Author: Andy Gu
Date: 11/08/2025

Introduction

Foundations of Supply and Demand

Supply and demand—the twin pillars that orchestrate market behavior. These forces determine prices. They dictate quantities. Markets hum with activity as buyers and sellers converge, their decisions creating price signals that ripple through entire economies without anyone coordinating the chaos. This unit explores how these mechanisms function, how sensitive participants are to price shifts, and how markets stumble into efficient outcomes almost by accident.

Markets are meeting places. Physical sometimes, digital often, conceptual always. They bring together those who want to buy with those willing to sell, and somewhere in that collision of interests, value gets created.

Supply and Demand Curves

The Law of Demand

The law of demand reveals an inverse relationship between price and quantity demanded—ceteris paribus, naturally. When prices climb, people buy less. Prices fall? They buy more. Two forces drive this pattern, working in tandem to shape consumer behavior in predictable yet fascinating ways.

The **substitution effect** kicks in first. A good becomes expensive, consumers pivot to alternatives that now look comparatively cheaper. Coffee prices spike? Tea consumption rises. It's rational switching behavior at its finest.

Then there's the **income effect**. Higher prices erode purchasing power. Your wallet feels lighter even if nothing physically changes. You consume less because, in real terms, you're poorer than before. Both effects push in the same direction, creating that distinctive downward slope on demand curves.

The demand curve itself is a visual representation of willingness and ability to purchase at various price points during some specified timeframe. Each point captures a snapshot of consumer readiness. But here's what trips people up: movement along the curve differs fundamentally from shifting the entire curve. Price changes trigger movements. Everything else shifts the whole thing left or right.

Determinants of Demand

Price moves you along the curve. These other factors—they relocate the entire relationship.

Tastes and preferences shift demand through cultural currents, advertising blitzes, or sudden health revelations. A celebrity endorses a product? Demand shifts right. Studies link something to cancer risk? Left it goes. Consumer psychology matters more than we'd like to admit in supposedly rational markets.

Income plays different roles depending on the good in question:

- **Normal goods** see demand increase as income rises—think restaurant meals, new vehicles, vacation packages. People earn more, they consume more. Simple.
- **Inferior goods** behave counterintuitively. Rising income decreases demand as consumers upgrade to better alternatives. Generic brands get abandoned for name brands. Public buses lose riders to personal cars. Ramen noodles gather dust in pantries as wallets fatten.

Prices of related goods create spillover effects that ripple across markets:

- **Substitutes** satisfy similar needs. Beef and chicken. Coke and Pepsi. When one's price jumps, demand for the other climbs as consumers make rational switches to relatively cheaper options.
- **Complements** get consumed together—cars need gasoline, coffee pairs with cream, smartphones demand apps. Demand for its partner falls because the combined purchase now costs more.

Expectations about future conditions shape current decisions. Anticipate price increases? Buy now. Expect shortages? Stock up today. Think income will rise? Might splurge earlier than planned. Conversely, expected price drops shift current demand leftward as people wait for better deals.

The number of buyers seems obvious but matters tremendously. Population growth, demographic transitions, market expansions—all shift demand rightward. Declining populations or market contractions push it left.

Rightward shifts mean more demanded at every single price point. Leftward shifts mean less. The entire relationship between price and quantity relocates.

The Law of Supply

The law of supply describes a direct relationship—price and quantity supplied move together, ceteris paribus enforced. Prices rise? Firms produce more. Fall? Output contracts. Three interconnected reasons explain this pattern that feels intuitive once you see it but requires unpacking to truly grasp.

Higher prices boost profitability margins, encouraging existing producers to expand output and utilize more capacity. New firms smell profit opportunities and enter markets they previously ignored. And crucially, firms face rising marginal costs as production scales up—making additional units requires higher prices to justify the extra expense and resource strain.

The supply curve slopes upward, each point showing quantities producers are willing and able to offer at given prices during specific periods. Like demand, distinguishing between movements along the curve (price-driven) and shifts of the entire curve (everything else) separates superficial from deep comprehension.

