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Bachelor of Commerce (B2001) | Level 1 • Part A Core | Monash University

Principles of microeconomics

Course Code: ECC1000 • Module 1 Notes

Module 1: Economic Thinking, Scarcity, Supply, Demand & Competitive Market Equilibrium

Chapter 1: Foundations of Microeconomic Reasoning and Scarcity

1.1 The Scope of Microeconomics and the CORE Econ Perspective

Microeconomics examines how individuals, households, firms, and governments make choices under conditions of scarcity and how those choices interact within markets and institutional frameworks. Following *The Economy 2.0: Microeconomics* (CORE Econ), economic agents do not operate in an institutional vacuum; rather, outcomes emerge from the interplay of preferences, technological constraints, relative prices, property rights, and social norms. Whereas macroeconomics analyses economy-wide aggregates such as national inflation, the Reserve Bank of Australia (RBA) cash rate target, and gross domestic product, microeconomics disaggregates these outcomes into the incentives and constraints facing specific decision-makers—from a Melbourne household allocating weekly grocery expenditure to an Australian horticulture firm deciding how many seasonal workers to employ.

Scarcity is the foundational premise of all microeconomic analysis. Productive resources—labour hours, physical capital, arable land, freshwater allocations in the Murray-Darling Basin, and entrepreneurial time—are finite, whereas human wants and competing societal objectives are effectively unlimited. Because resources have alternative uses, every allocation entails a trade-off. Microeconomics formalises these trade-offs through constrained optimisation: agents seek to maximise an objective (utility, profit, or social welfare) subject to technological, budgetary, or legal boundaries.

1.2 Positive Versus Normative Analysis

In evaluating economic policy and market performance, economists distinguish strictly between positive and normative statements:

- **Positive economics** addresses empirical and causal questions of what *is*, *was*, or *will be* under specified assumptions. Positive claims are testable against data from sources such as the Australian Bureau of Statistics (ABS) or the Household, Income and Labour Dynamics in Australia (HILDA) survey. For example, predicting that a 10 per cent excise increase on tobacco will reduce consumption among younger Australians by 6 per cent is a positive statement.
- **Normative economics** involves value judgments about what *ought* to be, requiring ethical criteria regarding fairness, equity, or individual liberty. Asserting that the Australian Government should raise the JobSeeker payment to reduce poverty, even if it requires higher marginal income tax rates, is a normative proposition.

Economic models clarify the trade-offs and distributional consequences of policy options (positive analysis) so that citizens, regulators, and bodies such as the Fair Work Commission or Productivity Commission can make informed normative judgments.

1.3 Opportunity Cost, Economic Rent, and Sunk Costs

The true economic cost of any choice is its **opportunity cost**: the net value of the next best forgone alternative. Accounting cost captures explicit monetary outlays, whereas economic cost sums explicit outlays and implicit opportunity costs (such as forgone wages or forgone returns on owner-invested capital). When an agent selects an option whose net benefit exceeds that of the next best alternative, the difference is termed an **economic rent** (or reservation surplus). Innovation rents, for instance, motivate firms to adopt cost-saving technologies before competitors imitate them.

Conversely, a **sunk cost** is an expenditure that has already been incurred and cannot be recovered regardless of future action. Rational marginal decision-making ignores sunk costs. If a Melbourne hospitality business signs a non-refundable $4,500 commercial kitchen equipment deposit and subsequently discovers that operating the pop-up venue will yield $3,000 in revenue against $3,800 in avoidable variable labour and ingredient costs, the rational choice is to shut down the pop-up rather than "recover" the sunk deposit, because continuing increases the net loss from $4,500 to $5,300.

Rational choice at the margin compares the **marginal benefit** (MB) of an incremental unit of activity against its **marginal cost** (MC):

$$MB(q) \geq MC(q)$$

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Where:

- q denotes the level of the economic activity (for example, hours studied, units produced, or litres consumed).
- $MB(q)$ denotes the additional benefit derived from the q-th unit of activity, measured in dollars or utility equivalents.
- $MC(q)$ denotes the additional opportunity cost incurred by undertaking the q-th unit of activity.

