ECON10004 Introductory Microeconomics

UNIVERSITY OF MELBOURNE · FACULTY OF BUSINESS & ECONOMICS

EXAM CHEATSHEET
Sem 1 2026 · **SIDE 1 OF 2**
Final exam · 50% · 2 hrs · ≥50% hurdle

SIDE 1/2 Exam blueprint · Foundations · Comparative advantage · D&S · Elasticity · Choice · Welfare · Govt · Costs · Competition

`FINAL = 50% · 2 HRS · ≥50% HURDLE`

Compiled by **AskSia** from real ECON10004 materials · asksia.ai/cheatsheet/unimelb-econ10004

0 · Exam Blueprint

READ FIRST

★ **Final exam = 50% of the subject mark, 2 hours**, and a HURDLE — you must score ≥ 50% on the exam itself to pass the subject, no matter your assignment marks.

This is the **whole subject on two pages**, with the real worked numbers. The prize isn't recall — it's recognising *which model and which formula* instantly, so revise by re-deriving each diagram until it's reflex.

Format: roughly half **MCQ** (one-correct / "which is wrong" / select-all-areas), half **structured calc + graph**, multi-part (a)–(e) with mark splits.

SIA → *Graph + definition marks are the easiest in the paper and cannot be lost to clock pressure. Draw the diagram first, words second. Markers scan diagrams for full marks before reading prose.*

1 · Foundations

W2

Scarcity · wants > resources ⇒ choice. *Cost–benefit* · act iff MB ≥ MC; think at the margin. *Opp cost* · value of next-best forgone alternative. *Sunk cost* · already spent & unrecoverable ⇒ opp cost 0 ⇒ **ignore**.
Fixed ≠ sunk: fixed cost is avoidable by stopping production (positive opp cost, *matters*); sunk cannot be recovered (irrelevant). R&D = fixed + sunk; marketing = fixed not sunk.

4 THINKING PITFALLS

1. Absolute $ vs %
2. Ignoring opp cost (esp. time)
3. **Sunk-cost fallacy**
4. Failing to think at the margin

POSITIVE VS NORMATIVE

Positive · descriptive, testable. **Normative** · prescriptive, value-laden.

PPF

Max output combos given resources & tech. Slope = −MRT = opp cost in y-units. **Bowed-out** ⇒ increasing opp cost; **linear** ⇒ constant. Inside = inefficient · on = efficient · outside = unattainable. Growth/tech shifts PPF out.

READ SLOPE AS OPP COST

```
give up 20 Y to gain 10 X
⇒ opp cost of 1 X = 2 Y
```

ECONOMIC VS ACCOUNTING COST

Economic cost = accounting cost + opportunity cost of resources used. Economic profit nets out opp cost; **zero economic profit = a normal return** (the resource just covers its best alternative use). Exam loves the gap between the two.

SHORT RUN VS LONG RUN

SR · at least one input fixed (not a fixed length of time). **LR** · all inputs variable, free entry/exit. Definitions, not calendar time.

QUICK DEFINITIONS

Marginal · one-more-unit. **Average** · per-unit. **Ceteris paribus** · all else equal. **Endogenous** · set in the model · **Exogenous** · given. **Stock** · level at a point · **Flow** · per period. **Real** · inflation-adjusted · **Nominal** · current $.

MARGINAL DECISION · WORKED

ACT WHILE MB ≥ MC

```
study hr: MB=$8 > MC=$5 ⇒ do it
next hr: MB=$4 < MC=$5 ⇒ stop ·
optimum where MB = MC
```

Decisions are made at the **margin**, never on totals or averages — the classic "should I do one more?" test.

2 · Comparative Advantage

RICARDO 1817

Specialise in the good with **lower opp cost**, then trade ⇒ both consume beyond their PPF. Driven by comparative, *not* absolute, advantage.

WORKED · AUSTRALIA VS NZ

Output per worker-hour:

	WHEAT	CLOTH	OC 1 WHEAT	OC 1 CLOTH
Aus	6	3	½ cloth	2 wheat
NZ	1	2	2 cloth	½ wheat

Aus has **absolute advantage in both** (6>1, 3>2). But OC(wheat): Aus ½ < NZ 2 ⇒ Aus → wheat. OC(cloth): NZ ½ < Aus 2 ⇒ NZ → cloth.

Gains live *between* the two opp costs: trade ratio between ½ and 2 wheat per cloth (e.g. 1:1) ⇒ both consume beyond their PPF.

SIA → *Compute opp cost per unit (cloth÷wheat), never compare raw outputs. The examiner plants the absolute-advantage figure precisely so you pick the wrong specialiser.*

3 · Demand & Supply

W3

Law of demand P↑⇒Q_d↓ (sub + income effects). **Law of supply** P↑⇒Q_s↑ (rising MC).

