Price Discrimination

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Today's Game plan: Price Discrimination

1. Motivation: Higher Education
2. Perfect Price Discrimination (PPD)
   - Key characteristics
   - Welfare analysis
   - Case Study: PPD & Big Data
3. Non-linear pricing (2PD)
4. Group-specific pricing (3PD)

Motivational Example: Trends in Higher Ed

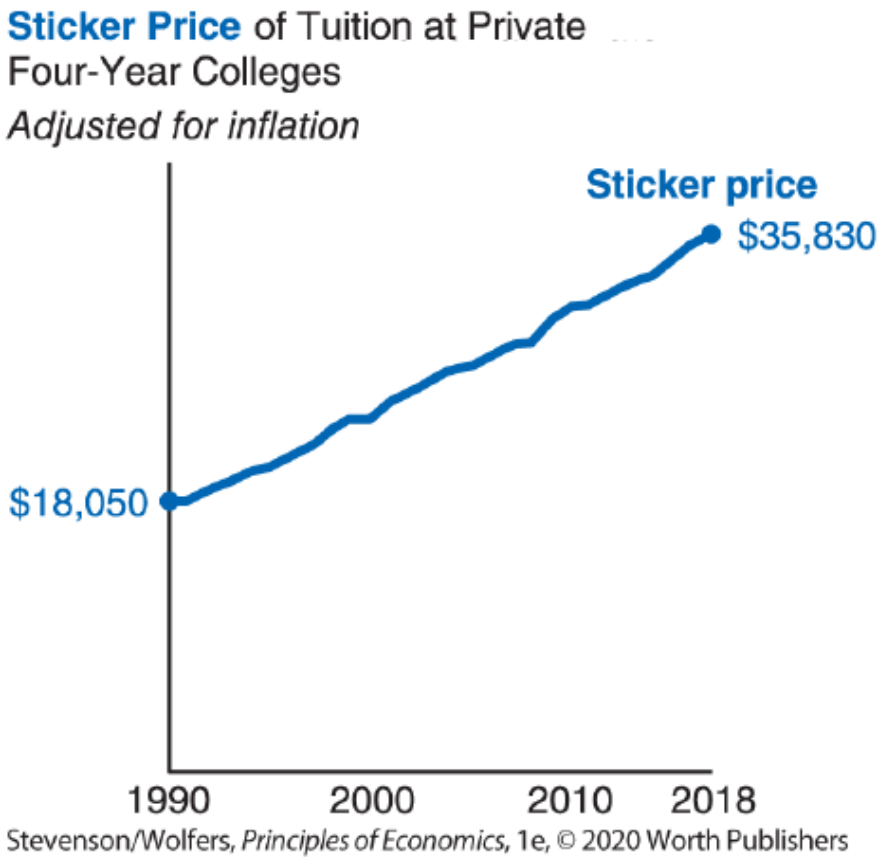


Figure 1: The Cost of Higher (Private) Education in the US, 1990 - 2018

Perfect Price Discrimination (PPD)

Up until now, we only considered uniform pricing where each firm charges customers the same price

$\Longrightarrow$ Relax this assumption!

Key characteristics PPD

1. Non-uniform pricing: Charge different customers different prices
   - PPD commonly referred to as 1st degree Price Discrimination (PD)
2. Complete Information
   - Consumers' preferences known
3. Conditions for PD
   - Firms need market power (i.e. D downward-sloping)
   - Prevent resales
   - Target each customer with optimal P

In what follows, assume:

- MC constant
- No FC (implies PS=Profit)

