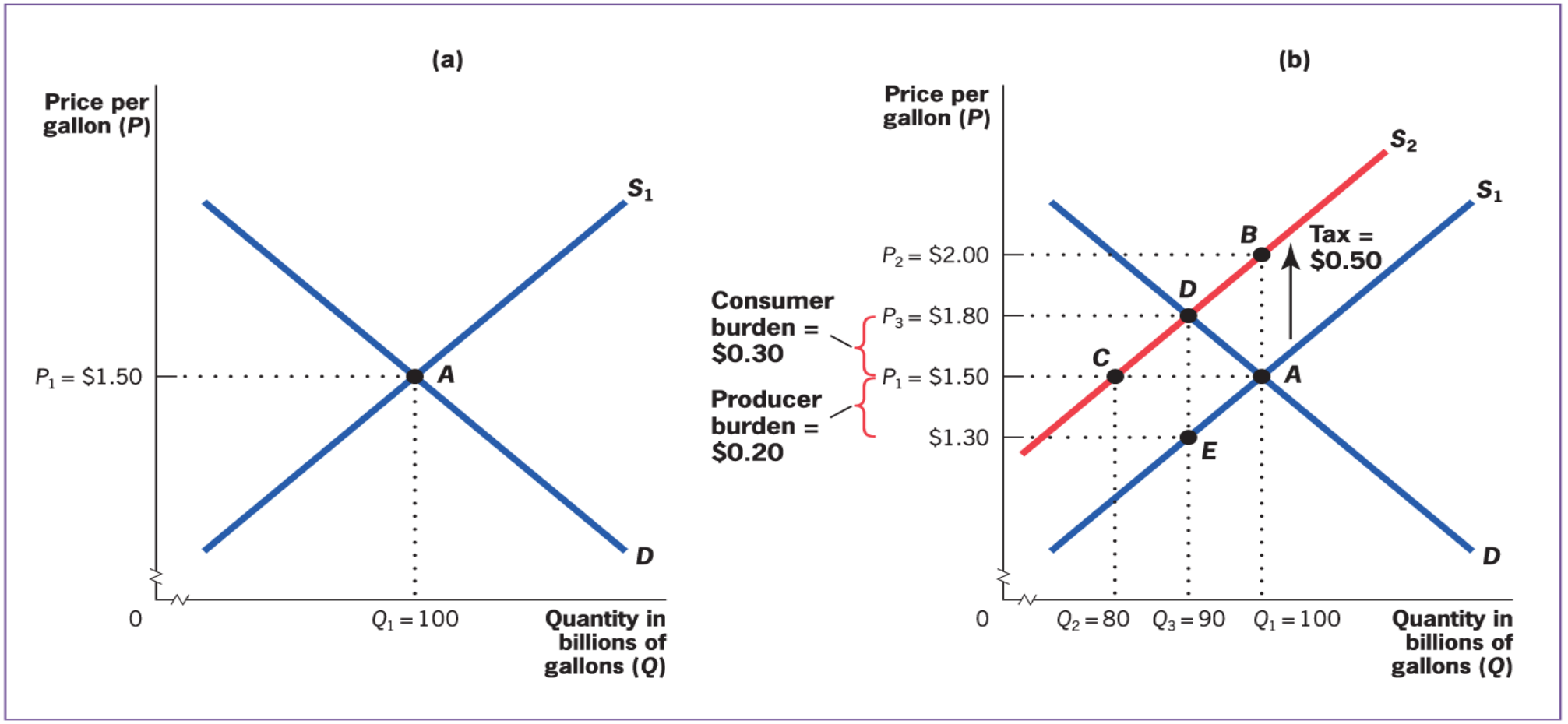


Equilibrium after tax

Supply curve shifts upwards



Rule 1: The Statutory Burden of a Tax Does Not Describe Who Really Bears the Tax 3



Burden of the Tax on Consumers and Producers 1

- The tax burden for consumers is:

consumer tax burden = *(post-tax price − pre-tax price) + per unit tax payments by consumers=*

1.8 – 1.5 +0= 0.3

- For producers, the tax burden is:

producer tax burden *=(pre-tax price − post-tax price) + per-unit tax payments by producers*