Determinants of Supply

Price causes movements. These determinants shift the whole curve.

Input prices (resource costs) directly affect production viability. Wages increase? Costs rise, supply decreases. Raw material prices drop? Per-unit costs fall, supply expands rightward. Oil prices plummet? Transportation-intensive industries see supply shift right as their cost structures improve dramatically.

Technology reduces per-unit production costs through innovation, automation, efficiency gains, or entirely new production methods. Manufacturing robots, improved farming techniques, software optimization—all push supply rightward. Technological regression (rare but theoretically possible) would reverse the effect.

Taxes and subsidies alter effective costs:

- **Taxes** on producers burden them with additional costs per unit, shifting supply leftward. Excise taxes, payroll taxes, production levies—all reduce willingness to supply at given prices.
- **Subsidies** work oppositely, effectively lowering costs and shifting supply rightward. Agricultural subsidies, renewable energy credits, research grants—government payments that make production artificially cheaper.

Prices of related goods in production matter when firms can produce multiple outputs with similar resources. Corn prices surge relative to soybeans? Farmers shift acreage to corn, decreasing soybean supply. Auto manufacturers face strong SUV demand? They retool sedan production lines, shifting sedan supply leftward.

Expectations about future prices influence current supply decisions. Expect higher prices soon? Withhold current supply, shifting it leftward temporarily. Anticipate price drops? Sell everything now before values collapse, shifting current supply rightward.

The number of sellers directly impacts market supply through simple addition. New firms enter? Supply shifts right. Competitors exit due to losses or consolidation? Left it goes.

Rightward shifts increase supply at every price. Leftward shifts reduce it. The fundamental price-quantity relationship relocates in space.

Graphing Skills Checklist

When drawing these curves, you need to:

1. Label vertical axis Price (P), horizontal axis Quantity (Q). Always. No exceptions.
2. Draw downward-sloping demand (D) and upward-sloping supply (S). The slopes matter—they encode elasticity information we'll explore later.
3. Distinguish movements along curves (price changes) from shifts of curves (determinants). This single distinction prevents countless errors.

4. Show demand increases as rightward shifts from D_1 to D_2, decreases as leftward shifts to D_3.
5. Show supply increases as rightward shifts from S_1 to S_2, decreases as leftward shifts to S_3.
6. Label everything clearly. Use arrows indicating shift directions. Clarity prevents confusion later.

Market Equilibrium and Price Determination

Finding Equilibrium

Market equilibrium materializes where quantity demanded equals quantity supplied exactly. At equilibrium price (P*), buyer intentions align perfectly with seller intentions at equilibrium quantity (Q*). Graphically? The intersection point where demand and supply curves cross.

Equilibrium means the market clears—no frustrated buyers unable to find goods, no disappointed sellers stuck with inventory. No inherent pressure pushing price or quantity elsewhere. It's stable, given current conditions. But stability doesn't mean permanence. Conditions change constantly.

Market Forces: Shortages and Surpluses

Non-equilibrium prices trigger automatic correction mechanisms through competitive pressures that need no central coordinator.

Surplus (excess supply) emerges when price exceeds equilibrium:

- Quantity supplied outstrips quantity demanded. Inventory accumulates. Warehouses fill.
- Sellers compete to offload unsold goods by cutting prices, trying to attract the buyers who remain.
- Falling prices reduce quantity supplied (movement along supply) while increasing quantity demanded (movement along demand).
- The process continues. Automatically. Relentlessly. Until equilibrium reestablishes itself.

Shortage (excess demand) appears when price sits below equilibrium:

- Quantity demanded swamps quantity supplied. Lines form. Goods disappear from shelves quickly.
- Buyers compete by bidding prices upward, signaling willingness to pay more to secure scarce goods.
- Sellers recognize pricing power and raise prices accordingly.
- Rising prices decrease quantity demanded while increasing quantity supplied, both moving toward equilibrium.
- Again, automatic adjustment through self-interested behavior creating socially beneficial outcomes.