Worked Example 1.1: Opportunity Cost of University Study in Melbourne

Consider an undergraduate student at Monash University deciding whether to enrol full-time for one academic year rather than working full-time in retail logistics in Dandenong. Suppose full-time work pays an annual after-tax salary of $54,000. Full-time study incurs explicit annual costs of $8,200 for student contribution fees (HECS-HELP deferred or upfront equivalent) and $1,300 for textbooks and software, while living expenses of $22,000 for rent and groceries would be incurred under either option. Because rent and groceries are identical in both states, they are not differential opportunity costs. The economic cost of the year of study is:

$$\text{Economic Cost} = \text{Explicit Educational Outlays} + \text{Forgone Net Earnings} = 8,200 + 1,300 + 54,000 = 63,500$$

Where:

- Explicit Educational Outlays ($8,200 + $1,300 = $9,500) are direct costs strictly attributable to university enrolment.
- Forgone Net Earnings ($54,000) represent the implicit opportunity cost of the student's time.

If the student instead works part-time while studying and earns $16,000 after tax, the net forgone wage falls to $38,000 ($54,000 minus $16,000), lowering the total economic cost of the year of study to $47,500.

1.4 Scarcity, the Feasible Frontier, and the Marginal Rate of Transformation

CORE Econ formalises constrained choice using the **production function** and the **feasible frontier**. Suppose a student has 14 hours per day available after sleep and essentials to allocate between free time (t) and study hours ($h = 14 - t$), which translate into a final grade (y) via a concave production function $y = f(h)$ exhibiting diminishing marginal product of study time. Plotting free time (t) on the horizontal axis and final grade (y) on the vertical axis yields the feasible set—all combinations (t, y) achievable given available hours and study productivity. The upper boundary of this set is the **feasible frontier**.

The slope of the feasible frontier measures the **Marginal Rate of Transformation (MRT)**: the quantity of the vertical good (grade points, or Output Y) that must be sacrificed to obtain one additional unit of the horizontal good (free time, or Output X). Because the production function exhibits diminishing returns, the feasible frontier is concave to the origin, meaning the opportunity cost of free time increases as study hours shrink (or equivalently, the opportunity cost of Output X rises as more X is produced).

$$MRT_{X,Y} = -\frac{dY}{dX} = \frac{MC_X}{MC_Y}$$

Where:

- $MRT_{X,Y}$ is the Marginal Rate of Transformation of good X into good Y (units of Y given up per extra unit of X).
- dY/dX is the instantaneous slope of the feasible frontier (negative because of the trade-off).
- MC_X and MC_Y are the marginal resource costs of producing one extra unit of X and Y, respectively.

Concept	Formal Definition	Graphical Representation	Decision Role
Feasible Frontier	Maximum attainable output combinations given fixed resources and technology.	Upper boundary of the shaded feasible set; concave to the origin.	Defines what is physically or economically achievable.
Marginal Rate of Transformation (MRT)	Rate at which one good must be sacrificed to gain one unit of another.	Magnitude of the slope of the tangent to the feasible frontier.	Measures the marginal opportunity cost of the trade-off.

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Concept	Formal Definition	Graphical Representation	Decision Role
Marginal Rate of Substitution (MRS)	Rate at which a decision-maker is willing to trade goods while keeping utility constant.	Magnitude of the slope of the indifference curve.	Measures subjective marginal willingness to trade.
Constrained Optimum	Allocation maximising preference satisfaction subject to feasibility.	Tangency point where $MRS = MRT$ on the frontier.	Eliminates unexploited mutual gains from reallocation.

Worked Example 1.2: Computing MRT Along a Concave Feasible Frontier

Suppose a regional Victorian farm has fixed irrigation water and land capable of producing wheat (W, in tonnes) and canola (C, in tonnes) according to the production possibilities frontier:

$$C = 120 - 0.05W^2$$

Where:

- C represents tonnes of canola produced per season ($C \in [0, 120]$).
- W represents tonnes of wheat produced per season ($W \in [0, \cancel{2400}]$, or $W \leq 48.99$).