DEMAND SHIFTERS · 6

- **Income**: normal D↑ / inferior D↓
- **Related P**: subs (P_S↑⇒D↑) · compl. (P_C↑⇒D↓)
- Tastes · preferences
- Expected P (P^e↑⇒D_{now}↑)
- # buyers · demographics
- Information / quality signals

SUPPLY SHIFTERS · 6

- **Input prices** · **Technology** (S→right)
- Taxes (S left) / subsidies (S right)
- # sellers · entry/exit
- Expected P (P^e↑⇒S_{now}↓)
- Natural events · regulation

EQUILIBRIUM & COMPARATIVE STATICS

P*,Q* solve $Q_d(P)=Q_s(P)$. P<P* ⇒ shortage (P bid up); P>P* ⇒ surplus (P falls).

SHOCK	P*	Q*
D↑ / D↓	↑ / ↓	↑ / ↓
S↑ / S↓	↓ / ↑	↑ / ↓
D↑ S↑	?	↑
D↑ S↓	↑	?
D↓ S↓	?	↓

SIA → *A shift ≠ movement along. If P caused it ⇒ movement along; any other determinant ⇒ shift the curve. The #1 exam trap.*

WORKED · EQUILIBRIUM FROM EQUATIONS

```
Qs = 2P · Qd = 100 − 2P
2P = 100 − 2P ⇒ 4P = 100
⇒ P* = 25, Q* = 50
```

Always set $Q_d = Q_s$, solve for P*, back-substitute for Q*.

The linear-equation setup is the spine of nearly every calc question.

SUBSTITUTES VS COMPLEMENTS

Substitutes · P of one ↑ ⇒ D for the other ↑ (Coke/Pepsi). **Complements** · P of one ↑ ⇒ D for the other ↓ (cars/petrol). Test via the sign of cross-price elasticity (col 3).

HOW A SHORTAGE CLEARS

1. P<P* ⇒ $Q_d > Q_s$ (shortage)

4 · Elasticity

W4

PED · MIDPOINT (ARC)

```
PED = %ΔQd / %ΔP
%Δ = (X2−X1) ÷ ((X1+X2)/2)
point: PED = (dQ/dP)·(P/Q)
```

|PED|	TYPE	P↑⇒TR
>1	Elastic	↓
=1	Unit	max
<1	Inelastic	↑
=0	Perf. inelastic	Q same
=∞	Perf. elastic	Q→0

WORKED · AFL TICKETS

Q_d = 200,000 − 10,000P.

- P=$10 ⇒ Q=100k ⇒ PED ≈ −1 (unit) ⇒ **TR-maximising**; any price move cuts TR.
- P=$15 ⇒ Q=50k ⇒ PED ≈ **−3** (elastic) ⇒ raising P cuts TR.

DETERMINANTS · 5

- **Substitutes** availability
- **Time** (LR > SR)
- Necessity vs luxury · share of income
- Definition breadth (Coke < soft drink < beverage)

YED

```
%ΔQ/%ΔY · >1 luxury · 0–1 nec · <0
inferior
```

XED

```
%ΔQA/%ΔPB · >0 sub · <0 compl · =0
unrelated
```

PES

```
%ΔQs/%ΔP · input mobility, time,
spare capacity
```

SIA → *Use the midpoint method unless told "at this point". Sign matters: a negative XED = complements; an income elasticity < 0 = inferior good.*

ELASTICITY ALONG A LINEAR D

On a straight-line demand curve PED varies: **elastic at the top** (high P, low Q), **unit-elastic at the midpoint**, **inelastic at the bottom**. So slope ≠ elasticity. TR peaks exactly at the unit-elastic midpoint.

CROSS-PRICE MATRIX · READING IT

Own-price (diagonal): |E|>1 elastic, <1 inelastic. Off-diagonal: XED>0 ⇒ substitutes, XED<0 ⇒ complements. E.g. cats |−3| elastic; kittens |−0.8| & dogs |−0.5| inelastic.

TOTAL-REVENUE RULE

DEMAND	P↑	P↓
Elastic	TR↓	TR↑
Unit	TR max	TR max
Inelastic	TR↑	TR↓

To raise revenue: cut price if elastic, raise price if inelastic.

APPLICATIONS

Bumper-harvest paradox: D inelastic ⇒ a big harvest (S→right) drops P a lot, Q little ⇒ farm revenue falls. **Tax design**: tax inelastic goods (tobacco, fuel) ⇒ revenue with small DWL. **Time**: petrol inelastic SR, elastic LR (substitutes appear).

The hinge to policy: the less-elastic side bears more of a tax (col 5); DWL is larger when both curves are elastic. Elasticity links the demand model to every welfare result.