These mechanisms demonstrate markets' invisible hand—Adam Smith's famous metaphor describing how individual self-interest generates collective coordination without planning or coercion.

Changes in Equilibrium

Determinants shift curves. Equilibrium relocates. Understanding these transitions requires careful analysis of which curve shifts, in what direction, and what that implies for price and quantity outcomes.

Changes in demand (supply constant):

- **Increase in demand** (rightward shift): Creates temporary shortage at original price. Bidding wars ensue. Price rises. Equilibrium price and quantity both increase as markets move up along the supply curve to the new intersection point.
- **Decrease in demand** (leftward shift): Creates temporary surplus at original price. Fire sales commence. Price falls. Equilibrium price and quantity both decrease as markets slide down the supply curve.

Changes in supply (demand constant):

- **Increase in supply** (rightward shift): Generates temporary surplus at original price. Inventory clearance. Price falls while quantity rises—markets move down along the demand curve to new equilibrium.
- **Decrease in supply** (leftward shift): Spawns temporary shortage at original price. Panic buying? Maybe. Price rises while quantity falls—markets move up along the demand curve.

Simultaneous shifts complicate analysis because effects partially offset or reinforce:

- Both increase? Quantity definitely rises. Price effect? Ambiguous—depends on relative shift magnitudes.
- Both decrease? Quantity definitely falls. Price? Still ambiguous.
- Opposite directions? Price change becomes predictable, quantity effect turns ambiguous.

Analyzing relative shift sizes determines ambiguous outcomes. No shortcuts exist here.

Graphing Skills Checklist: Market Equilibrium

When analyzing equilibrium, master these skills:

1. Draw intersecting supply and demand, label equilibrium point (E).
2. Identify and label equilibrium price (P*) and quantity (Q*) on both axes. Precision matters.
3. Show surplus as horizontal distance between quantity supplied and demanded above equilibrium, arrows pointing down indicating price pressure.
4. Show shortage as horizontal distance between quantity demanded and supplied below equilibrium, arrows pointing up showing price pressure.
5. Demonstrate curve shifts creating new equilibria, clearly labeling new price (P_2) and quantity (Q_2).

6. Trace paths from old equilibrium to new. Show the adjustment process visually.

Elasticity

Elasticity measures responsiveness. How much does quantity change when another variable shifts? It's dimensionless, calculated as percentage change ratios, making comparisons across wildly different markets possible and meaningful.

Price Elasticity of Demand (PED)

Price elasticity of demand quantifies quantity demanded's sensitivity to price changes. The question: if price changes by 1%, what percentage change occurs in quantity demanded?

Formula: PED = (% change in quantity demanded) / (% change in price)

Results are always negative due to demand's inverse relationship with price. Economists typically report absolute values for convenience, though the negative sign carries economic meaning.

Categories of Price Elasticity of Demand:

- **Elastic demand (|PED| > 1):** Quantity responds dramatically to price changes. A 10% price hike triggers more than 10% quantity drop. Consumers are touchy about prices. Demand curves appear relatively flat. Revenue moves opposite to price.
- **Inelastic demand (|PED| < 1):** Quantity barely responds to price shifts. A 10% price increase causes less than 10% quantity decrease. Consumers accept price changes without much adjustment. Demand curves appear relatively steep. Revenue moves with price.
- **Unit elastic (|PED| = 1):** Percentage changes match exactly. Proportional responsiveness. Total revenue remains constant when price changes.
- **Perfectly elastic (|PED| = ∞):** Any price increase whatsoever causes quantity demanded to crater to zero. Consumers won't pay even marginally more. Demand curve? Perfectly horizontal. Occurs when perfect substitutes exist at fixed prices.
- **Perfectly inelastic (|PED| = 0):** Quantity demanded ignores price changes completely. Consumers buy identical amounts regardless of price. The demand curve stands vertical. Rare in reality but approximates life-saving medicines or absolutely essential goods with zero substitutes.

