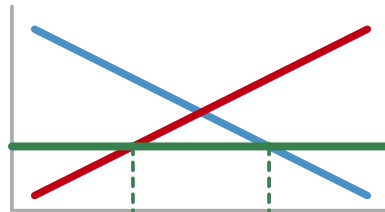


Chapter 6

Supply, Demand, and Government Policies



Price Controls

Definition. A **price ceiling** is a legal maximum price. A **price floor** is a legal minimum price.

A rule is **binding** when it prevents the market from reaching the price that would balance supply and demand.

A ceiling can create a shortage; a floor can create a surplus. First compare the legal price with the equilibrium price without the control.

A Hypothetical Bubble-Tea Market

Assume identical cups, competitive buyers and sellers, and no tax. The daily market schedules are

$$Q_D = 120 - P, \quad Q_S = P.$$

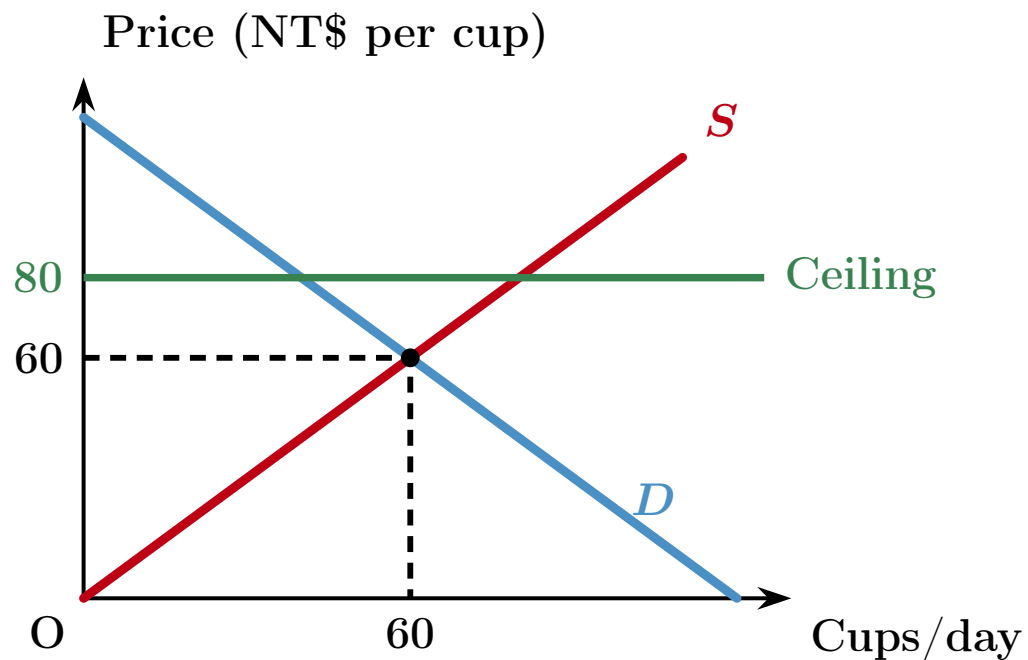
Here P is NT\$ per cup and Q is cups per day.

Equating quantity demanded and quantity supplied gives

$$120 - P = P \quad \Rightarrow \quad P^* = 60, \quad Q^* = 60.$$

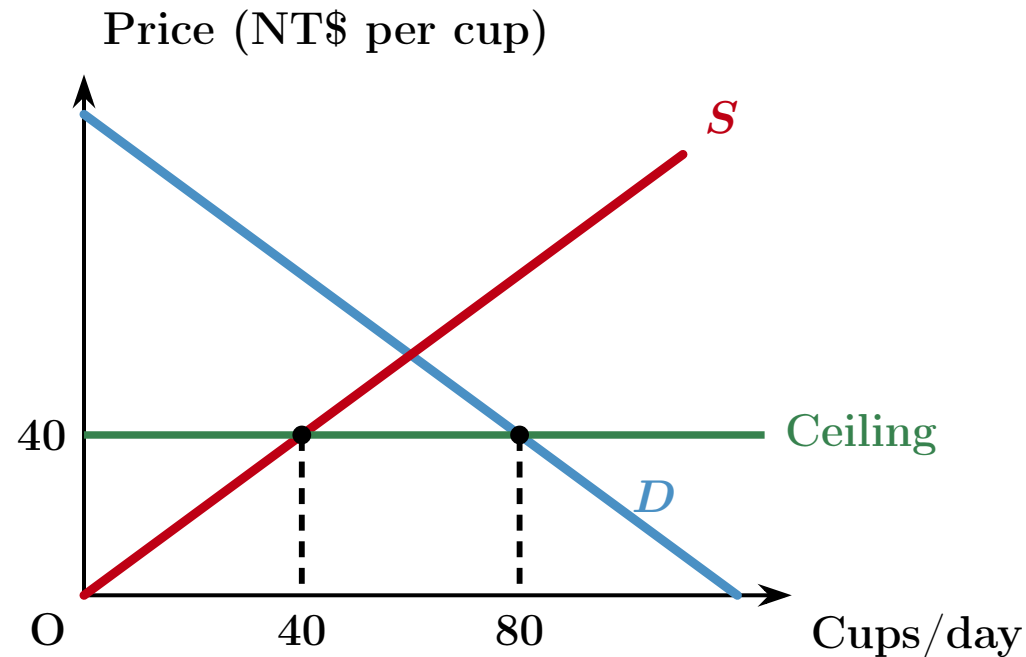
These illustrative numbers let us compare different policies in the same market.