5 · Consumer Choice

W4

Utility U(x,y) ranks bundles. MU_x=∂U/∂x. Diminishing MU: each extra unit adds less.

INDIFFERENCE CURVES

- Same-U combos; downward sloping
- **MRS_{xy}** = −slope = MU_x/MU_y
- Convex ⇒ diminishing MRS · ICs **never cross**

BUDGET LINE

```
Px·x + Py·y = I · slope = −Px/Py
```

OPTIMUM (TANGENCY)

```
MRSxy = Px/Py
⇔ MUx/Px = MUy/Py
```

"Equal bang per buck" across all goods at the optimum.

INCOME & SUBSTITUTION EFFECTS

P_x↓: (i) **sub effect** — x cheaper rel. y, buy more x; (ii) **income effect** — real income ↑.

- **Normal**: both ↑ ⇒ D_x↑
- **Inferior**: sub ↑, income ↓
- **Giffen**: inferior + income dominates ⇒ D upward-sloping

6 · Welfare & Surplus

W4

CS · area under D, above P. *PS* · area above S, below P.

```
TS = CS + PS + GovRev.
```

LINEAR D&S SURPLUS

```
CS = ½·Q*·(Pmax−P*)
PS = ½·Q*·(P*−Pmin)
```

WORKED · P*=18, Q*=36

Linear D & S meeting at P*=18, Q*=36 with D-intercept 36 & S-intercept 0:

```
CS = ½·36·(36−18) = 324
PS = ½·36·(18−0) = 324
TS = 648
```

Efficiency ≠ equity. Competitive eq. is Pareto-efficient but may be inequitable.

1ST WELFARE THEOREM

Competitive eq. maximises TS. Any wedge between buyer WTP and seller MC ⇒ DWL = triangle of trades not made.

SURPLUS FROM A SCHEDULE

CS = Σ (marginal value − P) over units bought; PS = Σ (P − marginal cost) over units sold. Worked: at P=$4 a buyer values units at $7,$5 ⇒ CS = 3+1 = **$4**; a seller's costs are $1,$3 ⇒ PS = 3+1 = **$4**.

DWL SOURCES · 5

- Per-unit tax · binding ceiling/floor
- Quota · tariff
- Monopoly / market power (P>MC)
- Externalities (private ≠ social)
- Under-provision of public goods

Every DWL is a **triangle of mutually-beneficial trades that don't happen** — width = ΔQ, height = the wedge.

WORKED · SURPLUS AFTER A DEMAND FALL

```
from P*=18, Q*=36 (CS=PS=324)
demand falls 12 units ⇒ P*=15, Q*=30
⇒ CS = PS = 225 · TS = 450
```

Fewer trades ⇒ surplus shrinks on both sides; the drop in TS is the gains-from-trade no longer realised.

Demand = marginal benefit; supply = marginal cost. The height gap D−S on each unit is its surplus; sum to Q*. Beyond Q*, MC > MB ⇒ extra trades *destroy* value — the source of every DWL.

7 · The Signature Chain

★ EXAM FAVOURITE

★ The single most-repeated exam problem: solve eq. → elasticities → CS/PS → tax → DWL.

GIVEN

```
QD = 100 − 5P · QS = 5P
```

- **Eq:** 100−5P = 5P ⇒ P*=10, Q*=50
- **Elasticity:** E_d=(−5)(10/50)=−1 · E_s=(5)(10/50)=1
- **Surplus:** D-intercept P=20 ⇒ CS=(20−10)·50/2=**250**; PS=10·50/2=**250**
- **Tax t=$2/unit:** 100−5(P+2)=5P ⇒ seller gets P_s=9, buyer pays P_b=11, Q=45
- **Gov rev** = 2·45 = **90**
- **DWL** = ½·t·ΔQ = ½·2·(50−45) = 5

TAX DWL

```
DWL = ½·t·(Q*−Qt) · grows ∝ t²
```

SIA → *DWL uses the change in Q, not the change in price. Drive ΔQ off the after-tax quantity, then ½·base·height.*

8 · Govt Intervention

W5

PER-UNIT TAX · T

Tax on sellers ⇒ S up by t; on buyers ⇒ D down by t. Outcome identical — incidence is independent of the statutory side.

INCIDENCE SHARE

```
buyer = PES/(PES+|PED|)
seller = |PED|/(PES+|PED|)
```

★ **Burden falls on the less-elastic side.** Perfectly inelastic D ⇒ buyers bear all of t.

SUBSIDY · S

Mirror of tax: lowers P_b, raises P_s, raises Q. The **more-elastic side captures more** of the subsidy. Creates DWL via over-production — unless correcting a positive externality.