Determinants of Price Elasticity of Demand:

Multiple factors shape elasticity magnitudes:

- **Availability of substitutes:** More substitutes? More elastic demand—consumers easily switch when prices rise. Fewer substitutes? More inelastic. Narrow categories (Pepsi specifically) have

more elastic demand than broad categories (soft drinks generally) because narrow categories face more substitutes.

- **Necessity vs. luxury:** Necessities (insulin, basic food, commuting gasoline) exhibit inelastic demand—consumers must purchase regardless of price. Luxuries (vacation travel, jewelry, fine dining) show elastic demand because they're discretionary, easily postponed or eliminated.
- **Proportion of income:** Goods consuming large budget shares (rent, automobiles, college tuition) generate more elastic demand because price changes significantly impact purchasing power. Cheap items (salt, pencils, toothpicks) have inelastic demand—consumers barely notice price fluctuations.
- **Time horizon:** Demand elasticity increases over time as consumers discover alternatives, adjust habits, make substitutions. Short-run demand? More inelastic because adjustment is costly or impossible. Gasoline exemplifies this—inelastic short-run demand becomes more elastic long-run as people change vehicles and commuting patterns.
- **Market definition breadth:** Narrowly defined goods have more elastic demand than broad categories. Cheerios faces elastic demand. Breakfast cereal? Less elastic. Food in general? Highly inelastic.

The Total Revenue Test:

Price changes and total revenue (TR = P × Q) relationships reveal elasticity without calculations:

- Price rises, revenue rises? Demand is inelastic. Percentage quantity decrease is smaller than percentage price increase, so revenue climbs.
- Price rises, revenue falls? Demand is elastic. Percentage quantity decrease exceeds percentage price increase, so revenue drops.
- Price rises, revenue unchanged? Demand is unit elastic. Percentage changes exactly offset each other.

This test helps firms make pricing decisions and governments predict tax revenue effects. Firms facing inelastic demand should raise prices to boost revenue. Firms facing elastic demand should lower prices.

Price Elasticity of Supply (PES)

Price elasticity of supply quantifies quantity supplied's sensitivity to price changes. The question: if price changes by 1%, what percentage change occurs in quantity supplied?

Formula: PES = (% change in quantity supplied) / (% change in price)

Results are always positive due to supply's direct relationship with price.

Categories of Price Elasticity of Supply:

- **Elastic supply (PES > 1):** Quantity supplied responds dramatically to price changes. Producers easily adjust output. Supply curves appear relatively flat.

- **Inelastic supply (PES < 1):** Quantity supplied barely responds to price shifts. Production capacity is limited, inflexible, making quick output adjustments difficult. Supply curves appear relatively steep.
- **Unit elastic (PES = 1):** Percentage changes match.
- **Perfectly elastic (PES = ∞):** Producers supply infinite amounts at fixed prices but nothing at lower prices. Supply curve? Horizontal.
- **Perfectly inelastic (PES = 0):** Quantity supplied cannot change regardless of price. The supply curve stands vertical. Examples include unique items (original Picasso paintings), fixed-capacity venues (stadium seats for tonight's game), or ultra-short-run agricultural supply before harvest completes.

Determinants of Price Elasticity of Supply:

Key factors affecting supply elasticity:

- **Time period:** Supply is more elastic in the long-run when firms can build factories, hire and train workers, acquire resources, and adjust capacity fully. Short-run supply? More inelastic because capacity is fixed. This dominates all other determinants.
- **Availability of inputs:** Readily available resources, labor, materials make supply more elastic. Scarce or specialized inputs create inelastic supply.
- **Mobility and flexibility of factors:** Easily transferable resources increase elasticity. General-purpose machinery and multi-skilled workers make supply more elastic than highly specialized equipment and workers.
- **Storage capacity:** Storable goods (canned goods, raw materials) have more elastic supply because firms release inventory when prices rise. Perishable goods have inelastic supply.
- **Spare capacity:** Firms with unused capacity, idle workers, underutilized equipment respond more elastically to price increases. Firms operating at full capacity have inelastic supply—they literally cannot produce more quickly.

Income Elasticity of Demand (YED)

Income elasticity measures how quantity demanded responds to consumer income changes. It reveals whether goods are necessities or luxuries and how demand patterns shift as societies become wealthier.