1.5-1.8 +0.5= 0.2

Burden of the Tax on Consumers and Producers 1

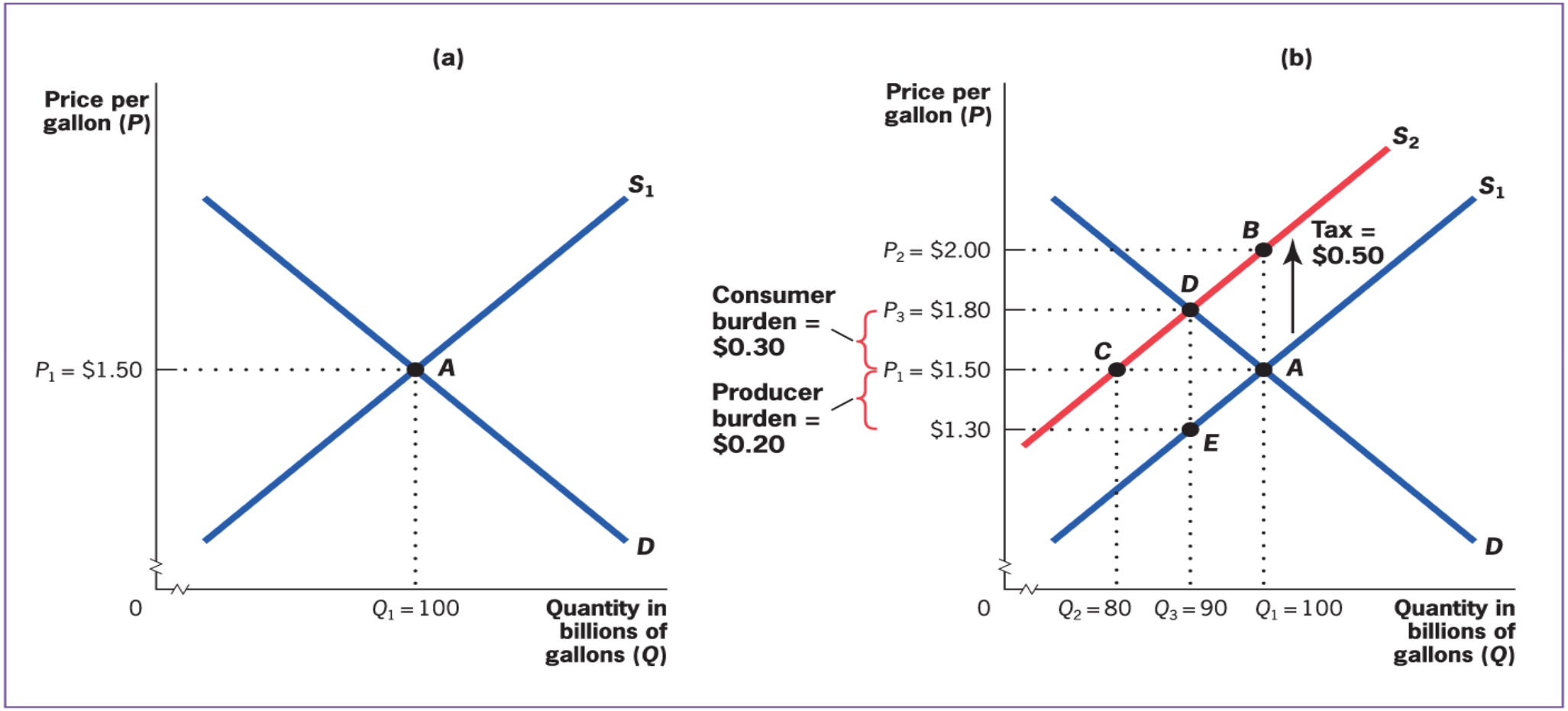
- **Tax wedge:** The difference between what consumers pay and what producers receive (net of tax) from a transaction.

- The tax wedge is $0.50.

- The consumer burden is $0.30

- The producer burden is $0.20

Burden of the Tax on Consumers and Producers 2



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Rule 2: The Side of the Market on Which the Tax Is Imposed Is Irrelevant to the Distribution of the Tax Burden

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Gross Versus After-Tax Prices

- **Gross price (or post tax 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.*

Rule 3: 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 the full burden of the tax. There is a full shifting of the tax burden to that side of the market.
  - **Full shifting:** When one party in a transaction bears all of the tax burden.