PRICE CONTROLS

- **Ceiling < P*** ⇒ shortage, queues, black market, quality erosion
- **Floor > P*** ⇒ surplus (min wage ⇒ unemployment)
- Binding only if ceiling < P* or floor > P*

WORKED · SUBSIDY INCIDENCE

```
Qd=700−100P, Qs=400+50P ⇒ P*=2,
Q*=500
$1 subsidy to producers ⇒ buyer price
$1.67
buyer share = 2−1.67 = $0.33 (⅓)
gov cost = $1 × 533 ≈ $533
```

Demand here is more elastic (ε_d=0.4 > ε_s=0.2) so **buyers capture more** of the subsidy.

GOVT TOOLS · CLASSIFY

TOOL	EFFECT	DWL?
Tax	Q↓, wedge	Yes
Subsidy	Q↑ past Q*	Yes*
Ceiling	Shortage	Yes
Floor	Surplus	Yes

*unless correcting an externality.

WORKED · BINDING PRICE FLOOR

```
Qd=700−100P, Qs=400+50P ⇒ P*=2,
Q*=500
floor at $3 ⇒ Qd=400, Qs=550 ⇒
surplus 150
```

A floor binds only *above* P*; a ceiling only *below*. Quantity traded = the **short side** of the market.

9 · Quota · Tariff · Trade

W6

Quota $\bar{Q}$ < Q*: raises P, transfers surplus to quota holders, DWL, *no* gov revenue.

Small open economy: face world price P_w. P_w<P_{aut} ⇒ import; P_w>P_{aut} ⇒ export. Trade ⇒ TS rises, distribution shifts.

Tariff τ on imports: P_d=P_w+τ ⇒ CS↓, PS↑, gov rev↑, net DWL = production Δ + consumption Δ.

Tariff vs production subsidy (raise domestic Q by the same amount): tariff DWL = **B+E** (distorts production *and* consumption); subsidy DWL = **B** only ⇒ subsidy is the more efficient tool.

WORKED · SMALL OPEN ECONOMY

```
QD=12−3P, QS=P
Pw=1 ⇒ Qs=1, Qd=9 ⇒ import 8, CS=13.5
Pw=4 ⇒ Qs=4, Qd=0 ⇒ export 4, CS=0
```

Higher world price helps domestic producers, prices out domestic consumers.

10 · Worked · Min Wage

W4–5

L_D=2000−50W, L_S=1000+50W.

- Free eq: **W*=10, L*=1500**
- Min wage $15 ⇒ L_D=1250, L_S=1750 ⇒ employment = **1250** (500 unemployed)
- Own-wage E_d at W=15: (−50)(15/1250)=**−0.6**
- Workers +$5625 · employers −$6875 · DWL = −$1250

Employment fall is larger when labour demand is **elastic**.

11 · Costs & Production

W8

IDENTITIES

```
TC=FC+VC · ATC=TC/Q · AVC=VC/Q
AFC=FC/Q (→0) · MC=dTC/dQ=dVC/dQ
```

- ★ **MC cuts AVC & ATC at their minima** (MC<AC pulls AC down; MC>AC pulls up)
- ATC = AVC + AFC ⇒ converge as Q↑ · U-shaped from diminishing MP

MP_L=ΔQ/ΔL · **MP cuts AP at AP max**. Diminishing MP (SR, K fixed). **Returns to scale** (LR, scale all inputs): IRS⇒AC↓ · CRS⇒AC flat · DRS⇒AC↑. **RTS (LR) ≠ diminishing MP (SR).**

WORKED · CUBIC TC

```
TC=10+5Q−Q²+0.2Q³ ⇒ MC=5−2Q+0.6Q²
min AVC at Q=2.5 ⇒ AVC=3.75
```

12 · Side 1 Take-aways

1. Spot **which model + formula** instantly
2. Shifts ≠ movements along
3. Opp cost per unit; rank by it, not raw output
4. Tax/DWL uses ΔQ; burden on less-elastic side
5. MC cuts ATC at min; P=MC ⇒ allocative efficiency

SIA → *The signature chain (col 7) reappears every paper. Memorise the number pattern P*=10/Q*=50/CS=PS=250/DWL=5 – then any variant is a re-skin.*

13 · Side-1 formula belt

```
opp cost(X) = ΔY/ΔX · PED = (dQ/dP)
(P/Q)
MRS = MUx/MUy · opt MUx/Px = MUy/Py
CS = ½Q*(Pmax−P*) · PS = ½Q*(P*−Pmin)
MC = dTC/dQ · ATCmin ⇔ MC = ATC
DWLtax = ½·t·(Q*−Qt) · incidence =
PES/(PES+|PED|)
```

Recipe: set Q_d=Q_s ⇒ P*,Q* → elasticity → CS/PS → impose policy → recompute Q → DWL. Same chain, fresh numbers.