A Ceiling That Does Not Bind



A ceiling of NT\$80 allows the equilibrium price of NT\$60. The market still sells 60 cups. A legal maximum is not a required price.

A Binding Price Ceiling



At the NT\$40 ceiling, $Q_S = 40$ and $Q_D = 80$. The **shortage is 40 cups**. With no outside supply, at most 40 cups can be sold; the 80 cups demanded are not actual sales.

Who Gets the Available Cups?

A lower price due to a binding ceiling means that not everyone can buy a cup. When buyers want 80 cups but sellers offer only 40, who gets to buy?

Cups might go to those who line up first, win a lottery, or are chosen by the seller. Shops might limit how many cups each person can buy. Waiting in line takes time, even when the price is low.

Buyers who get a cup may benefit from the lower price. Those who cannot buy may lose. A lower price helps only if a buyer can actually get a cup without spending too much time waiting.

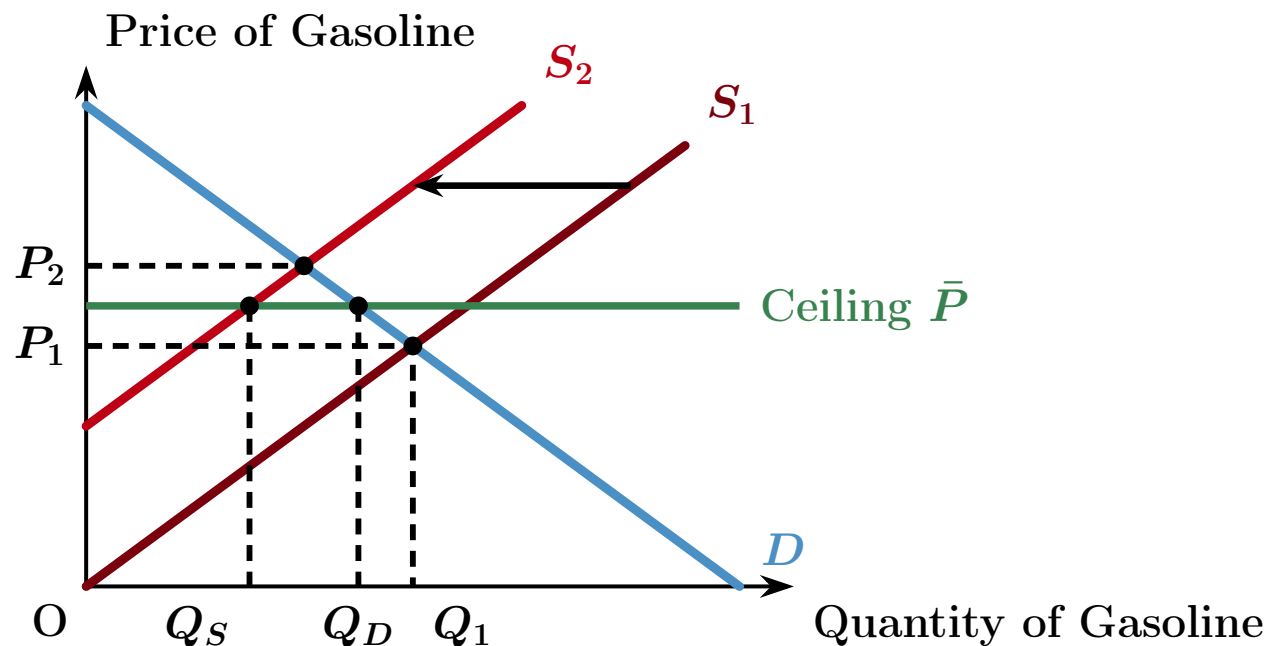
A Supply Reduction Can Make a Ceiling Bind

Higher input costs can interact with a price ceiling. Higher crude-oil costs reduce the supply of gasoline.

A ceiling above the original equilibrium can be below the new equilibrium. It then prevents price from clearing the market, producing a shortage.

The supply reduction and the legal restriction have distinct roles. Without the ceiling, the same supply reduction raises the market-clearing price.

A Supply Shock under a Price Ceiling



Higher input costs shift supply from S_1 to S_2 . The ceiling is above P_1 but below the new market-clearing price P_2 . At $\bar{P}$, the shortage is $Q_D - Q_S$; without the ceiling, price rises to P_2 .

Discussion: Rice Price Controls

Suppose the government, worried about the price of rice after a poor harvest, sets a legal maximum price for rice below the post-harvest equilibrium price. Compare this policy with the same post-harvest market without a price control.