Perfectly Inelastic Demand

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Perfectly Elastic Demand

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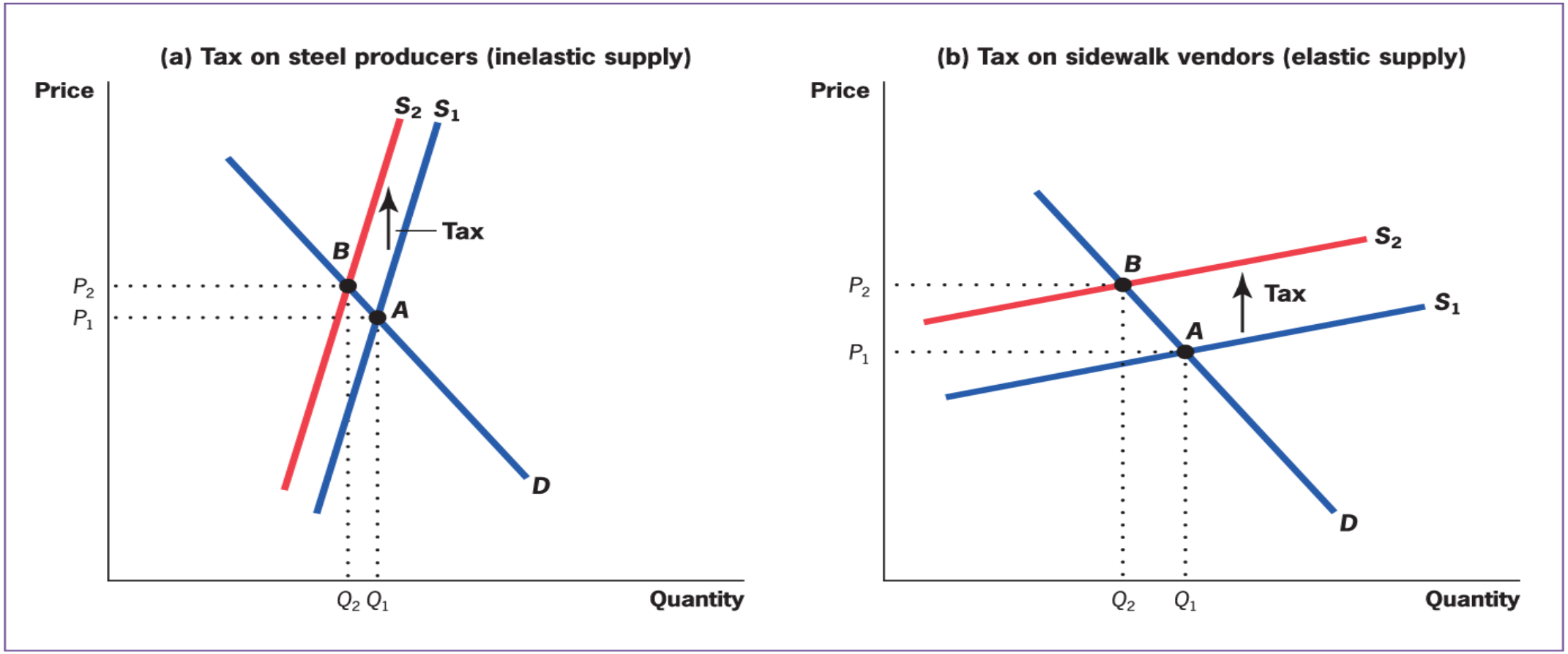
General Case

- 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.

Supply Elasticities



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Example

The demand for an ice-cream is given by $Q = 2{,}000 - 300P$ and the supply of ice-creams is given by $Q = -100 + 100P$.

- **Find the equilibrium price and quantity.**
- **Suppose the government imposes a statutory tax of a $2 per unit tax on the sale of ice creams?**
- **Who bears the *statutory* incidence of a $2 per unit tax on the sale of ice creams?**
- **Who bears the *economic* incidence of this tax?**
- **Compute the consumers' tax burden.**
- **Compute the producers' tax burden.**

Answer: Equilibrium without tax

- Without the tax: $2{,}000 - 300P = -100 + 100P$. Price = $5.25.

- With the tax, the price the consumer pays is increased by $2.00.

Answer: Statutory tax

- Demand:

$$\boldsymbol{Q} = 2{,}000 - 300\,(P + 2)$$

- Supply:

$$\boldsymbol{Q} = 100\boldsymbol{P} - 100$$

Answer: Equilibrium with tax

$$2{,}000 - 300(P + 2) = 100P - 100$$

$$1{,}400 - 300P = 100P - 100$$

$$1{,}500 = 400P,$$

price = $3.75.

Answer: Tax burden

- The consumers' tax burden = (post-tax price − pre-tax price) + tax payments by consumers:

$$\$3.75 - \$5.25 + \$2 = \$0.50.$$

- The producers' tax burden = (pre-tax price − post-tax price) + tax payments by producers:

$$\$5.25 - \$3.75 + \$0 = \$1.50.$$

- In this case the producer bears a larger share of the tax burden than the consumer, despite the statutory incidence falling on the consumer.

Example: Statutory tax on producers

- **The demand for ice creams is still $Q = 2{,}000 - 300P$ and the supply is still $Q = -100 + 100P$, as before.**

- **The Government decides that instead of imposing the $2 sales tax, the government will instead force producers to pay the tax directly.**

- **How will the size of the consumer tax burden change?**

Answer: Equilibrium with tax

$$2{,}000 - 300P = 100(P-2) - 100$$

$$2{,}000 - 300P = 100P - 300$$

$$2{,}300 = 400P,$$

price = $5.75.

Answer: Tax burden

- The consumers' tax burden = (post-tax price − pre-tax price) + tax payments by consumers:

$$\$5.75 - \$5.25 = \$0.50.$$

- The producers' tax burden = (pre-tax price − post-tax price) + tax payments by producers:

$$\$5.25 - \$5.75 + \$2 = \$1.50.$$

- In this case the producer bears a larger share of the tax burden than the consumer as before.