13 · Profit Max & Shutdown W9

UNIVERSAL RULE

```
Choose Q where MR = MC
π = TR - TC = (P - ATC)·Q
```

CONDITION	DECISION
P ≥ ATC	Operate, π ≥ 0
AVC ≤ P < ATC	SR operate, loss
P < AVC	**SR shutdown**
P < ATC (LR)	**Exit**

Shutdown vs exit: SR shutdown still pays FC (reversible); LR exit permanent (π=0 at Q=0). Worked: ATC=12, MC=10, AVC=9, P=10 ⇒ P=MC and P>AVC ⇒ **keep producing** (loss $2×Q is less than shutting).

14 · Perfect Competition W9

4 ASSUMPTIONS ⇒ PRICE-TAKER

1. Many small buyers & sellers
2. Homogeneous product
3. Free entry & exit
4. Perfect information

`D = MR = AR = P` (horizontal). SR: firm Q* where **P = MC** (rising arm); SR supply = MC above min AVC; π can be +, 0, −.

LONG-RUN EQUILIBRIUM (LRCE)

- ★ Entry/exit drives π → 0 (normal return)
- ★ P = MC = min ATC
- Each firm at efficient scale; productively & allocatively efficient

WORKED · # FIRMS

```
Mkt D: Q=1000-P · LR P=min ATC=$5
each firm q=5 ⇒ Q=995 ⇒ N = 995/5 =
199 firms
```

LR industry supply: constant-cost ⇒ flat; increasing-cost (input P↑) ⇒ upward; decreasing-cost ⇒ downward (rare).

SIA → *A subsidy to a fixed cost leaves MC (and SR price) unchanged ⇒ SR profit rises; LR entry competes it away, price falls. Don't shift MC for an FC shock.*

SR → LR ADJUSTMENT

- π > 0 ⇒ entry ⇒ S→right ⇒ P↓ to min ATC
- π < 0 ⇒ exit ⇒ S→left ⇒ P↑ to min ATC
- LRCE: P = MC = min ATC, π = 0

A cost-saving technology adopted in SR: P stays, firm count fixed ⇒ **profits rise**; only in LR does entry push P down to the new min ATC.

CHOOSING A PRODUCTION METHOD

High-FC / low-MC methods win at **high output**; low-FC / high-MC win at **low output**. Compare total cost at the relevant Q; the ATC curves cross. (Pillow makers, taxi vs Uber.)

PC FIRM DIAGRAM CHEATS

AT Q* (P=MC)	OUTCOME
P > ATC	profit (P−ATC)·Q
P = min ATC	break-even (LRCE)
AVC ≤ P < ATC	loss, keep going SR
P < AVC	shut down

Shade the profit/loss rectangle between P and ATC at Q*. SR supply = the MC curve above min AVC.

14b · Efficiency at a glance

TWO EFFICIENCIES

```
Productive: P = min ATC
Allocative: P = MC = MSB = MSC
PC long run hits both; monopoly
neither
```

Invisible hand (Smith): self-interest + the price signal push Q to where MSB = MSC ⇒ total surplus

15 · Monopoly W9–10

SOURCES OF POWER · 4

1. Legal barriers · patents, licences
2. Natural monopoly · IRS / large FC
3. Exclusive resource control
4. Network effects

Faces the *market* D (downward) ⇒ to sell more must lower P on *all* units ⇒ MR < P for Q>0.

LINEAR MR RULE

```
P = a - bQ ⇒ MR = a - 2bQ
(same intercept, twice the slope)
```

Choose Q* where MR = MC; charge P off the **demand** curve at Q*.

WORKED · P = 16 − Q, TC = Q²

```
MR = 16-2Q · MC = 2Q
16-2Q = 2Q ⇒ Q*=4, P*=12
TR=48, TC=16 ⇒ π = 32
```

LERNER MARK-UP

```
(P - MC)/P = 1/|PED|
μ = P - MC · less elastic ⇒ bigger
mark-up
```

vs competition: $P_m > P_c$, $Q_m < Q_c$, $\pi_m > 0$. Allocatively inefficient (P>MC).

SIA → *Read the monopoly price off the demand curve at Q*, never off MR. MR=MC only locates the quantity; the price sits up on D directly above it.*

16 · Monopoly Welfare & DWL

Monopolist has no supply curve; PS = area above MC, below P. DWL = lost trades where WTP > MC over $Q_m \to Q_c$.