To find the MRT of wheat into canola at any production level W, differentiate C with respect to W:

$$\frac{dC}{dW} = -0.10W \implies MRT_{W,C} = -\frac{dC}{dW} = 0.10W$$

Where:

- $MRT_{W,C}$ is the tonnes of canola that must be forgone to produce one additional tonne of wheat.

Step 1: At $W = 20$ tonnes of wheat, canola output is $C = 120 - 0.05(20)^2 = 120 - 20 = 100$ tonnes, and $MRT_{W,C} = 0.10(20) = 2.0$ tonnes of canola per tonne of wheat.
Step 2: At $W = 40$ tonnes of wheat, canola output falls to $C = 120 - 0.05(40)^2 = 120 - 80 = 40$ tonnes, and $MRT_{W,C} = 0.10(40) = 4.0$ tonnes of canola per tonne of wheat. Because MRT doubles from \$2.0*to*4.0\$, the opportunity cost of wheat rises as wheat expands, illustrating the Law of Increasing Opportunity Cost.

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Chapter 2: Demand, Supply and Competitive Market Equilibrium

2.1 Willingness to Pay and the Law of Demand

In a competitive market, buyers and sellers act as price-takers: no single participant is large enough to influence the prevailing market price. The **demand schedule** relates the price of a good to the quantity consumers are willing and able to purchase during a specific time period, holding all other determinants constant (*ceteris paribus*). Underlying the downward-sloping demand curve is each consumer's **willingness to pay (WTP)**—the maximum price a buyer will pay for a given unit, reflecting diminishing marginal utility. As price falls, existing buyers purchase additional units whose WTP now exceeds the market price, and new buyers with lower WTP enter the market. Both forces produce the **Law of Demand**: an inverse relationship between own price and quantity demanded.

Students must rigorously distinguish between a **movement along the demand curve** and a **shift of the demand curve**. A change in the good's own price causes a movement along a fixed demand curve (a change in *quantity demanded*). A change in any non-price determinant shifts the entire demand curve horizontally (a change in *demand*):

- **Household Income:** Higher disposable income increases demand (rightward shift) for *normal goods* (e.g., restaurant dining, private health cover) and decreases demand (leftward shift) for *inferior goods* (e.g., budget instant noodles, older second-hand appliances).
- **Prices of Related Goods:** A rise in the price of a *substitute* (e.g., domestic flights between Melbourne and Sydney) shifts demand rightward for the alternative (e.g., intercity express rail or coach travel). A rise in the price of a *complement* (e.g., espresso machines) shifts demand leftward for the paired good (e.g., ground specialty coffee beans).
- **Tastes, Preferences, and Demographics:** Health warnings, seasonal weather, or population growth in outer Melbourne suburbs shift demand for housing, childcare, and utilities.
- **Expectations of Future Prices or Income:** Anticipating an increase in fuel excise or property prices accelerates current demand.

2.2 Marginal Cost, Willingness to Accept, and the Law of Supply

On the production side, a firm's supply decision rests on its **willingness to accept (WTA)**—the minimum price required to induce production of an additional unit, which equals the firm's marginal opportunity cost (MC). Because short-run production faces diminishing marginal returns to variable inputs, marginal cost rises with output. Consequently, higher market prices enable firms to cover higher marginal costs and draw higher-cost producers into the industry, generating the upward-sloping supply curve and the **Law of Supply**.

A change in the good's own price causes a movement along the supply curve (a change in *quantity supplied*). Non-price factors shift the entire supply curve:

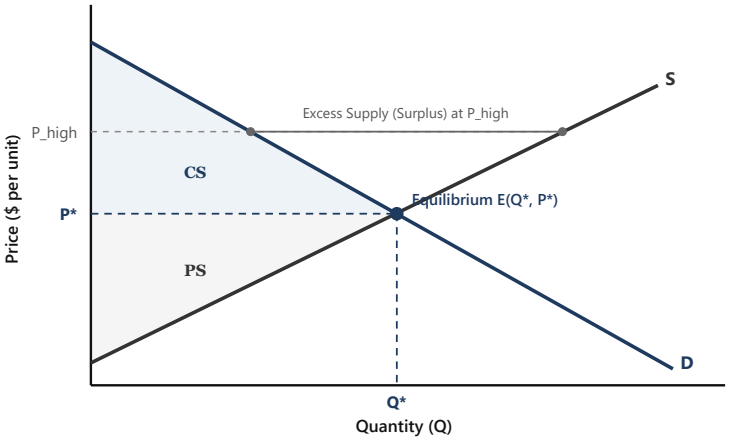
- **Input Prices:** Increases in wholesale electricity tariffs, Award wage rates, or raw material prices raise MC at every output level, shifting supply leftward (upward).
- **Technology and Productivity:** Automated warehousing or drought-resistant crop varieties lower MC, shifting supply rightward (downward).
- **Natural Conditions and Supply Shocks:** Bushfires, floods in Queensland agricultural valleys, or port disruptions abruptly contract supply leftward.
- **Taxes, Subsidies, and Regulation:** Per-unit excise taxes shift the supply curve vertically upward by the tax amount; production subsidies shift supply downward.
- **Number of Sellers:** Market entry shifts market supply rightward; firm exit shifts market supply leftward.

2.3 Market Clearing, Price Discovery, and Comparative Statics

Market equilibrium occurs at the intersection (Q^*, P^*) where quantity demanded equals quantity supplied ($Q_d(P^*) = Q_s(P^*)$). At P^*, the plans of buyers and sellers are mutually consistent and there is no endogenous tendency for price to change. If the prevailing price sits above P^*, quantity supplied exceeds quantity demanded, creating an **excess supply (surplus)**. Unsold inventories accumulate, prompting sellers to undercut rivals until price falls to P^*. Conversely, if price sits below P^*, quantity demanded exceeds quantity supplied, creating an **excess demand (shortage)**. Rationed buyers bid prices upward until equilibrium is restored.

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Figure 1.1: Competitive Market Equilibrium, Consumer Surplus (CS) and Producer Surplus (PS)



Comparative statics analyses how (Q^*, P^*) adjusts when an exogenous shock shifts one or both curves. When a single curve shifts, both P^* and Q^* move unambiguously. When both demand and supply shift simultaneously, one variable moves unambiguously while the direction of the other depends on the relative magnitudes of the shifts:

Market Shock	Curve Shift	Effect on Equilibrium Price (P^*)	Effect on Equilibrium Quantity (Q^*)
Increase in Demand	D shifts right	Increases (↑)	Increases (↑)
Decrease in Demand	D shifts left	Decreases (↓)	Decreases (↓)
Increase in Supply	S shifts right	Decreases (↓)	Increases (↑)
Decrease in Supply	S shifts left	Increases (↑)	Decreases (↓)
D ↑ and S ↑ simultaneously	Both shift right	Ambiguous (depends on relative shift size)	Unambiguously Increases (↑)
D ↑ and S ↓ simultaneously	D right, S left	Unambiguously Increases (↑)	Ambiguous (depends on relative shift size)

Worked Example 1.3: Algebraic Market Equilibrium and Supply Shock

Suppose the weekly wholesale market for specialty roasted coffee beans in Melbourne is described by the linear demand and supply functions:

$$Q_d = 1,200 - 15P \qquad \text{and} \qquad Q_s = -150 + 30P$$

Where:

- P is the wholesale price in dollars per kilogram ($P \geq 5$).
- Q_d is the quantity demanded in kilograms per week.
- Q_s is the quantity supplied in kilograms per week.

Step 1 (Initial Equilibrium): Set $Q_d = Q_s$:

$$1,200 - 15P = -150 + 30P \implies 1,350 = 45P \implies P^* = 30$$

Where:

- $P^* = 30$ represents the market-clearing price of \$30 per kilogram.

Substitute $P^* = 30$ into the demand function to verify quantity: $Q^* = 1,200 - 15(30) = 750$ kg (and $Q_s = -150 + 30(30) = 750$ kg).

Step 2 (Supply Shock): Suppose severe frost in South American growing regions raises green-bean import costs, shifting

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supply leftward to $Q_s' = -330 + 30P$. Equating $Q_d = Q_s'$:

$$1,200 - 15P = -330 + 30P \implies 1,530 = 45P \implies P^{**} = 34$$

Where:

- $P^{**} = 34$ is the post-shock equilibrium price ($34 per kilogram).