Tax incidence and the elasticities of demand and supply

- To analyse tax incidence, we need to measure how imposing a tax changes the price in a market.

- Total price change is:

$$\Delta P + \tau$$

- ΔP denotes the change in market price.
- τ denotes the tax payment

Elasticities

- Demand:

$$\sigma_d = \frac{\Delta Q}{\Delta P + \tau} \frac{P}{Q}$$

- Supply:

$$\sigma_s = \frac{\Delta Q}{\Delta P} \frac{P}{Q}$$

Rearrange terms

$$\frac{\Delta Q}{Q} = \frac{\sigma_d(\Delta P + \tau)}{P}$$

$$\frac{\Delta Q}{Q} = \frac{\sigma_s \Delta P}{P}$$

The economic effect of tax incidence

The change in market price as a function of the tax:

$$\Delta P = \frac{\sigma_d}{\sigma_s - \sigma_d} \times \tau$$

- If demand is inelastic, $\sigma_d = 0$, then $\Delta P = 0$. The price does not change and consumer bear the full tax burden.

- If demand is perfectly elastic, $\sigma_d \to \infty$, then $\Delta P = -\tau$. The price falls by the full amount of the tax offsetting the consumer tax payment.

The economic effect of tax incidence

The change in market price as a function of the tax:

- When tax is imposed on consumer:

$$\Delta P = \frac{\sigma_d}{\sigma_s - \sigma_d} \times \tau$$

- When tax is imposed on supplier:

$$\Delta P = \frac{\sigma_s}{\sigma_s - \sigma_d} \times \tau$$

Example

- **The elasticity of demand for ice creams is –2.0 and the elasticity of supply is 3.0.**
- **How much will the price of ice-creams change with a per-unit tax of $2?**
- **Who bears the larger burden of the tax, consumers or producers?**

Reply

- **How much will the price of ice-creams change with a per-unit tax of $2?**

- **When the tax is imposed on consumers:**

$$\Delta P = \frac{\sigma_d}{\sigma_s - \sigma_d} \times \tau$$

$$\Delta P = \frac{-2}{3 + 2} \times 2 = -0.8$$

Reply

- **How much will the price of ice-creams change with a per-unit tax of $2?**

- **When the tax is imposed on suppliers:**

$$\Delta P = \frac{\sigma_s}{\sigma_s - \sigma_d} \times \tau$$

$$\Delta P = \frac{3}{3 + 2} \times 2 = 1.2$$

Reply

Price paid by the consumer:

- when tax imposed on consumers is:

$$P+2+\Delta P=P+2-0.8=P+1.2$$

- when tax imposed on suppliers is:

$$P+\Delta P=P+1.2$$

Answer: *Total price increase paid by consumer is 1.2*

Reply

- **Who bears the larger burden of the tax, consumers or producers?**

(Hint: Parties with inelastic supply or demand bear a larger burden.)

Answer:

Consumers because the price elasticity of demand (-2) is smaller than the price elasticity of supply (3) in absolute terms.