WORKED · P = 12 − ½Q, TC = Q²

```
MR=12-Q · MC=2Q
Monopoly: 12-Q=2Q ⇒ Q=4, P=10, π=24
Competitive (P=MC): 12-½Q=2Q ⇒
Qc=4.8, Pc=9.6
ΔCS=-1.76 · ΔPS=+0.96
DWL = ½·(4.8-4)·(10-8) = 0.80
```

NATURAL MONOPOLY REGULATION

- P=MC ⇒ allocatively best but firm **loss** (P<ATC)
- P=ATC ⇒ break-even, small residual DWL
- Two-part tariff: fixed fee + per-unit MC

Strong natural monopoly (AC & MC both declining): P=MC sits below ATC ⇒ loss ⇒ infeasible. Optimal regulated price = P_R = ATC (break-even, mark-up minimised). Order on the axis: $Q_m < Q_R < Q_c$.

MR TABLE INTUITION

As the monopolist cuts P to sell one more unit, the **price effect** (lower P on all prior units) drags MR below P; MR can even go **negative** once the price effect beats the output effect — that's the inelastic region of demand, where the firm never operates.

WELFARE SUMMARY

- CS shrinks; part transfers to PS, part becomes DWL
- $Q_m < Q_c$ · $P_m > P_c$
- Mark-up μ = P − MC measures market power
- Productively efficient only if Q* sits at min ATC

16b · Structures vs the optimum

STRUCTURE	P VS MC	LR Π	DWL
Perfect comp.	P = MC	0	none
Monop. comp.	P > MC	0	some
Oligopoly	P > MC	> 0	some–large
Monopoly	P ≫ MC	> 0	large

Mark-up (P−MC)/P rises as |PED| falls ⇒ more power, more DWL. Only perfect competition is allocatively efficient (P = MC in the long run also P = min ATC).

17 · Price Discrimination *PIGOU 1920*

3 CONDITIONS

1. Market power (P > MC)
2. Identifiable segments, different PED
3. Prevent **resale** between segments

DEG.	MECHANISM	CS	DWL
1st	Each buyer's WTP	0	0
2nd	Quantity / block	+	some
3rd	Group (student/senior)	+	some

1st-degree (perfect): firm captures all surplus, Q = Q_{comp} ⇒ no DWL but CS=0. **3rd-degree**: $(P_i - MC)/P_i = 1/|PED_i|$ ⇒ higher P to the less-elastic group.

18 · Monopolistic Competition W10

- Many firms · **differentiated** product
- Free entry & exit · each has slight market power

SR like monopoly (Q* at MR=MC, P off D). **LR**: entry shifts each firm's D inward until *tangent to ATC* ⇒ π=0.

- P > MC ⇒ allocatively inefficient
- P > min ATC ⇒ **excess capacity**
- Trade-off: variety gained, efficiency lost

Ex: restaurants, hairdressers, clothing, cafés.

19 · Market Structures

STRUCTURE	FIRMS	P VS MC
Perfect comp	Many	P=MC
Monop. comp	Many	P>MC
Oligopoly	Few	P>MC
Monopoly	One	P>MC

Oligopoly = few firms, strategic interaction, entry barriers ⇒ analyse with game theory (col 4). Cartels mimic monopoly Q but each member's MR>MC ⇒ incentive to cheat ⇒ unstable without enforcement (OPEC).

Concentration: CR_4 = combined share of the top 4 firms; HHI = $\Sigma\, s_i^2$ (×10,000), higher ⇒ more concentrated.

EFFICIENCY CHECK

- **Productive**: produce at min ATC
- **Allocative**: P = MC (= MSB = MSC)

Only perfect competition's LR equilibrium achieves both. Every form of market power has P>MC ⇒ allocative loss.

19b · Cost Curves Recap

SRATC U-shaped (diminishing MP). LRAC is the **lower envelope** of all SRACs. LRAC↓ ⇒ economies of scale (EoS); flat ⇒ CRS; ↑ ⇒ diseconomies. **MES** = smallest Q at min LRAC; MES large vs market ⇒ few firms / natural-monopoly tendency.

WORKED · CUBIC AC

```
TC=32+Q²/16 ⇒ ATC=32/Q+Q/16
MC=Q/8 · MC cuts ATC at its minimum
```

19c · Spot the structure

"Identify the market structure" Qs: ask three things — **# of firms**, **product** (identical / differentiated), **entry barriers**.

STRUCTURE	FIRMS	PRODUCT	ENTRY
Perfect comp.	many	identical	free
Monop. comp.	many	differentiated	free
Oligopoly	few	either	barriers
Monopoly	one	unique	blocked

Wheat ⇒ perfect comp · cafés/clothing ⇒ monop. comp · banks/airlines ⇒ oligopoly · tap water ⇒

20 · Game Theory W10–11

- **Strategy** · complete plan of action
- **Dominant strategy** · best regardless of rival
- **Nash eq.** · each best-responds; no profitable unilateral deviation
- **Best-response method** · underline each player's best reply; cell with *both* underlined = Nash

PRISONER'S DILEMMA

A \ B	COOP	DEFECT
Coop	3, 3	0, 5
Defect	5, 0	**1, 1**

Nash = (Defect, Defect); Defect dominant for both. Collectively worse than (Coop, Coop) — the core of cartel instability & free-riding.