Formula: YED = (% change in quantity demanded) / (% change in income)

Categories of Income Elasticity:

- **Normal goods (YED > 0):** Demand rises with income. Most goods fall here.
    - **Necessities** have YED between 0 and 1 (income inelastic): Demand rises but proportionally less than income. Basic food, utilities, household staples. Income doubles? Demand increases but doesn't double.

    - **Luxuries** have YED > 1 (income elastic): Demand rises proportionally more than income. Fine dining, international travel, jewelry, sports cars. Income doubles? Demand more than doubles.
- **Inferior goods (YED < 0):** Demand falls when income rises as consumers substitute toward higher-quality alternatives. Generic brands, instant noodles, used clothing, public transportation (for some), low-quality processed foods. People get wealthier? They switch to better options.

Income elasticity helps predict demand pattern evolution with economic growth, explains consumption differences between wealthy and poor nations, guides business strategy about which products to emphasize as markets develop.

Cross-Price Elasticity of Demand (XED)

Cross-price elasticity measures how quantity demanded of one good responds to another good's price change. It identifies relationships between goods and helps define market boundaries.

Formula: XED = (% change in quantity demanded of Good A) / (% change in price of Good B)

Categories of Cross-Price Elasticity:

- **Substitutes (XED > 0):** Good B's price rises? Demand for Good A increases as consumers switch to the relatively cheaper option. Larger positive values indicate stronger substitutability. Coke and Pepsi, butter and margarine, different smartphone brands.
- **Complements (XED < 0):** Good B's price rises? Demand for Good A decreases because the combined purchase becomes more expensive, less attractive. Larger negative values indicate stronger complementarity. Cars and gasoline, coffee and cream, smartphones and data plans, printers and ink cartridges.
- **Unrelated goods (XED ≈ 0):** Price changes in one good don't affect the other because they're consumed independently. Shoes and orange juice, haircuts and gasoline.

The magnitude indicates relationship strength. Strong substitutes show large positive values. Strong complements show large negative values.

Cross-price elasticity helps businesses identify competitors and complementary products, enables firms to predict how rivals' pricing affects their sales, assists antitrust authorities in defining relevant markets for competition analysis.

Calculating Elasticity: The Midpoint Method

Calculating elasticity creates ambiguity because percentage changes differ depending on starting points. Economists use the midpoint (arc) method to eliminate this problem:

Midpoint formula: Elasticity = $[(Q_2 - Q_1) / ((Q_2 + Q_1)/2)] / [(P_2 - P_1) / ((P_2 + P_1)/2)]$

This uses averages of initial and final values as bases, producing identical elasticity regardless of whether price increases or decreases. For exams, use either simple percentage change or midpoint method unless specified otherwise.

Graphing Skills Checklist: Elasticity

When illustrating elasticity concepts, master these:

1. Draw relatively flat (elastic) and steep (inelastic) demand and supply curves, recognizing angles reflect elasticity.
2. Show perfectly elastic curves as horizontal lines, perfectly inelastic curves as vertical lines.
3. Recognize that along linear downward-sloping demand curves, elasticity varies: elastic at high prices, unit elastic at midpoints, inelastic at low prices.
4. Calculate elasticity using percentage change formulas or midpoint method when given price and quantity data.
5. Apply total revenue test: if price and total revenue move together, demand is inelastic; if they move opposite, demand is elastic.

Consumer and Producer Surplus

Consumer and producer surplus measure benefits market participants receive from trade. These concepts are fundamental for grasping market efficiency and welfare effects of economic policies.

Consumer Surplus

Consumer surplus is the difference between what consumers are willing to pay (shown by demand curves reflecting marginal benefit) and what they actually pay (market price). It represents net benefit, the gain buyers receive from market participation.

Each demand curve point shows the maximum price a consumer would pay for that unit. For all units where willingness to pay exceeds market price, the consumer receives surplus. Summing these individual surpluses across all purchased units gives total consumer surplus.