Tax Incidence Extensions

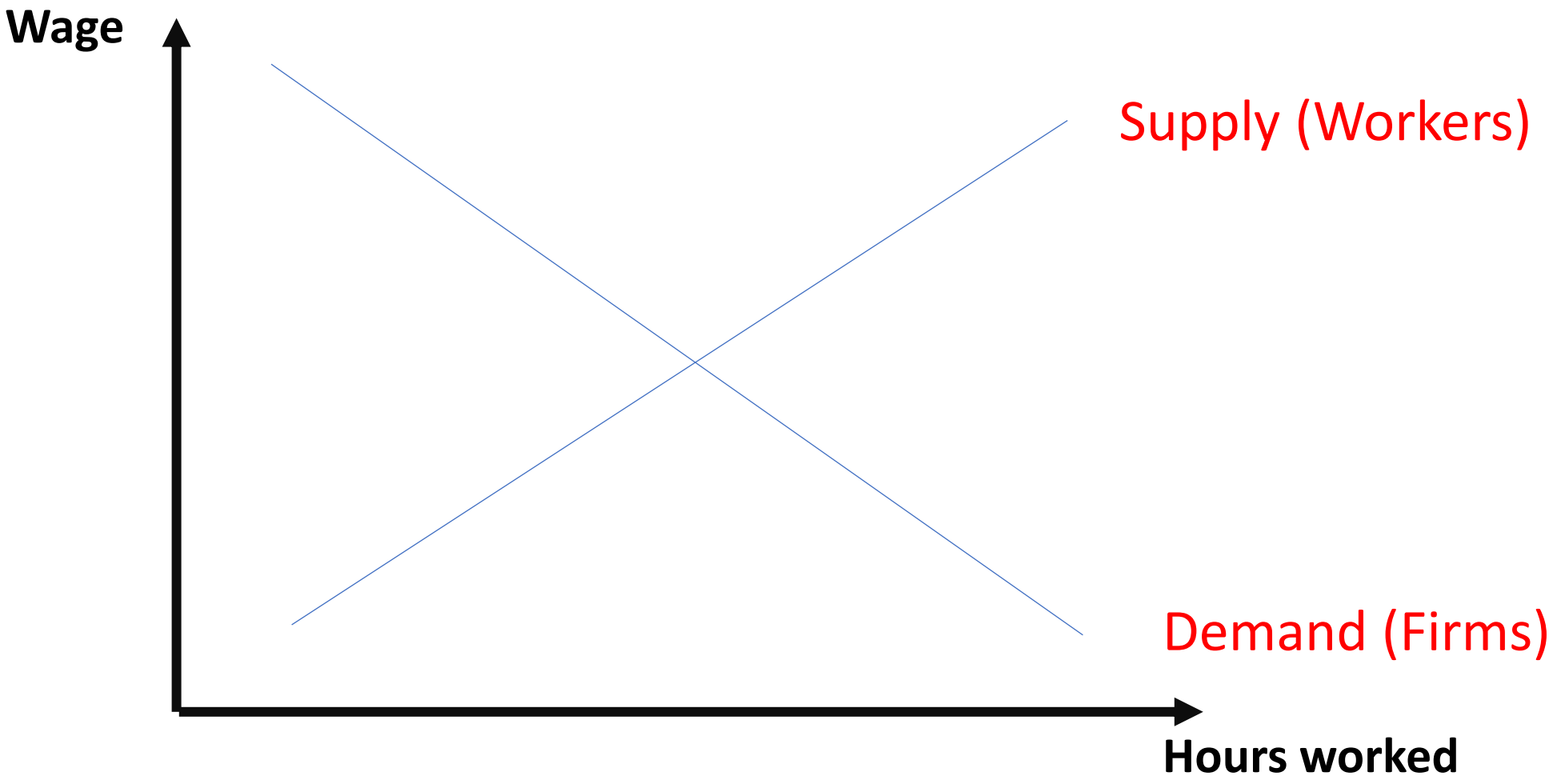
- To recap:
  - The statutory burden of a tax does not describe who really bears the tax.
  - The side of the market on which the tax is imposed is irrelevant to the distribution of tax burdens.
  - Parties with inelastic supply or demand bear taxes; parties with elastic supply or demand avoid them.