SUSTAINING COOPERATION

- **Repeated games**: finite known end ⇒ unravels by backward induction; indefinite ⇒ cooperation sustainable
- Tit-for-tat · reputation · contracts · regulation

Public-good free-rider is a PD: if Zheng (MB 30) produces knowledge at cost 25 he nets $5 while Danielle free-rides for $40 ⇒ each waits ⇒ good not produced.

KEY DISTINCTIONS

- Dominant strategy ⇒ always Nash; Nash needn't be dominant
- Nash can be **Pareto-inefficient** (PD: both defect)
- Multiple Nash possible; or none in pure strategies

Entry deterrence: an incumbent uses limit pricing or excess capacity to threaten a price war — credible only if the commitment is costly to reverse. **First-mover advantage** appears in sequential games (solve by backward induction).

21 · Externalities W7

Externality · uncompensated 3rd-party effect ⇒ private ≠ social.

- Neg. production: **SMC=PMC+MEC** ⇒ over-produce
- Pos. consumption: **SMB=PMB+MEB** ⇒ under-produce

PIGOUVIAN RULE

```
tax = MEC at Q* (neg.)
subsidy = MEB at Q* (pos.)
```

DWL = triangle between MSC and MSB over the over/under-produced range. Other tools: cap-and-trade · regulation (cap Q) · property rights.

MINI · LAND-CLEARING

```
PMB=120-2Q, PMC=Q, MEC=30 ⇒ SMC=Q+30
market Q=40 → efficient Q=30
DWL=½·30·10=150 · tax=$30
```

A corrective tax is most effective (big consumption cut, small price rise) when demand is **elastic**.

4 TYPES · WHICH CURVE MOVES

TYPE	WEDGE	MKT Q
Neg. production	SMC>PMC	too high
Pos. production	SMC<PMC	too low
Neg. consumption	SMB<PMB	too high
Pos. consumption	SMB>PMB	too low

Worked (kindergarten, pos. consumption): PMB=100−2Q, PMC=3Q, SMB=120−2Q ⇒ market Q=20, efficient Q=24 ⇒ optimal subsidy = **$20/child**.

INTERNALISING THE EXTERNALITY

The fix forces the decision-maker to face the full social cost/benefit. Where the market is already efficient (Q*=Q**), *any* intervention **lowers** welfare — only intervene where there's a genuine wedge.

22 · Worked · Pigouvian Tax ★

★ **Steel pollution.** PMB=110−Q, PMC=10+Q, SMC=50+Q (MEC=$40).

- Market: 110−Q=10+Q ⇒ **Q=50, P=60**
- Efficient: 110−Q=50+Q ⇒ **Q=30, P=80**
- DWL = ½·(50−30)·(100−60) = 400
- Pigouvian tax = MEC = **$40** (= $P_D - P_S$ at Q=30)

River variant: D=100−Q, SMC=Q+20, MEC=20. Market Q=50 → efficient Q=40; tax = **$20**. Direct regulation: cap output at Q=40.

Solving recipe: (1) market Q from PMB=PMC; (2) efficient Q from SMB=SMC; (3) tax = MEC = vertical gap; (4) DWL = ½ × MEC × ($Q_{mkt} - Q_{eff}$). Same four steps every time, neg. or pos.

SIA → *Pigouvian tax = the per-unit external cost, set so post-tax PMC meets SMC at the efficient Q. The effectiveness of a corrective tax rises with how elastic demand is.*

23 · Coase Theorem *COASE 1960*

STATEMENT

Well-defined property rights + low transaction costs ⇒ private bargaining reaches the efficient Q regardless of who holds the rights. The allocation of rights affects *distribution* only.

Fails when: high transaction costs · many parties (assignment/holdout) · asymmetric info · weak enforcement. Best for small, localised externalities; global problems ⇒ government (e.g. EU ETS).

Polluter has the rights ⇒ victim pays them to abate; victim has the rights ⇒ polluter compensates. Same efficient Q either way — only the distribution differs.

24 · Public Goods & Commons W7

	EXCL.	NON-EXCL.
Rival	Private *food*	Common *fish, roads*
Non-rival	Club *Netflix*	**Public** *defence*

Public good: non-rival + non-excl ⇒ free-riding ⇒ market **under-provides**. Optimum: $\Sigma\, MB_i = MC$ (sum WTP *vertically*, not P_i=MC). Fund via tax; **Lindahl tax** = each pays a share = their share of total WTP.

