

Competition, Markups, and Conduct (EIOBook-4)

A coherent review guide (Demand \rightarrow FOCs \rightarrow Markups \rightarrow MC \rightarrow Conduct)

The one mental picture (the full pipeline)

This chapter is built around a single inferential pipeline:

Demand + Equilibrium FOCs \Rightarrow Markups \Rightarrow Marginal Costs \Rightarrow Conduct.

Empirically, we typically observe **prices** and **quantities/shares**, but not **marginal costs** or the **nature of competition**. The equilibrium model of competition (Cournot, Bertrand, collusion, etc.) supplies the missing bridge: once demand is known, the model's first-order conditions (FOCs) translate observed outcomes into implied markups and marginal costs, and—with additional identifying variation—into the underlying conduct regime.

The coherence spine (why every step exists)

The chapter is a single workflow. We observe (p, q) (or prices and shares), but we want to learn marginal costs and conduct. Demand estimation comes first because markups are not free parameters: they are pinned down by how demand responds to price (derivatives/slopes). Equilibrium FOCs then connect those demand derivatives to markups, and markups to marginal costs. Conditional on a conduct hypothesis, marginal costs are therefore recoverable even when input usage is unobserved. However, conduct itself is generally not identified from level shifts alone; separating competition from collusion requires additional variation that changes the markup incentive (notably, demand **rotations** that alter slopes/curvature). Once demand, costs, and conduct are pinned down, counterfactuals (mergers, taxes, entry) are obtained by solving the **new equilibrium** under changed primitives.

The chapter's spine (everything connects)

1. Choose market type: homogeneous vs. differentiated.

Connection: this determines the demand object you need and the form of equilibrium FOCs.

- Homogeneous good \Rightarrow one inverse demand curve $P(Q)$ and one slope $P'(Q)$.
- Differentiated products \Rightarrow a demand system $q = D(p, x)$ and a full Jacobian $\frac{\partial q}{\partial p}$ with cross-price derivatives.

2. Estimate demand (because markups depend on demand derivatives).

Connection: without demand derivatives you cannot form marginal revenue, so you cannot use $MR = MC$ to recover costs. Demand supplies the slope/curvature that governs markup incentives.

3. Write equilibrium FOCs (the bridge).

Connection: FOCs translate consumer-side substitution (demand derivatives) into firm-side optimality. Conduct enters through the marginal revenue term, so the same demand can imply different markups under different conduct.

4. **Use FOCs to back out markups and marginal costs.**

Connection: once demand derivatives and FOCs are in place, markups are implied (not assumed), and marginal costs follow mechanically.

5. **Identify conduct using extra variation (when needed).**

Connection: different combinations of conduct and cost curvature can rationalize the same (p, q) . To distinguish them, you need variation that changes markup incentives differently across conduct models (e.g., demand rotations that shift slopes rather than mere level shifts).

6. **Counterfactuals: solve a new equilibrium.**

Connection: after primitives are learned (demand, costs, conduct), policy/merger analysis is simply computing the new equilibrium under changed primitives (ownership, taxes, cost shifters, entry conditions).

Study plan (60–90 minutes, high ROI)

Pass 1 (10 min): Homogeneous goods — one demand curve, one MR, one MC

The unifying idea is that under any conduct assumption the firm's optimality condition is:

$$MR_i(\text{conduct}) = MC_i.$$

Different conduct assumptions change marginal revenue, not demand itself.

- **Perfect competition:** $MR = p$, hence $p = MC_i(q_i)$.
- **Cournot quantity competition:**

$$MR_i = p + P'(Q) q_i.$$

- **Conjectural variations (CV):** a single parameter CV_i reshapes marginal revenue:

$$MR_i = p + P'(Q) (1 + CV_i) q_i.$$

Interpretation: CV_i indexes how aggressively firm i believes rivals respond to its output changes; conduct enters through the markup incentive embedded in MR .

Conduct ladder (memory anchor).

$CV = -1 \Rightarrow$ perfect competition, $CV = 0 \Rightarrow$ Cournot, $CV = N-1 \Rightarrow$ perfect collusion/cartel.