Tax Incidence in Factor Markets

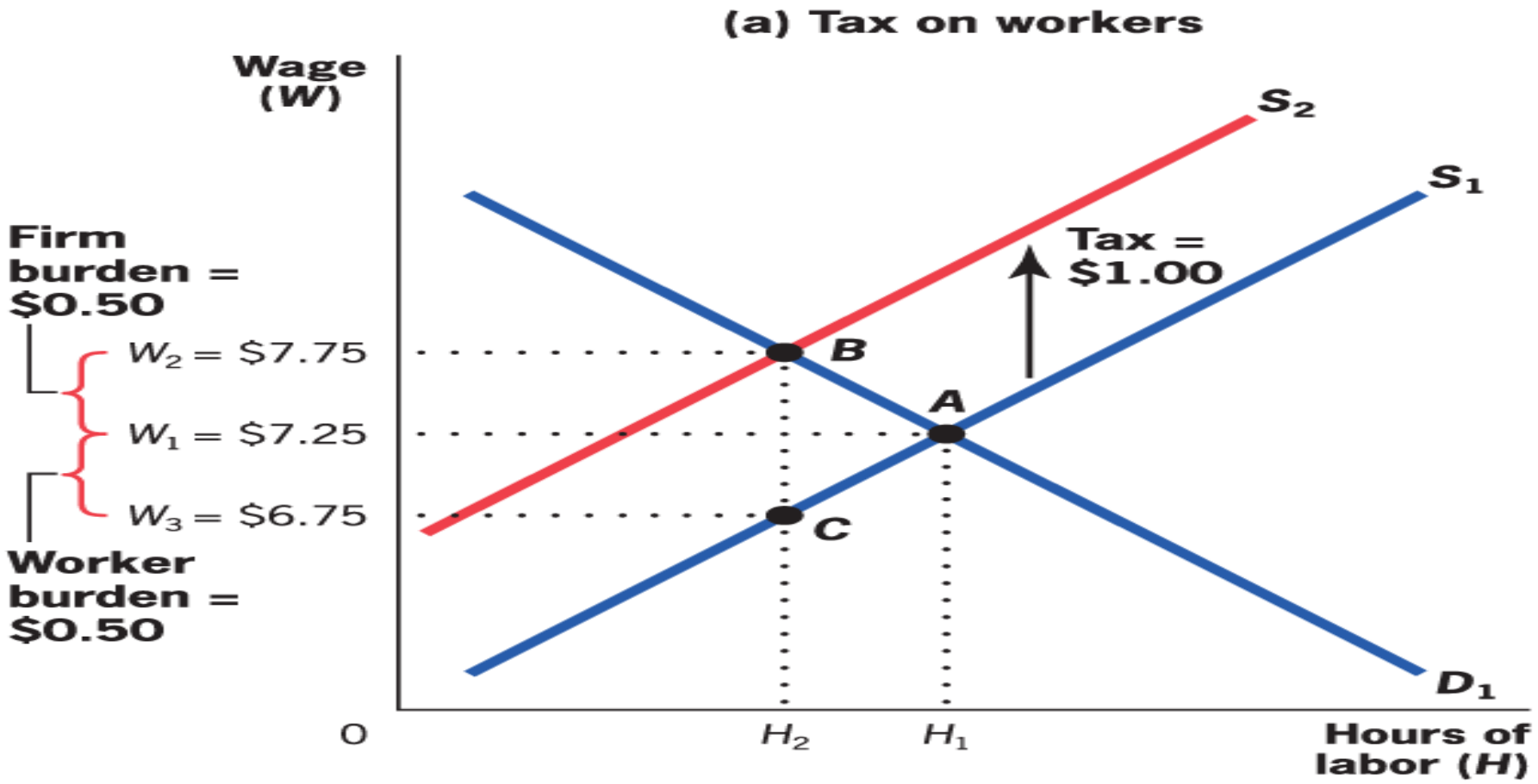
Tax incidence in Factor Markets

- So far we focused on taxes levied in the goods markets.
- Many taxes are levied in factor markets.
- Example: Labour Market.
- As before the analysis involves a demand and supply side.
- You can think firms as the consumers of the factors (demand side); while the producers are individuals (supply side).