Baseline (No PD): Graphical illustration

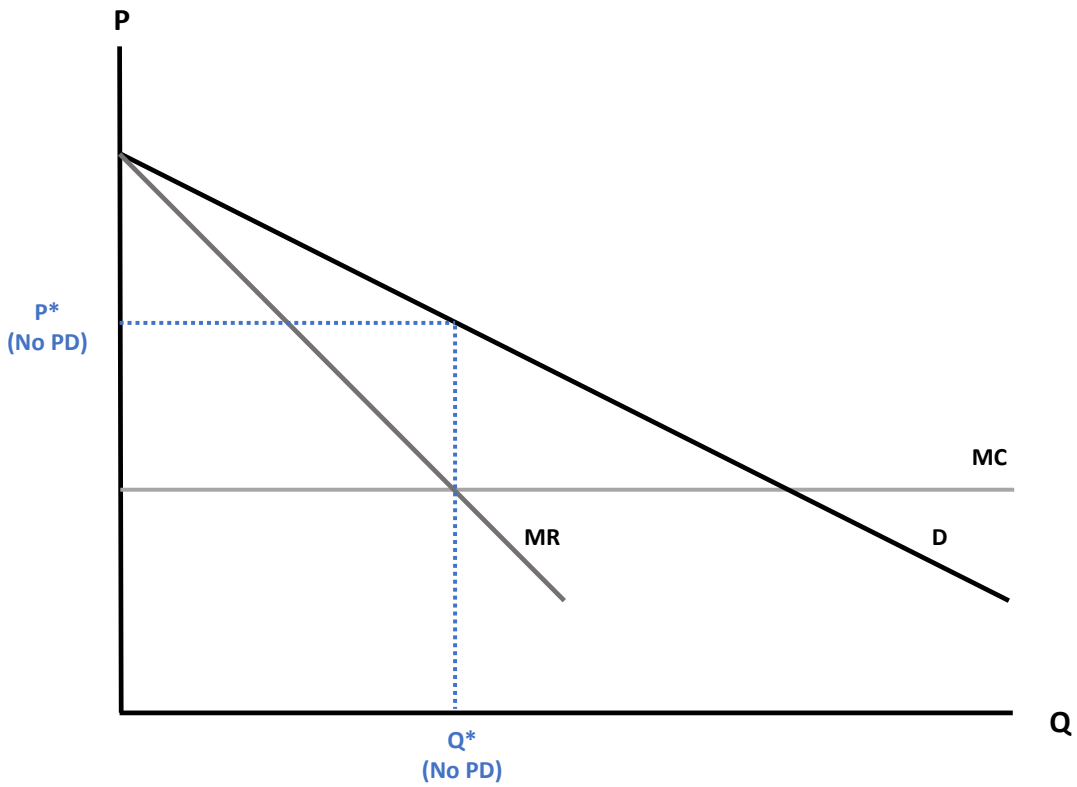


Figure 2: Monopolist: No PD

- Optimality: MR = MC

PPD: Graphical illustration

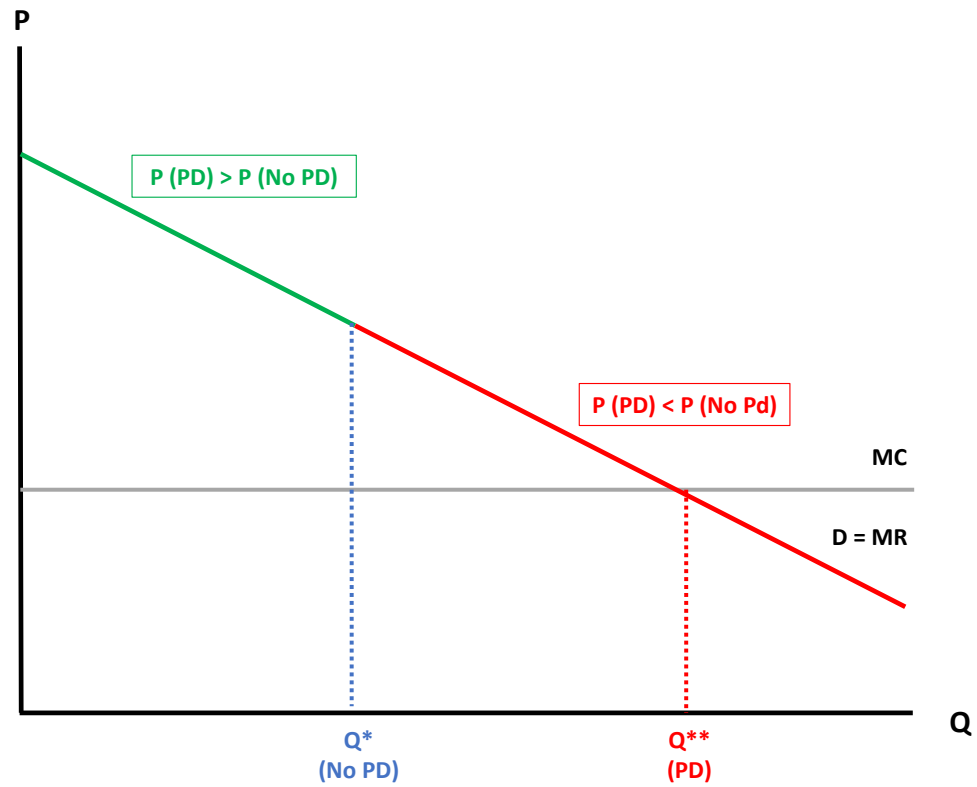


Figure 3: Monopolist: PPD

- Optimality: MR = MC, P=MC

Poll

What are the welfare implications of PPD?

A. Welfare-enhancing due to to higher output
B. Welfare-reducing due to reduction in CS
C. Welfare unchanged, TS simply redistributed