1. What happens to the quantity of rice demanded and the quantity supplied at this legal price?
2. Will everyone who wants to buy rice at the legal price be able to find some? Explain.
3. Who is likely to support this policy, and who is likely to oppose it?

Answer: Rice Price Controls

1. Relative to the post-harvest equilibrium, the lower legal price raises quantity demanded and lowers quantity supplied. The result is a **shortage**, not a shift of either curve.
2. Some willing buyers cannot obtain rice. With no government supply or imports, sales cannot exceed quantity supplied. Queues or purchase limits may ration the available rice.
3. Buyers who obtain rice at the lower price may support the policy. Those unable to buy may lose, and waiting is costly. Sellers generally oppose a lower selling price. A low posted price does not guarantee access for all buyers.

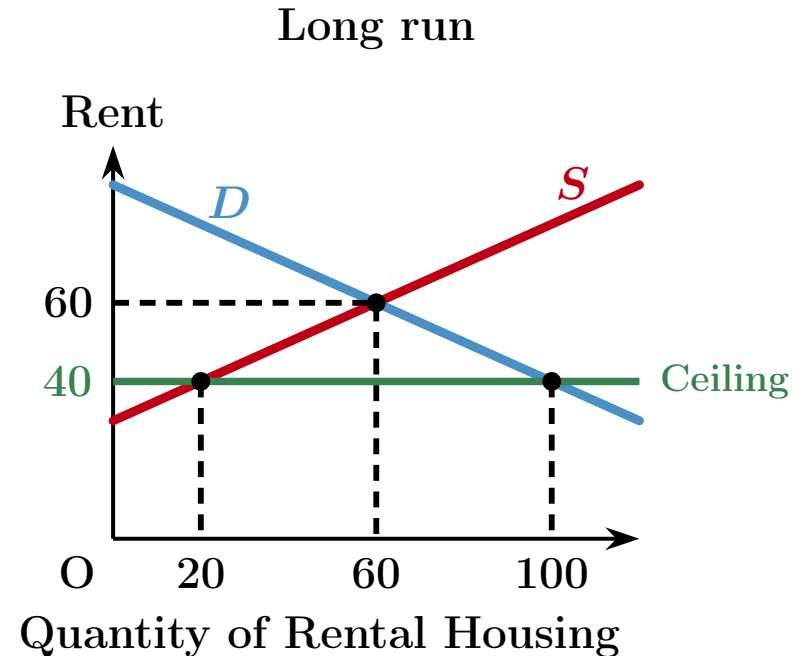
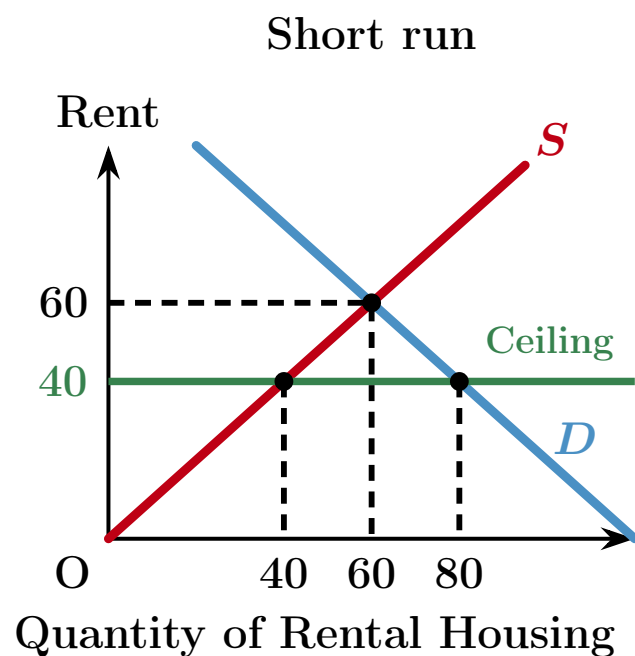
Rent Control and the Time Horizon

A binding rent ceiling is a price ceiling in the housing market. In the short run, the housing stock and households' arrangements adjust slowly.

Over time, landlords can alter construction and maintenance, while tenants can change where and with whom they live. Supply and demand can respond more.