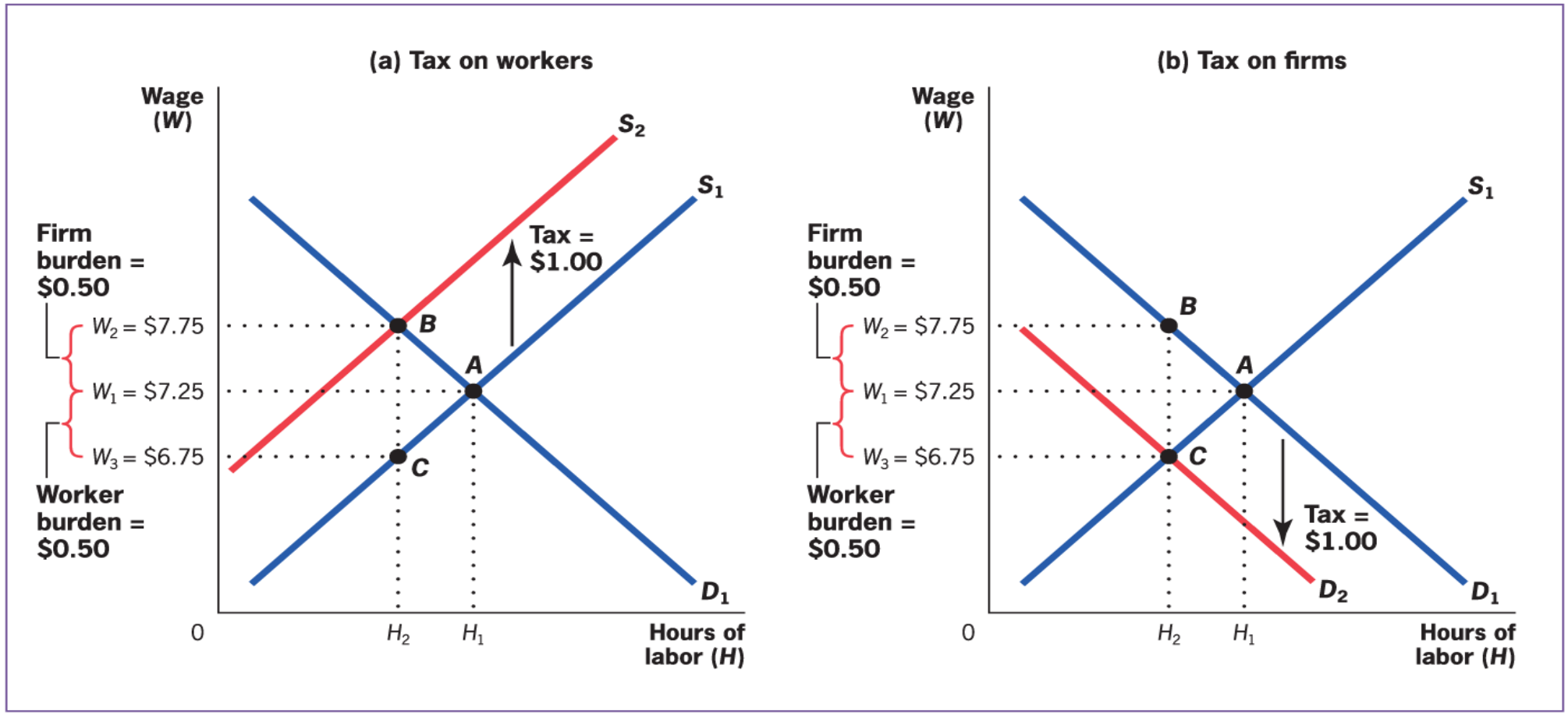
Labour market equilibrium



Tax Incidence in Factor Markets



Tax Incidence in Factor Markets



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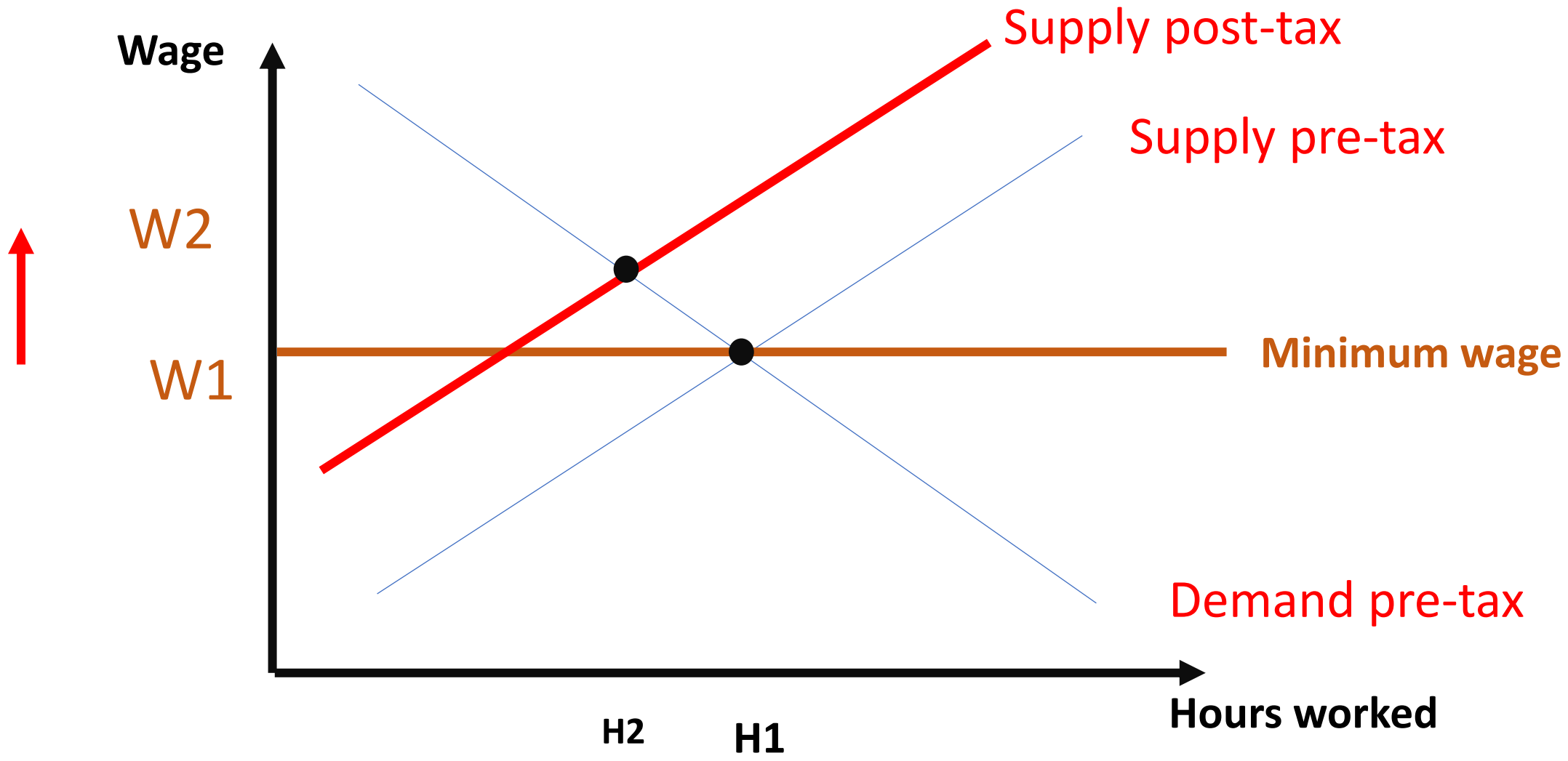
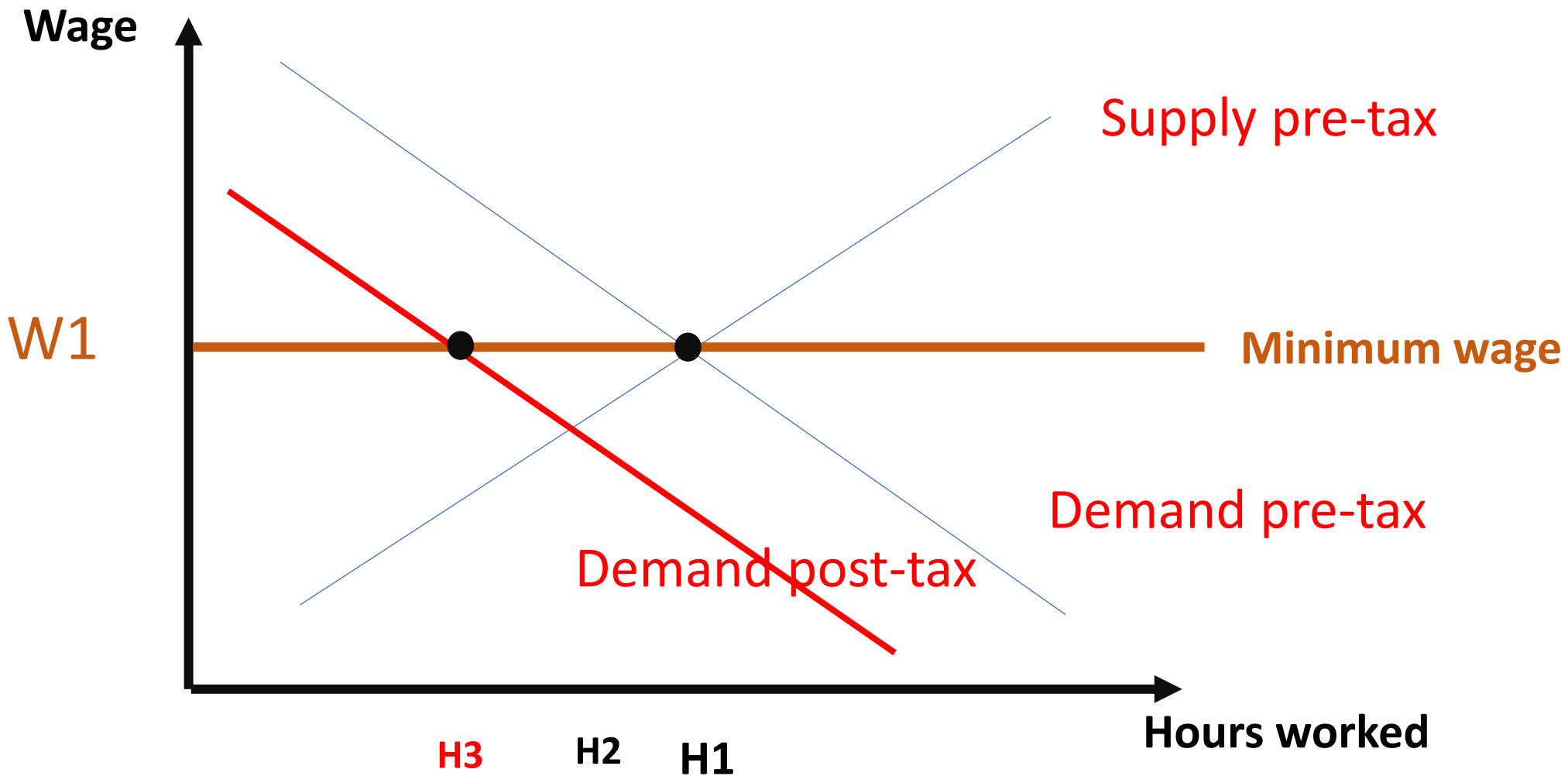
Impediments to Wage Adjustment

- 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 of the tax burden.

Tax on workers



Tax on firms


Wage
Supply pre-tax
W1
Minimum wage
Demand pre-tax
Demand post-tax
Hours worked
H3
H2
H1

Additional Reading

- European Commission (2020).***Taxation trends in the European Union 2020 edition***.

- Kostarakos I. and P. Varthalitis (2020). *Effective tax rates in Ireland*. **ESRI Research Series 110**.

- Kostarakos I. and P. Varthalitis (2020). *Effective tax rates in Ireland*. **Tax Point Feature Article**. **(Required)**

- Kostarakos I. and P. Varthalitis (2020). *Effective tax rates in the EU: An updated database over 1995-2017*. **ESRI Research Series**.