The new equilibrium quantity is $Q^{**} = 1,200 - 15(34) = 690$ kg. Equilibrium price rises by $4 per kilogram and weekly volume contracts by 60 kg.

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Chapter 3: Elasticity of Demand and Supply

3.1 Price Elasticity of Demand: Point and Midpoint Formulations

Slopes of demand and supply curves depend on arbitrary units of measurement (for example, kilograms versus tonnes, or cents versus dollars). To measure responsiveness in dimensionless percentage terms, economists use **elasticity**. The **price elasticity of demand (ε_d)** measures the percentage change in quantity demanded resulting from a 1 per cent change in the good's own price:

$$\varepsilon_d = \frac{\%\Delta Q_d}{\%\Delta P} = \frac{dQ_d}{dP} \cdot \frac{P}{Q_d}$$

Where:

- ε_d is the point price elasticity of demand (negative along any downward-sloping demand curve, though frequently discussed in absolute value $|\varepsilon_d|$).
- dQ_d/dP is the derivative of quantity demanded with respect to price (the reciprocal of the inverse demand curve's slope).
- P and Q_d are the price and quantity coordinates at the evaluation point.

When computing elasticity between two discrete observations (Q_1, P_1) and (Q_2, P_2), standard percentage changes depend on which point serves as the base. To ensure directional symmetry, the **arc (midpoint) elasticity formula** divides changes by the average of the initial and final values:

$$\varepsilon_d^{\text{arc}} = \frac{(Q_2 - Q_1)/\left(\frac{Q_1+Q_2}{2}\right)}{(P_2 - P_1)/\left(\frac{P_1+P_2}{2}\right)}$$

Where:

- Q_1, P_1 are the initial quantity and price coordinates.
- Q_2, P_2 are the new quantity and price coordinates.

Demand is classified as **price elastic** when $|\varepsilon_d| > 1$ (quantity responds more than proportionately to price), **unit elastic** when $|\varepsilon_d| = 1$, and **price inelastic** when $|\varepsilon_d| < 1$ (quantity responds less than proportionately). Extreme theoretical benchmarks include **perfectly inelastic** demand ($\varepsilon_d = 0$, vertical curve, such as life-preserving insulin) and **perfectly elastic** demand ($|\varepsilon_d| \to \infty$, horizontal curve facing an individual competitive wheat grower). Crucially, along any downward-sloping linear demand curve $P = a - bQ$, the slope is constant, yet $|\varepsilon_d|$ varies continuously from ∞ at the vertical intercept ($Q = 0$) to $u = 1$ at the midpoint ($P = a/2$), and approaches zero at the horizontal intercept ($P = 0$).

3.2 Determinants of Demand Elasticity in Australian Markets

Five structural factors govern how sensitive consumers are to price changes:

1. **Availability of Close Substitutes:** Goods with numerous close substitutes display high elasticity. A price increase on one brand of supermarket cheddar cheese prompts shoppers at Coles or Woolworths to switch immediately to competing brands ($|\varepsilon_d| > 1$), whereas aggregate demand for dairy milk across all brands is relatively inelastic ($|\varepsilon_d| \approx 0.4$).
2. **Necessity Versus Luxury:** Essential goods such as residential electricity and tap water exhibit low price elasticity ($|\varepsilon_d| \approx 0.2$ to 0.4), whereas discretionary luxuries such as international leisure airfares or fine dining exhibit elastic demand.
3. **Proportion of Household Budget:** Items absorbing a trivial share of weekly income (e.g., table salt, matches) generate minimal budget pressure when prices double, keeping demand inelastic; housing rent and motor vehicles absorb large budget shares, inducing stronger quantity adjustments.
4. **Time Horizon:** Elasticity rises over longer horizons as consumers adjust habits and capital stock. Following an acute petrol price spike in Melbourne, motorists initially absorb the cost because commuting routes are fixed (short-run $|\varepsilon_d| \approx 0.2$); over several years, households relocate closer to train lines or transition to hybrid and electric vehicles (long-run $|\varepsilon_d| \approx 0.7$).