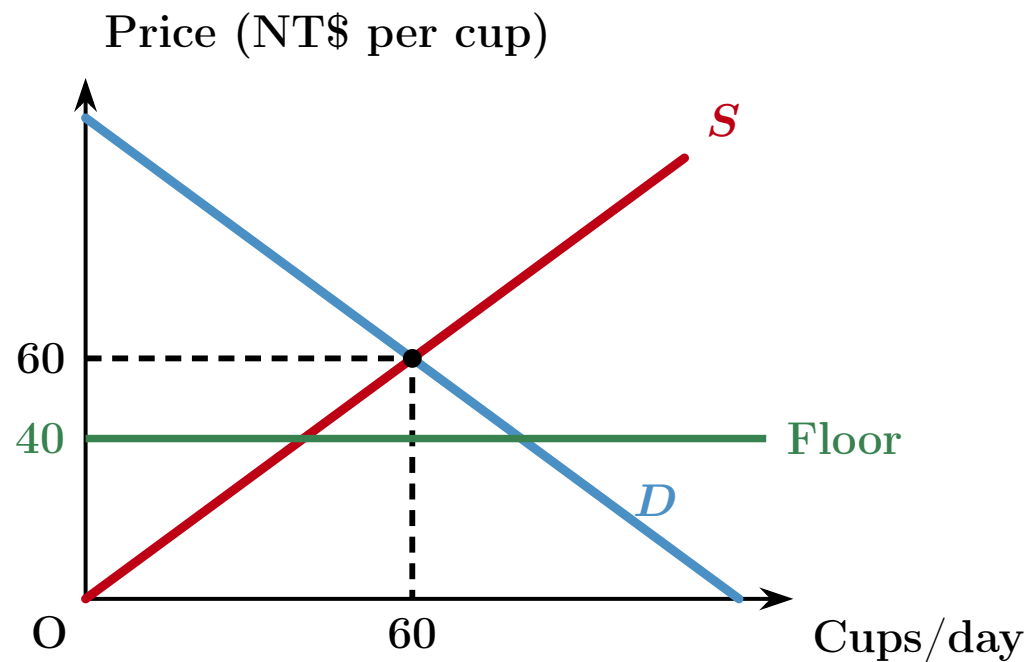
For the same rent reduction from a common starting equilibrium, more elastic supply and demand imply a larger shortage.

Rent Control: Two Adjustment Horizons



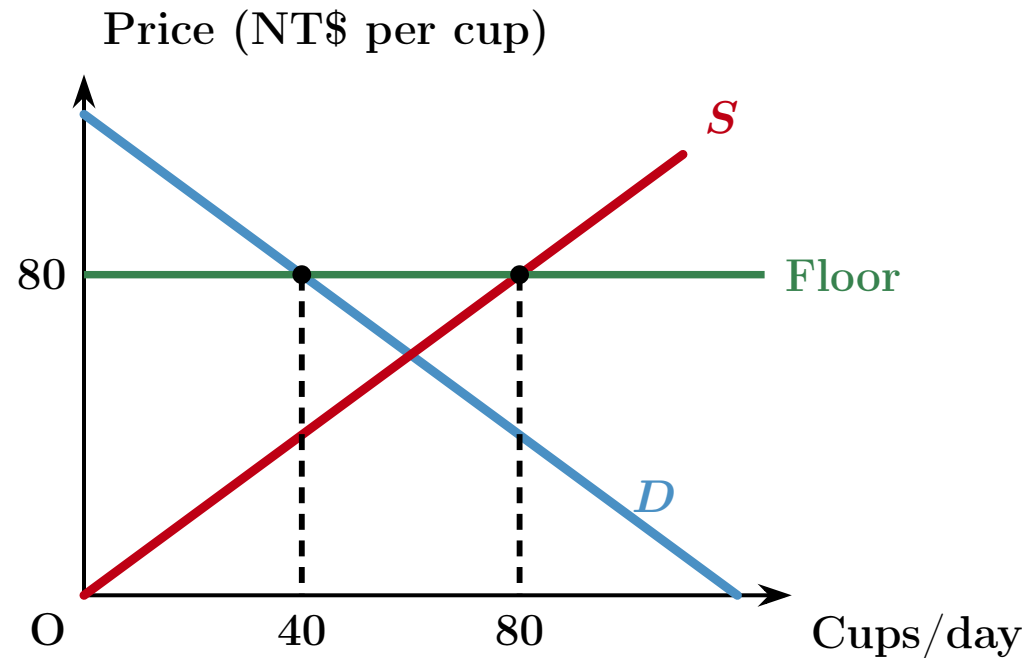
Both markets start at rent 60 and housing quantity 60. The ceiling is 40. The shortage is 40 in the short-run illustration and 80 in the long-run illustration.

A Floor That Does Not Bind



A floor of NT\$40 permits the equilibrium price of NT\$60. Quantity sold remains 60 cups. A legal minimum does not force the price down.

A Binding Price Floor



At the NT\$80 floor, $Q_S = 80$ and $Q_D = 40$. The **surplus is 40 cups**. Without government purchases or other buyers, at most 40 cups are sold; quantity supplied need not equal sales.