Graphically, consumer surplus is the triangular area below the demand curve and above the market price line, bounded by quantity actually purchased. It extends from quantity zero to equilibrium quantity.

Formula for triangular consumer surplus: CS = ½ × base × height = ½ × quantity × (maximum willingness to pay − market price)

Consumer surplus increases when:

- Price falls (consumers pay less for the same willingness to pay)
- Demand increases (more value placed on the good)

- Quantity increases at the same price

Consumer surplus decreases when price rises or demand decreases.

Producer Surplus

Producer surplus is the difference between the price sellers receive (market price) and the minimum price they're willing to accept to produce each unit (shown by supply curves reflecting marginal cost). It represents net benefit, the profit sellers receive from market participation.

Each supply curve point shows the minimum price a producer would accept for that unit, equaling their marginal production cost. For all units where market price exceeds marginal cost, the producer receives surplus. Summing these individual surpluses across all sold units gives total producer surplus.

Graphically, producer surplus is the triangular area above the supply curve and below the market price line, bounded by quantity actually sold. It extends from quantity zero to equilibrium quantity.

Formula for triangular producer surplus: PS = ½ × base × height = ½ × quantity × (market price − minimum acceptable price)

Producer surplus increases when:

- Price rises (producers receive more for the same willingness to supply)
- Supply decreases while price rises (remaining producers gain)
- Quantity increases at the same price

Producer surplus decreases when price falls or supply increases while price falls.

Total Surplus

Total surplus (also called social surplus or economic surplus) is the sum of consumer surplus and producer surplus. It measures total net benefit to society from production and consumption in markets—the total value created by all market transactions.

Formula: Total Surplus = Consumer Surplus + Producer Surplus

Total surplus represents the difference between total benefit consumers receive (area under demand curves up to quantity traded) and total production cost (area under supply curves up to quantity traded). This is net gain from trade.

Changes in Surplus

Market condition changes redistribute surplus:

Price increases:

- Consumer surplus decreases (higher price reduces buyer benefit)
- Producer surplus increases (higher price increases seller benefit)
- Some consumer surplus transfers to producers

Price decreases:

- Consumer surplus increases (lower price increases buyer benefit)
- Producer surplus decreases (lower price reduces seller benefit)
- Some producer surplus transfers to consumers

Demand increases (demand curve shifts right):

- Equilibrium price and quantity both rise
- Consumer surplus may increase or decrease depending on relative effects of higher price (decreases CS) and higher quantity (increases CS)
- Producer surplus unambiguously increases (higher price and quantity)
- Total surplus increases

Supply increases (supply curve shifts right):

- Equilibrium price falls and quantity rises
- Consumer surplus unambiguously increases (lower price and higher quantity)
- Producer surplus may increase or decrease depending on relative effects of lower price (decreases PS) and higher quantity (increases PS)
- Total surplus increases

Graphing Skills Checklist: Surplus

When analyzing surplus, master these skills:

1. Shade triangular area representing consumer surplus above market price line and below demand curve, from quantity zero to equilibrium quantity.
2. Shade triangular area representing producer surplus below market price line and above supply curve, from quantity zero to equilibrium quantity.
3. Calculate surplus areas using triangle area formula: ½ × base × height.
4. Show how consumer and producer surplus change when price changes, demand shifts, or supply shifts.
5. Label and calculate total surplus as the sum of consumer and producer surplus.
6. Identify surplus redistribution between consumers and producers when price changes.

Market Efficiency and Deadweight Loss

Market efficiency and deadweight loss concepts evaluate how well markets allocate resources and measure costs of market imperfections or interventions.

Allocative Efficiency

Allocative efficiency occurs when resources are allocated to produce the combination of goods and services most valued by society. In markets, this happens at equilibrium where demand curves (marginal benefit, MB) intersect supply curves (marginal cost, MC).