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5. **Breadth of Market Definition:** Narrowly defined goods (e.g., "Victorian Granny Smith apples") have far more elastic demand than broadly defined categories ("fresh fruit").

3.3 Total Revenue and Price Elasticity

Firms setting prices must understand how price adjustments alter **total revenue ($TR = P \cdot Q$)**. Differentiating TR with respect to price yields a direct link to ε_d:

$$\frac{d(TR)}{dP} = Q + P\frac{dQ}{dP} = Q\left(1 + \frac{P}{Q}\frac{dQ}{dP}\right) = Q\left(1 + \varepsilon_d\right) = Q\left(1 - |\varepsilon_d|\right)$$

Where:

- TR is total expenditure by buyers, which equals total revenue received by sellers.
- Q is quantity sold and $|\varepsilon_d| = -\varepsilon_d$ is the absolute price elasticity of demand.

Three operational pricing rules follow immediately: when demand is **inelastic** ($|\varepsilon_d| < 1$), $d(TR)/dP > 0$, so raising price increases total revenue because the revenue gained per unit outweighs the modest drop in volume. When demand is **elastic** ($|\varepsilon_d| > 1$), $d(TR)/dP < 0$, so raising price reduces total revenue because lost sales outweigh higher unit margins. Total revenue reaches its maximum precisely where demand is **unit elastic** ($|\varepsilon_d| = 1$).

3.4 Income, Cross-Price, and Supply Elasticities

Beyond own-price sensitivity, microeconomists track responsiveness to income, related-good prices, and production capacity:

$$\varepsilon_Y = \frac{\%\Delta Q_d}{\%\Delta Y}, \qquad \varepsilon_{xy} = \frac{\%\Delta Q_x}{\%\Delta P_y}, \qquad \varepsilon_s = \frac{\%\Delta Q_s}{\%\Delta P}$$

Where:

- ε_Y is the **income elasticity of demand**, measuring percentage quantity change for a 1 per cent change in household income Y.
- ε_{xy} is the **cross-price elasticity of demand** between good x and good y, measuring percentage change in Q_x for a 1 per cent change in P_y.
- ε_s is the **price elasticity of supply**, measuring producer responsiveness to own-price changes.

Elasticity Measure	Numerical Range	Economic Classification	Australian Market Example
Income Elasticity (ε_Y)	$\varepsilon_Y < 0$	Inferior Good	Discount store-brand staples, intercity bus travel
Income Elasticity (ε_Y)	$\varepsilon_Y \in (0, 1)$	Normal Necessity	Basic groceries, residential water and electricity
Income Elasticity (ε_Y)	$\varepsilon_Y > 1$	Normal Luxury	Overseas holidays, private schooling, luxury SUVs
Cross-Price Elasticity (ε_{xy})	$\varepsilon_{xy} > 0$	Substitutes	Qantas vs. Virgin Australia Melbourne–Sydney fares
Cross-Price Elasticity (ε_{xy})	$\varepsilon_{xy} < 0$	Complements	Printer hardware and replacement ink cartridges
Supply Elasticity (ε_s)	$\varepsilon_s < 1$ (short run)	Inelastic Supply	Inner-city residential apartments (zoning & build lags)

Worked Example 1.4: Midpoint Elasticity, Point Elasticity, and Revenue Impact

A commuter ferry operator in Sydney raises one-way adult fares from $8.00 to $10.00, observing daily patronage fall from 2,200 passengers to 1,800 passengers.

Step 1 (Arc Price Elasticity):

$$\varepsilon_d^{\text{arc}} = \frac{(1,800 - 2,200)/2,000}{(10 - 8)/9} = \frac{-0.2000}{0.2222} = -0.90$$

Where:

- The average quantity is $(2,200 + 1,800)/2 = 2,000$ passengers and average price is $(8 + 10)/2 = 9$ dollars.