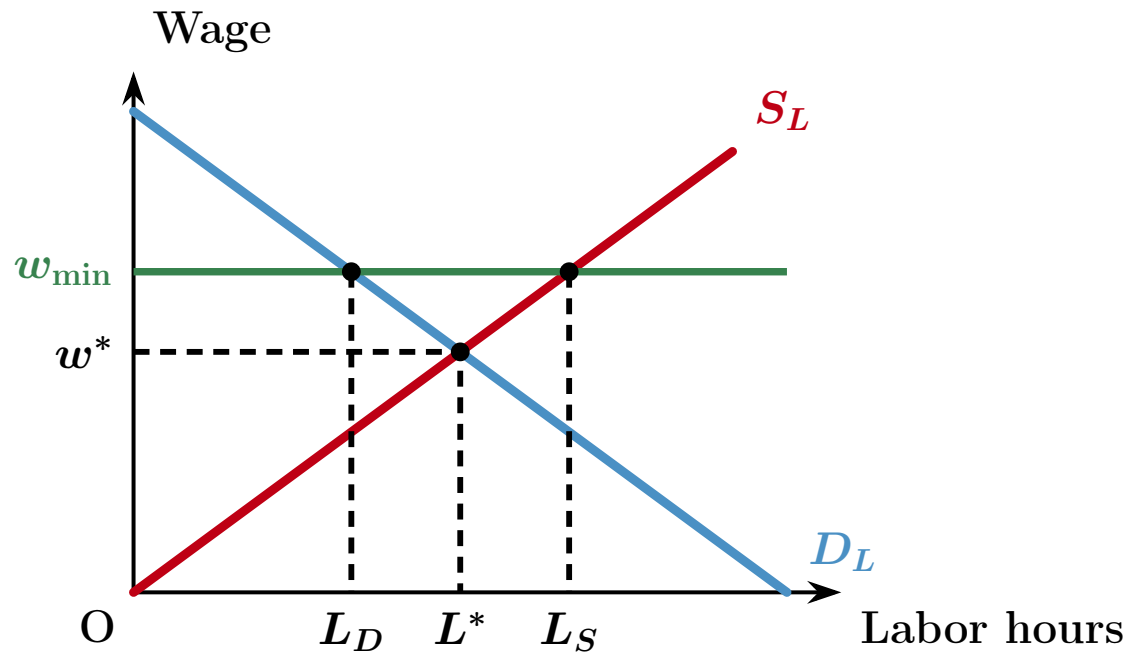
The Minimum Wage in a Competitive Labor Market

Workers supply labor; employers demand labor. The wage is the price of labor. A minimum wage is a legal wage floor.

If it lies above the competitive equilibrium wage, labor supplied exceeds labor demanded. Employers hire fewer hours than workers would like to supply.

Workers who retain jobs at the higher wage can gain; workers who lose hours or cannot find work can lose.

A Binding Minimum Wage

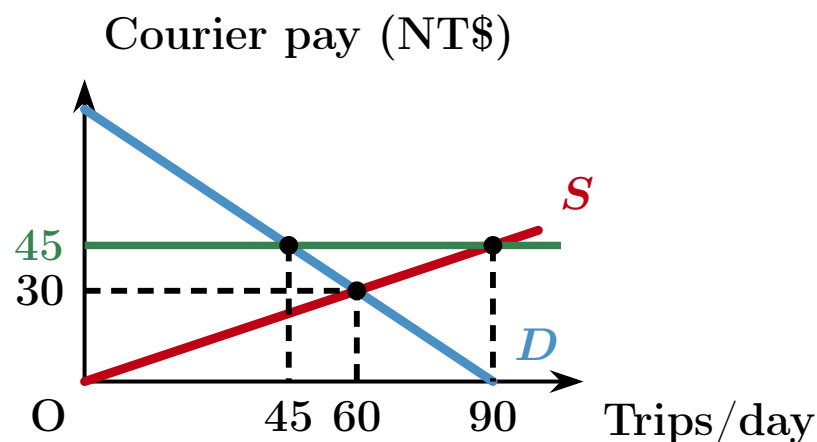


At $w_{\min} > w^*$, firms hire L_D hours while workers offer L_S . Employment falls from L^* to L_D ; the excess supply of labor is $L_S - L_D$. This prediction assumes a competitive labor market.

Example: Taiwan's Delivery-Pay Floor

Taiwan's delivery-worker law, in effect since July 21, 2026, requires platforms to pay couriers at least NT\$45 per completed delivery, rising above NT\$45 once a delivery takes more than about 11 minutes.

For identical short trips, suppose platform demand is $Q_D = 90 - r$ and courier supply is $Q_S = 2r$, where r is pay per trip; these schedules are hypothetical.



Discussion: Which Controls Bind?

Return to $Q_D = 120 - P$ and $Q_S = P$. Consider each policy separately.

1. A ceiling of NT\$50. Find quantities demanded and supplied and the shortage.
2. A floor of NT\$50. Find the market price and quantity sold.
3. A floor of NT\$70. Find quantities demanded and supplied and the surplus.

Answer: Which Controls Bind?

1. The NT\$50 ceiling binds. $Q_D = 70$ and $Q_S = 50$, so the shortage is 20 cups. Sales cannot exceed 50 cups.
2. The NT\$50 floor does not bind. The market clears at NT\$60 with 60 cups sold.
3. The NT\$70 floor binds. $Q_D = 50$ and $Q_S = 70$, so the surplus is 20 cups. Without other buyers, sales cannot exceed 50 cups.

Evaluating Price Controls

A policy's stated goal and its market effects are different questions. Binding price ceilings can help successful buyers while discouraging supply. Binding price floors can help successful sellers while discouraging purchases.

Both distort markets by preventing them from reaching equilibrium. Evaluating a control means asking who trades, who is excluded, and whether quality, waiting time, or side payments change.