At efficient quantities:

- MB = MC exactly
- The last unit produced provides benefit precisely equal to its cost
- Total surplus is maximized
- No reallocation could make someone better off without making someone else worse off (Pareto efficiency)

For quantities below equilibrium:

- MB > MC: The benefit of producing more exceeds the cost, so society gains from increasing production
- Potential surplus remains unrealized

For quantities above equilibrium:

- MB < MC: Production cost exceeds benefit, so society loses from overproduction
- Resources get wasted on low-value uses

Only at equilibrium does MB = MC, achieving allocative efficiency and maximizing total surplus.

Deadweight Loss

Deadweight loss (DWL) is the reduction in total surplus compared to efficient outcomes. It represents lost gains from trade—transactions that would benefit both buyers and sellers but don't occur. Deadweight loss measures inefficiency of outcomes.

Graphically, deadweight loss appears as a triangular area between supply and demand curves, representing trades that would create surplus but are prevented.

Deadweight loss occurs whenever quantity traded deviates from efficient equilibrium quantity, whether due to:

- Government interventions (price controls, taxes, quotas)
- Market failures (externalities, public goods, market power)
- Trade barriers
- Information asymmetries

Deadweight loss magnitude depends on elasticity: more elastic supply and demand curves produce larger deadweight loss because more trades get discouraged.

Price Ceilings and Deadweight Loss

A price ceiling is a legal maximum price set below equilibrium. Intended to help consumers by keeping prices low, binding price ceilings create inefficiency.

Effects of binding price ceilings:

- Quantity demanded exceeds quantity supplied, creating shortage
- Quantity traded falls to lower quantity supplied (determined by supply at ceiling price)
- Consumer surplus changes ambiguously: consumers who successfully purchase at lower prices gain surplus, but consumers rationed out of the market lose all surplus. Net effect depends on area sizes.
- Producer surplus unambiguously decreases: lower price and lower quantity sold
- Deadweight loss emerges from mutually beneficial trades that no longer occur between quantity supplied and equilibrium quantity

The deadweight loss triangle is bounded by:

- The demand curve (showing marginal benefit of foregone units)
- The supply curve (showing marginal cost of foregone units)
- The quantity supplied under the ceiling and the equilibrium quantity

Additionally, price ceilings create non-price costs:

- Waiting lines and search costs
- Favoritism and discrimination in rationing
- Black markets where goods trade above ceiling prices
- Quality deterioration as producers cut costs
- Misallocation of goods to consumers who value them less

Examples include rent control, gasoline price caps during shortages, interest rate ceilings.

Price Floors and Deadweight Loss

A price floor is a legal minimum price set above equilibrium. Intended to help producers by ensuring higher prices, binding price floors create inefficiency.

Effects of binding price floors:

- Quantity supplied exceeds quantity demanded, creating surplus
- Quantity traded falls to lower quantity demanded (determined by demand at floor price)

- Producer surplus changes ambiguously: producers who successfully sell at higher prices gain surplus, but producers unable to sell lose all surplus. Net effect depends on area sizes.
- Consumer surplus unambiguously decreases: higher price and lower quantity purchased
- Deadweight loss emerges from mutually beneficial trades that no longer occur between quantity demanded and equilibrium quantity

The deadweight loss triangle is bounded by:

- The demand curve (showing marginal benefit of foregone units)
- The supply curve (showing marginal cost of foregone units)
- The quantity demanded under the floor and the equilibrium quantity

Additionally, price floors create costs:

- Excess supply that may require government purchases (agricultural surpluses)
- Unemployment (when minimum wage exceeds equilibrium wage)
- Wasted resources in overproduction
- Illegal activity to circumvent the floor

Examples include minimum wage laws, agricultural price supports, milk price floors.

Taxes and Deadweight Loss

Taxes create wedges between prices buyers pay (P_b) and prices sellers receive (P_s). This wedge equals per-unit tax. Taxes shift either supply curves upward (if collected from sellers) or demand curves downward (if collected from buyers) by tax amounts. However, economic outcomes are identical regardless of statutory incidence.