Step 2 (Revenue Verification): Because $|\varepsilon_d^{\text{arc}}| = 0.90 < 1$, demand over this fare range is price inelastic. Initial daily revenue was $TR_1 = 8 \times 2,200 = 17,600$ dollars; new daily revenue is $TR_2 = 10 \times 1,800 = 18,000$ dollars. As predicted by the elasticity rule, the fare increase raises total revenue by $400 per day.
Step 3 (Point Elasticity on Linear Demand): Suppose the underlying linear demand curve is $Q_d = 3,800 - 200P$. At $P = 10$ ($Q = 1,800$), point elasticity is:

$$\varepsilon_d = (-200) \cdot \frac{10}{1,800} = -1.11$$

Where:

- -200 is the constant slope dQ_d/dP of the linear demand curve.

Notice that at $P = 10$, demand has entered the elastic region ($|\varepsilon_d| = 1.11 > 1$); further fare increases above $9.50 (where $|\varepsilon_d| = 1$) would reduce total revenue.

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Chapter 4: Market Efficiency, Economic Surplus and Price Interventions

4.1 Consumer Surplus, Producer Surplus, and Pareto Efficiency

Market equilibrium does not merely clear quantities; it generates measurable gains from voluntary exchange. **Consumer surplus (CS)** is the difference between a buyer's willingness to pay and the price actually paid, summed across all units traded. Graphically, it equals the area beneath the demand curve and above the equilibrium price P^*. **Producer surplus (PS)** is the difference between the price received by sellers and their marginal cost (willingness to accept), summed across all units sold, corresponding to the area above the supply curve and below P^*. **Total social surplus (TS)** is the sum of consumer and producer surplus:

$$TS = CS + PS = \int_0^{Q^*} \left(P_d(Q) - P_s(Q)\right) dQ$$

Where:

- $P_d(Q)$ is the inverse demand price (WTP) at quantity Q.
- $P_s(Q)$ is the inverse supply price (MC) at quantity Q.
- Q^* is the competitive equilibrium quantity.

Under ideal competitive conditions—price-taking agents, full information, complete contracts, and absence of externalities—the competitive equilibrium (Q^*, P^*) maximises total surplus and is **Pareto efficient**: no reallocation of goods or production can make at least one person better off without making someone else worse off. Every unit for which $WTP \geq MC$ is produced and consumed, and no unit with $WTP < MC$ is traded. However, CORE Econ emphasises two vital caveats: first, Pareto efficiency says nothing about *fairness* or the distribution of surplus between buyers and sellers; second, real-world markets frequently violate competitive assumptions (via market power, externalities, or asymmetric information), motivating policy evaluation.

4.2 Incidence of Excise Taxes and Deadweight Loss

When the Australian Government levies a per-unit excise tax t (for example, on fuel or alcohol), it drives a wedge between the price paid by consumers (P_c) and the net price received by producers (P_p):

$$P_c - P_p = t$$

Where:

- P_c is the tax-inclusive price paid by buyers.
- P_p is the after-tax net price retained by sellers.
- t is the per-unit statutory tax rate.

A central insight of microeconomics is that **tax incidence**—how the economic burden of the tax is shared between buyers and sellers—is entirely independent of whether the statute collects the tax from buyers or sellers. Instead, incidence depends on relative elasticities. The less elastic (steeper) side of the market bears the greater share of the burden because it is less able to exit the market in response to an adverse price change:

$$\frac{\Delta P_c}{|\Delta P_p|} = \frac{\varepsilon_s}{|\varepsilon_d|}$$

Where:

- $\Delta P_c = P_c - P^*$ is the price increase borne by consumers.
- $|\Delta P_p| = P^* - P_p$ is the net price reduction borne by producers.

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- ε_s and $|\varepsilon_d|$ are the price elasticities of supply and demand.

Because the tax reduces quantity traded from Q^* to Q_t, mutually beneficial trades between Q_t and Q^* no longer occur. The lost consumer and producer surplus not captured as government tax revenue ($T = t \cdot Q_t$) constitutes the **deadweight loss (DWL)** of taxation:

$$DWL = \frac{1}{2} \cdot t \cdot (Q^* - Q_t)$$

Where:

- $Q^* - Q_t$ is the reduction in equilibrium quantity caused by the tax wedge t.