If the goal is to support low-income households, targeted transfers are another way. However, they require funding and can affect demand; they are not costless alternatives.

For example, Taiwan's public assistance programs target eligible households using income and asset tests, not the price in any one market.

Taxes Create a Wedge

Definition. **Tax incidence** describes how the burden of a tax is divided among market participants.

For a per-unit tax t , distinguish the price buyers pay, P_B , from the amount sellers keep after tax, P_S :

$$P_B - P_S = t.$$

Let P_0 denote the equilibrium price before the tax.

Definition. The **tax burden per unit** on buyers is $P_B - P_0$, the amount the price they pay rises. The burden per unit on sellers is $P_0 - P_S$, the amount the price they keep falls.

The person legally required to remit the tax need not bear its entire burden.

A Tax Collected from Sellers

Suppose sellers must remit NT\$20 for each cup sold. If buyers pay P_B , sellers retain $P_S = P_B - 20$.

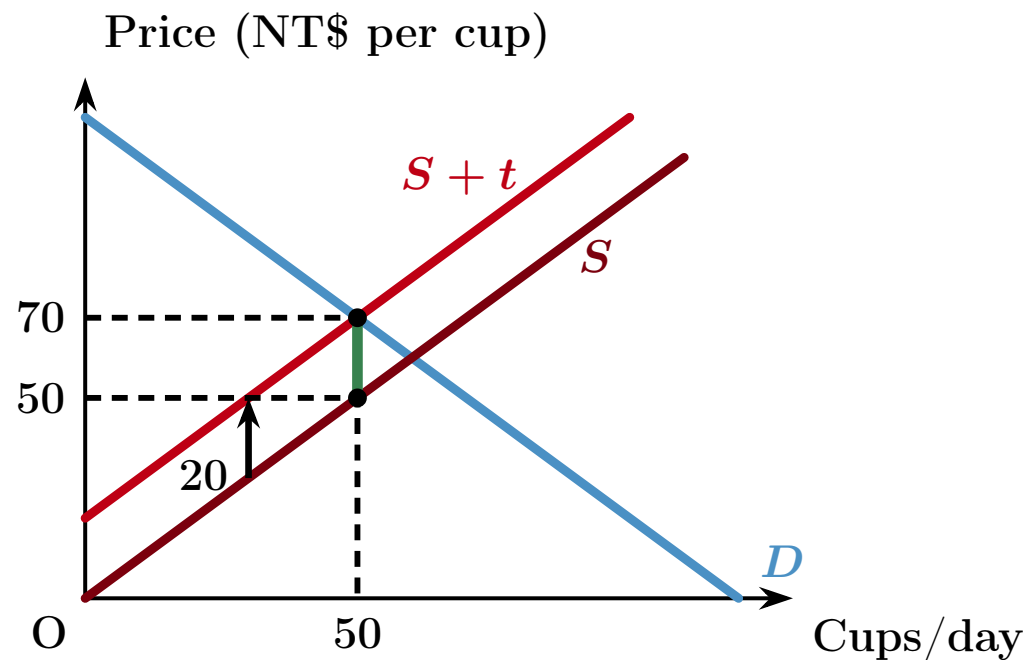
Recall the original, untaxed supply curve was $Q_S = P$. Sellers still supply according to $Q_S = P_S$, since P_S is the price they actually keep.

Substituting $P_S = P_B - 20$ gives supply in terms of the buyer price:

$$Q_S = P_B - 20.$$

At any quantity, buyers must pay NT\$20 more to leave sellers with the same net price. Supply expressed in buyer-price units shifts vertically up by 20. Demand in buyer-price units is unchanged.

Seller Tax: The Shifted Supply Curve



The demand curve meets $S + t$ at $Q = 50$ and $P_B = 70$. At that quantity, the original supply curve gives $P_S = 50$. The buyer price and the seller's net price differ by NT\$20.

Solving the Taxed Equilibrium

Demand depends on the buyer price and supply on the seller price:

$$Q_D = 120 - P_B, \quad Q_S = P_S, \quad P_B = P_S + 20.$$

Thus $120 - (P_S + 20) = P_S$, giving

$$P_S = 50, \quad P_B = 70, \quad Q = 50.$$

Compared with the original NT\$60 price, buyers pay 10 more and sellers keep 10 less per cup. Each side bears half of this tax.