Effects of taxes:

- Equilibrium quantity falls below efficient level
- Price paid by buyers rises above original equilibrium
- Price received by sellers falls below original equilibrium
- Both consumer surplus and producer surplus decrease
- Government collects tax revenue = tax per unit × quantity sold
- Deadweight loss occurs because trades between new quantity and original equilibrium quantity no longer happen

The deadweight loss triangle is bounded by:

- The demand curve (showing marginal benefit of foregone units)
- The supply curve (showing marginal cost of foregone units)
- The quantity with tax and equilibrium quantity without tax

For foregone units, MB > MC, meaning society values these units more than they cost to produce, but taxes prevent these beneficial trades.

Tax incidence (who bears the burden) depends on relative elasticity, not who legally pays:

- The party with more inelastic demand or supply bears larger tax burden shares because they cannot easily adjust behavior to avoid the tax
- If demand is more inelastic than supply, consumers bear more burden (price rises significantly for buyers)
- If supply is more inelastic than demand, producers bear more burden (price falls significantly for sellers)
- If demand is perfectly inelastic, consumers bear entire burden regardless of supply elasticity
- If supply is perfectly inelastic, producers bear entire burden regardless of demand elasticity

Deadweight loss and elasticity:

- More elastic supply and demand curves produce larger deadweight loss from given taxes because quantity falls more dramatically
- Perfectly inelastic supply or demand produces zero deadweight loss because quantity doesn't change (though this transfers all surplus to government revenue)

Subsidies and Deadweight Loss

A subsidy is a government payment to buyers or sellers that reduces effective prices. Subsidies shift supply rightward (if given to producers) or demand rightward (if given to consumers), creating wedges where sellers receive more than buyers pay.

Effects of subsidies:

- Equilibrium quantity rises above efficient level
- Price paid by buyers falls below original equilibrium
- Price received by sellers rises above original equilibrium
- Both consumer surplus and producer surplus increase
- Government incurs expenditure = subsidy per unit × quantity sold
- Deadweight loss occurs because production extends beyond where MB = MC

The deadweight loss triangle is bounded by:

- The demand curve (showing marginal benefit)
- The supply curve (showing marginal cost)
- The equilibrium quantity without subsidy and quantity with subsidy

For units produced beyond equilibrium, MC > MB, meaning society spends more to produce these units than they're worth, representing inefficiency. Resources get overallocated to this market compared to their value in alternative uses.

While subsidies increase private surplus for market participants, government expenditure exceeds surplus gained, creating net social loss. Taxpayers fund subsidies, and deadweight loss represents pure waste.

Quotas and Deadweight Loss

Quotas are quantitative restrictions on production or trade. They directly limit quantity below equilibrium, creating inefficiency similar to taxes but without generating government revenue.

Effects of binding quotas:

- Quantity is artificially restricted below equilibrium
- Price rises above equilibrium (creating scarcity value)
- Consumer surplus decreases
- Producer surplus may increase or decrease depending on price increase versus quantity decrease
- Quota rents (windfall profits from artificially high prices) accrue to whoever holds quota licenses
- Deadweight loss occurs from foregone mutually beneficial trades

Quotas are economically less efficient than taxes because they create identical deadweight loss without generating tax revenue for the government. Quota rent represents pure transfer to license holders.

Graphing Skills Checklist: Market Efficiency and Deadweight Loss

When analyzing efficiency and deadweight loss, master these skills:

1. Identify efficient equilibrium where MB = MC and total surplus is maximized.
2. Draw and label deadweight loss triangle for price ceilings, showing area between demand and supply from quantity supplied to equilibrium quantity.
3. Draw and label deadweight loss triangle for price floors, showing area between demand and supply from quantity demanded to equilibrium quantity.
4. Show tax wedge with P_b (price buyers pay) above P_s (price sellers receive), shade tax revenue rectangle, shade deadweight loss triangle.
5. Demonstrate how elasticity affects deadweight loss magnitude—more elastic curves create larger triangles.
6. Label all surplus areas (consumer, producer, government revenue, deadweight loss) clearly on intervention graphs.
7. Show subsidy wedge with P_s above P_b, shade government expenditure rectangle, shade deadweight loss triangle from overproduction.