Pass 2 (15 min): Homogeneous-goods markup formula (Lerner index)

A central relationship is the Lerner index:

$$\frac{p - MC}{p} = \frac{1 + CV}{N} \cdot \frac{1}{\eta},$$

where η is the (absolute) demand elasticity. This makes the comparative statics transparent:

- less elastic demand (smaller η) \Rightarrow higher markups,
- fewer firms (smaller N) \Rightarrow higher markups,
- more collusive conduct (larger CV) \Rightarrow higher markups.

Connection: because markups depend on conduct, imposing the wrong conduct assumption produces the wrong inferred markups and therefore the wrong recovered marginal costs.

Pass 3 (15–20 min): The identification punchline in homogeneous markets

A key obstacle is that, from (p, q) alone, one often identifies only a **combined** slope:

$$\gamma_i = \underbrace{\beta_2}_{\text{MC slope}} + \underbrace{\alpha_2(1 + CV_i)}_{\text{conduct channel via MR}}.$$

Thus competition vs. collusion can appear observationally similar unless additional identifying variation is available.

The fix: demand rotations. To identify conduct from outcomes, you need variation that changes the **incentive to mark up**, i.e., changes demand slope/curvature (a rotation), not merely demand level (a parallel shift). Intuitively, when the slope changes, monopoly-like prices respond strongly, whereas competitive prices respond weakly; this differential response identifies conduct.

Pass 4 (15–20 min): Differentiated products — Jacobians and ownership

In differentiated-product markets, demand is a system

$$q = D(p, x),$$

and firms often compete in prices (Bertrand). Let Δ^D denote the Jacobian matrix of demand derivatives with respect to prices (appropriately arranged), and let Θ encode conduct/ownership (e.g., Θ reduces to ownership under standard Nash–Bertrand).

Nash–Bertrand FOCs (multi-product firm f). A convenient matrix form is:

$$q_f + \Delta_f^D(p_f - MC_f) = 0 \implies p_f - MC_f = -(\Delta_f^D)^{-1}q_f.$$

Equivalently, at the market level one often writes:

$$MC = p + [\Theta * \Delta^D]^{-1}q,$$

where $*$ indicates the appropriate elementwise/ownership-adjusted product.

Cannibalization intuition. Multi-product firms internalize substitution across their own products: raising the price of one product shifts some demand to the firm’s other products, which changes optimal pricing and typically increases equilibrium markups relative to single-product ownership—even without explicit collusion.

Pass 5 (10 min): Identifying conduct in differentiated markets

Two standard routes:

1. **With some cost information:** test a hypothesized conduct matrix Θ by comparing observed vs. implied marginal-cost restrictions (moment-based or chi-square-type tests).
2. **Without marginal costs:** estimate conduct jointly with costs, requiring instruments because prices are endogenous (e.g., Hausman–Nevo cross-market price variation under strong assumptions, dynamic-panel approaches when valid, or strong quasi-experiments such as promotions).

Six items to memorize (highest ROI)

1. **FOC logic:** conduct affects MR , and $MR = MC$ is the core identification lever.
2. **CV ladder:** $CV \in \{-1, 0, N - 1\}$ corresponds to competition, Cournot, cartel.
3. **Lerner index:** $\frac{p-MC}{p} = \frac{1+CV}{N} \cdot \frac{1}{\eta}$.
4. **Why rotations matter:** shifts are often insufficient; slope/curvature changes identify conduct.
5. **Differentiated Bertrand markup:** $p - MC = -(\Delta^D)^{-1}q$ (ownership-adjusted).
6. **Cannibalization:** ownership structure changes markups even without collusion.

Five-minute self-test

1. Why does IO need an equilibrium model (not just demand and costs in isolation)?
2. In homogeneous goods, how does CV reshape marginal revenue?
3. Why can parallel demand shifts fail to identify competition vs. collusion?
4. In differentiated Bertrand, what demand objects are required to compute markups?
5. Give one reason multi-product ownership increases markups even without explicit collusion.