A Tax Collected from Buyers

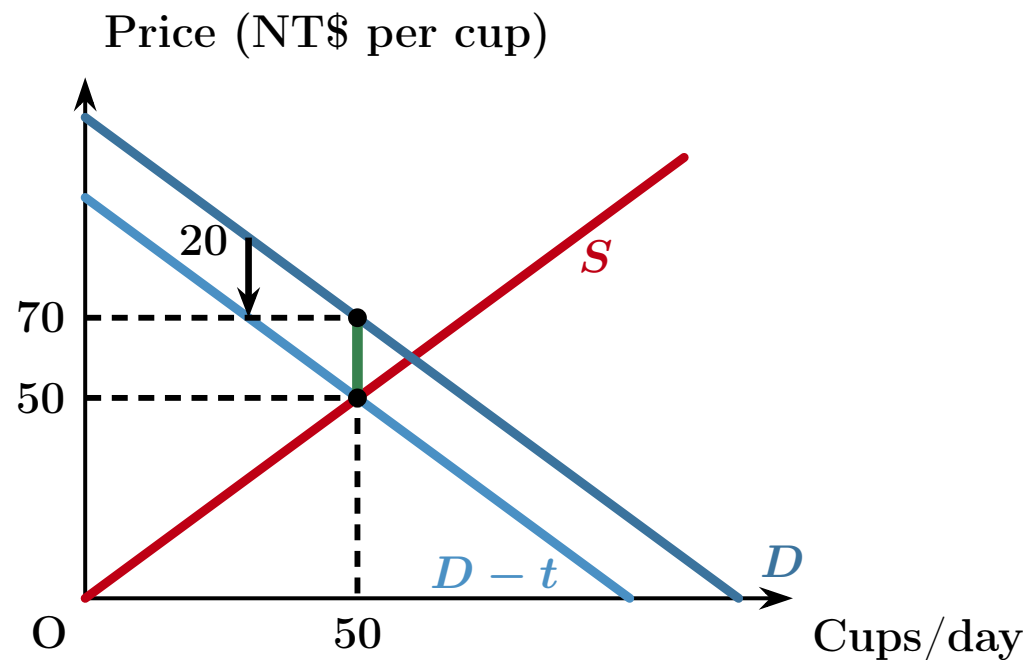
Now buyers remit the same NT\$20 tax. They pay the seller P_S and the government 20, so their total price is still $P_B = P_S + 20$.

Demand expressed in the seller-price units becomes

$$Q_D = 120 - (P_S + 20) = 100 - P_S.$$

Supply remains $Q_S = P_S$. Equilibrium again gives $P_S = 50$, $P_B = 70$, and $Q = 50$. Legal remittance changes; the outcome does not.

Buyer Tax: The Shifted Demand Curve



The supply curve meets $D - t$ at the seller price of NT\$50. Buyers pay NT\$70 including tax. The two legal arrangements create the same wedge, assuming the same coverage and compliance.

Tax Revenue and Private Receipts

In this example, 50 cups are sold with $P_B = 70$, $P_S = 50$, and $t = 20$.

Buyers' spending = $70 \times 50 = \text{NT\$}3,500$,

Sellers' receipts after tax = $50 \times 50 = \text{NT\$}2,500$,

Government tax revenue = $20 \times 50 = \text{NT\$}1,000$.

The receipts after tax are not profit. Production costs must also be paid.

Elasticity Determines the Division

The less elastic side of the market bears more of a per-unit tax burden. For the same percentage price change, its quantity changes by a smaller percentage.

If demand is relatively inelastic, buyers have fewer good alternatives and bear more through a higher buyer price. If supply is relatively inelastic, sellers bear more through a lower net price.

Our equal split came from symmetric demand and supply responses. It is not a general rule that taxes are shared equally.

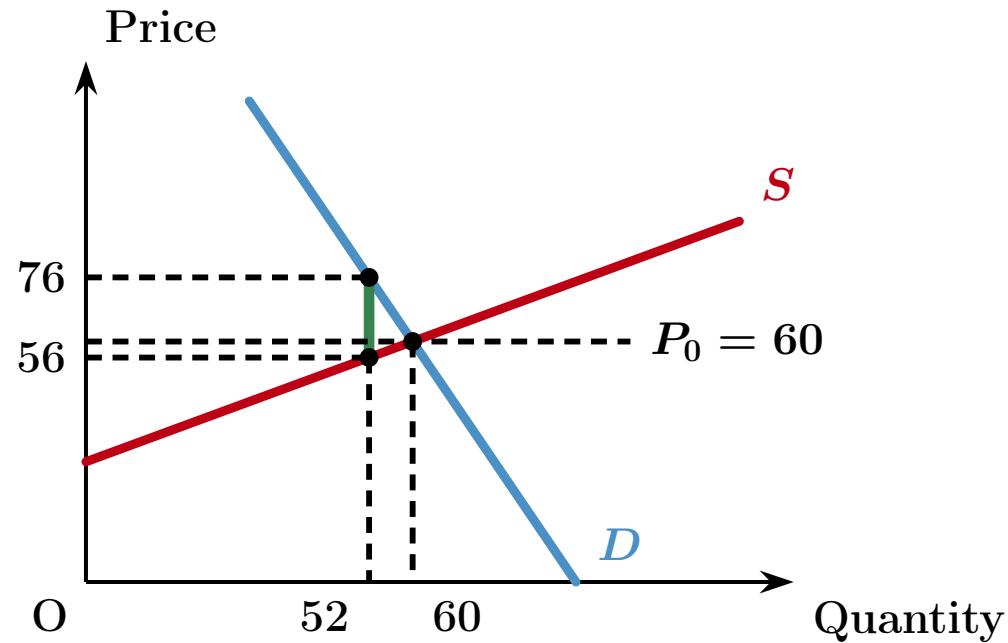
Two Tax-Incidence Examples

Consider two hypothetical markets. Both initially have $P = 60$, $Q = 60$, and then face a per-unit tax of 20.