Notice that because $Q^* - Q_t$ is itself proportional to t, deadweight loss grows with the *square* of the tax rate ($DWL \propto t^2$). Doubling an excise tax quadruples its excess burden, which explains why broad-based taxes with low rates (such as Australia's 10 per cent GST on a wide consumption base, paired with targeted transfers) are generally less distortionary than high narrow-base taxes, except where taxes deliberately correct negative externalities (such as tobacco or carbon emissions).

4.3 Price Ceilings and Price Floors

Governments sometimes intervene directly in prices rather than taxing transactions:

- **Binding Price Ceiling ($\bar{P} < P^*$):** A legal maximum price set below equilibrium (such as strict residential rent freezes or emergency wholesale gas price caps) creates persistent excess demand ($Q_d(\bar{P}) > Q_s(\bar{P})$). Quantity traded falls to the short side of the market, $Q_s(\bar{P})$, generating deadweight loss, non-price rationing (long waiting lists, reduced maintenance quality, or informal side payments), and a transfer of surplus from producers to those consumers lucky enough to secure supply.
- **Binding Price Floor ($\underline{P} > P^*$):** A legal minimum price set above equilibrium (such as historical Australian wool reserve price schemes or statutory minimum wages in a purely competitive labour market) creates excess supply ($Q_s(\underline{P}) > Q_d(\underline{P})$). In product markets, surpluses require government stockpiling or quotas; in labour markets, if employers act as competitive price-takers, a floor above equilibrium reduces employment, though CORE Econ demonstrates that when employers hold *monopsony* power over wages, a moderate minimum wage can actually increase both wages and employment.

Worked Example 1.5: Welfare Analysis of Equilibrium and Per-Unit Excise Tax

Suppose a competitive market has inverse demand and inverse supply functions:

$$P_d = 100 - 2Q \qquad \text{and} \qquad P_s = 10 + Q$$

Where:

- P_d and P_s are prices in dollars per unit and Q is quantity in thousands of units.

Step 1 (Competitive Equilibrium & Surplus): Equate $P_d = P_s$ to solve:

$$100 - 2Q = 10 + Q \implies 3Q = 90 \implies Q^* = 30, \qquad P^* = 10 + 30 = 40$$

Consumer surplus and producer surplus are triangular areas:

$$CS = \frac{1}{2}(100 - 40)(30) = 900, \qquad PS = \frac{1}{2}(40 - 10)(30) = 450$$

Where:

- The demand choke price is 100 dollars and the supply choke price is 10 dollars; surplus values are in thousands of dollars ($900,000 and $450,000, giving $TS = 1,350$ thousand dollars).

Step 2 (Impose a $15 Per-Unit Tax): The tax requires $P_c = P_p + 15$, which solves as:

$$100 - 2Q_t = (10 + Q_t) + 15 \implies 3Q_t = 75 \implies Q_t = 25$$

Step 3 (Prices & Tax Incidence): Buyers pay $P_c = 100 - 2(25) = 50$ dollars (an increase of \$10 above $P^* = 40$), while sellers net $P_p = 10 + 25 = 35$ dollars (a reduction of \$5 below $P^* = 40$). Thus buyers bear two-thirds (\$10/\$15) and sellers bear one-third (\$5/\$15) of the tax burden, because demand is twice as steep (less elastic at equilibrium) as supply.
Step 4 (Tax Revenue, Welfare, and Deadweight Loss):

$$T = 15 \times 25 = 375, \qquad CS_t = \frac{1}{2}(100 - 50)(25) = 625, \qquad PS_t = \frac{1}{2}(35 - 10)(25) = 312.5$$

$$DWL = \frac{1}{2} \cdot 15 \cdot (30 - 25) = 37.5$$

Where:

- All monetary aggregates are in thousands of dollars: tax revenue $T = 375$, post-tax $CS_t = 625$, post-tax $PS_t = 312.5$, and $DWL = 37.5$.

Verify total surplus accounting: $CS_t + PS_t + T + DWL = 625 + 312.5 + 375 + 37.5 = 1,350 = TS$, confirming that the entire pre-tax surplus is accounted for between remaining private surplus, government revenue, and deadweight loss.

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