Commons (rival + non-excl): *Tragedy of the commons* (*Hardin 1968*) ⇒ overuse. Fixes: privatise · quota · communal governance (Ostrom) · tax.

Worked · Lindahl: bridge costs $150; WTP A $20, B $30, C $50 (Σ=$100). Each pays cost × (own WTP / Σ WTP). Public-good optimum sums WTP **vertically** because the good is non-rival — everyone consumes the same Q.

Free-riding is why the market under-provides: everyone hopes someone else pays, so private provision falls short of the efficient Σ MB = MC level. Govt provision financed by tax is the standard fix.

CLASSIFY ANY GOOD

Ask two yes/no questions — **excludable?** and **rival?** — and drop it into the 2×2. Uncongested public roads are non-rival (the classic "which is wrong" trap calls them rival).

24b · Positive externality · worked

★ Education: PMB=100−2Q, PMC=3Q, SMB=120−2Q (MEB=$20). Market 100−2Q=3Q ⇒ Q=20; efficient 120−2Q=3Q ⇒ Q=24. Corrective subsidy = MEB = $20 lifts Q to the optimum.

Negative externality ⇒ over-produce ⇒ **tax**; positive ⇒ under-produce ⇒ **subsidy**. The corrective amount always equals the external effect at Q*.

25 · Asymmetric Info W7

LEMONS / ADVERSE SELECTION *Akerlof 1970*

Pre-trade. Buyers can't verify quality ⇒ pay avg P ⇒ good-unit sellers exit ⇒ avg quality ↓ ⇒ market unravels. Fixes: warranties · certification · reputation · regulation.

Moral hazard (post-trade): insured party takes more risk when others bear the cost. Fixes: deductibles · co-pays · monitoring.

Signalling (informed party acts): education as a signal — credible only if the cost is lower for the high type ⇒ separating equilibrium. **Screening** (uninformed party offers a menu): insurance deductible-vs-premium options that make types self-select. Both are responses to the same asymmetry from opposite sides.

```
Risk (1-line): risk-averse ⇒ U concave
⇒ EU(gamble) < U(EV) ⇒ buys insurance;
risk premium = EV - certainty
equivalent.
```

26 · Master Diagrams · 5 ★ BANKABLE MARKS

1. ★ S/D + tax · shade CS, PS, Gov, DWL
2. ★ PC firm · D=MR=P, MC & ATC, locate π/loss
3. ★ Monopoly · D, MR (twice slope), MC, ATC; Q*, P* off D, DWL
4. ★ Externality · PMC vs SMC, Q_m vs Q*, DWL, Pigouvian tax
5. ★ Trade + tariff · domestic S/D, P_w, P_w+τ; shade 4 areas

Always label axes, curves & shifts; shade CS/PS/DWL.

Practise each twice, pen on paper, pre-exam.

For the monopoly & externality diagrams the slip is always the same: students locate Q* correctly but then read the price off the wrong line. Monopoly P sits on **demand** above Q*; the efficient externality P sits where **SMB meets SMC**.

27 · Formula Belt

```
PED = (dQ/dP)(P/Q) · midpoint for arc
YED = %ΔQ/%ΔY · XED = %ΔQA/%ΔPB
MRS = MUx/MUy · opt: MUx/Px=MUy/Py
CS=½Q*(Pmax-P*) · PS=½Q*(P*-Pmin)
MC=dTC/dQ · ATCmin ⇔ MC=ATC
DWLtax=½·t·(Q*-Q1)
incidence: buyer = PES/(PES+|PED|)
MR = a - 2bQ (from P=a-bQ)
π = (P-ATC)·Q · Lerner: (P-MC)/P =
1/|PED|
Public good Q*: Σ MBi = MC
Pigouvian tax = MEC at Q* · HHI = Σ
si²
```

28 · Exam Discipline

- ★ Revise by re-deriving each diagram, not re-reading
- ★ **Diagram first**, label axes & curves, shade regions
- Show working — partial method = partial marks
- ≈1 min per mark; bank graph + definition marks first
- Stuck multi-part Q ⇒ move on, return fresh
- Multi-part calc: a wrong early number still earns later marks if your **method** is right — carry it through
- "Which is wrong / which is true" MCQ: test each option against the rule, don't pattern-match

SIA → *It's a hurdle: ≥50% on the exam or you fail the subject. Secure the certain marks (graphs, definitions, the signature chain) before reaching for the hard parts. You've got this.*

29 · Final-week drill

Work this sheet section by section. The exam reuses the same five master diagrams and the equilibrium →