	Less elastic demand	Less elastic supply
Demand	$Q_D = 90 - 0.5P_B$	$Q_D = 180 - 2P_B$
Supply	$Q_S = 2P_S - 60$	$Q_S = 0.5P_S + 30$
Buyer price	76	64
Seller price	56	44
Quantity	52	52
Burden per unit	Buyers 16; sellers 4	Buyers 4; sellers 16

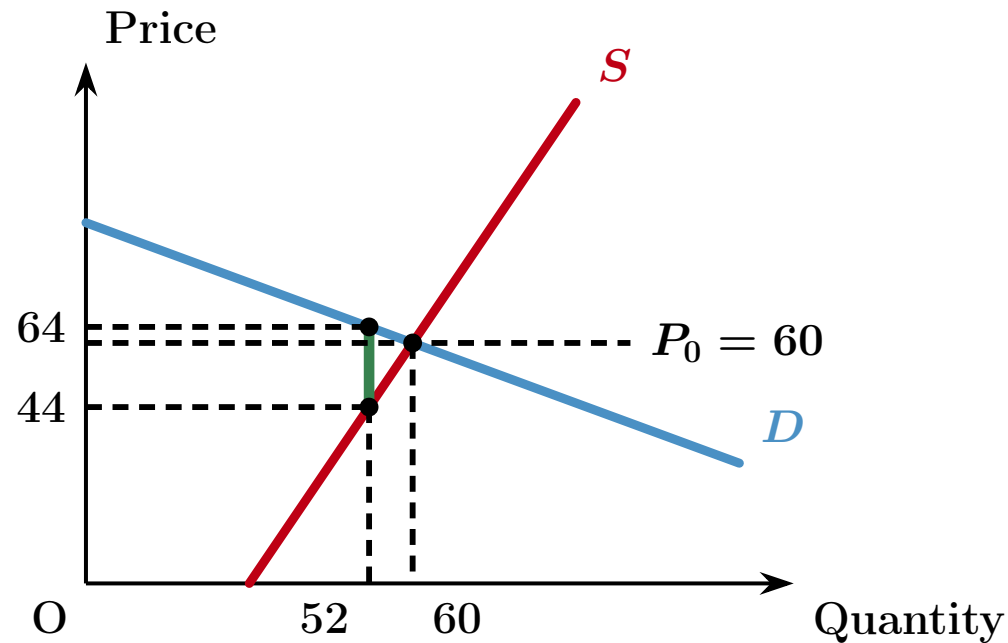
In each case, check $P_B - P_S = 20$ and $Q_D = Q_S$.

Tax Incidence with Less Elastic Demand



Demand is less elastic than supply. The buyer price rises from 60 to 76, while the seller price falls to 56. Buyers bear 16 of the tax of 20; sellers bear 4. Quantity falls from 60 to 52.

Tax Incidence with Less Elastic Supply



Supply is less elastic than demand. The buyer price rises from 60 to 64, while the seller price falls to 44. Sellers bear 16 of the tax of 20; buyers bear 4. Quantity again falls from 60 to 52.

Payroll Taxes and Luxury Taxes

A **payroll tax** is a tax on wages paid by employers or earned by workers.

It places a wedge between the total cost of employing a worker and the worker's take-home pay. In the competitive model, changing which side remits an otherwise identical tax does not determine its economic burden.

Consider a tax on luxury yachts. If yacht buyers can readily buy other goods but specialized workers and equipment cannot readily move elsewhere, demand is more elastic than supply.

Under those conditions, sellers and their inputs bear more of the burden. A tax aimed at wealthy buyers need not fall mainly on them.

Discussion: Who Bears the Tax?

1. A seller says, “The government taxes buyers, so sellers will not lose.”
What is wrong with the argument?
2. If supply is perfectly inelastic and demand slopes down, who bears a per-unit tax? What happens to quantity?
3. In the bubble-tea example, why is buyers' spending different from sellers' receipts after tax?

Answer: Who Bears the Tax?

1. A tax changes the equilibrium. Sellers can receive a lower net price even when buyers remit the tax.
2. With a fixed quantity supplied, sellers bear the whole tax through a lower net price. The buyer price and quantity are unchanged, assuming trade remains feasible.
3. Buyers spend 3,500 and sellers keep 2,500 after tax. The difference, NT\$1,000, goes to the government.

Takeaways

Price rules and taxes change the terms of exchange.

- A binding ceiling creates a shortage; a binding floor creates a surplus in the competitive model.
- Quantities demanded and supplied need not equal actual transactions under price controls.
- A per-unit tax creates the wedge $P_B - P_S = t$ and usually reduces trade.
- Legal responsibility for paying the tax does not determine incidence. The less elastic side bears more.
- Policy evaluation must consider who gains, who loses, and how behavior adjusts.