Baseline (No PD): Welfare

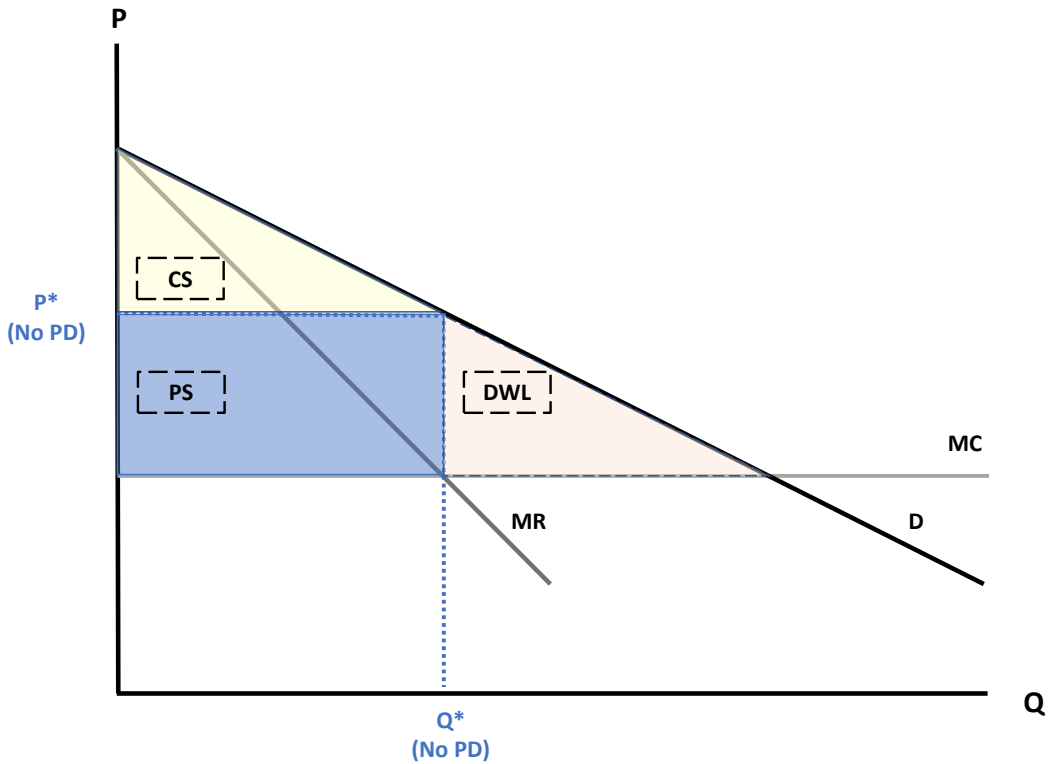


Figure 4: Monopolist: No PD

- Welfare: $\underbrace{\int_0^{Q*} (D - C)\, dQ}_{\text{TS}} = \underbrace{\int_0^{Q*} (D - P(Q))\, dQ}_{\text{CS}} + \underbrace{\int_0^{Q*} (P(Q) - C)\, dQ}_{\text{PS}}$

PPD: Welfare

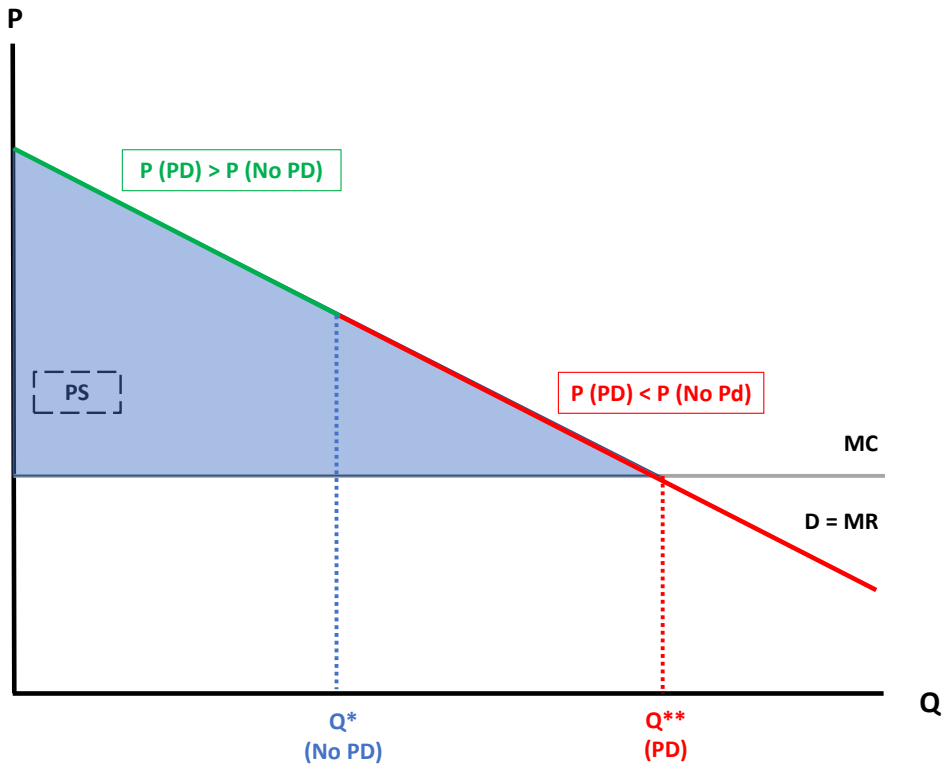


Figure 5: Monopolist: PPD

- Welfare: $\underbrace{\int_0^{Q*} (D - C)\, dQ}_{\text{TS}} = \underbrace{\int_0^{Q**} (P(Q) - C)\, dQ}_{\text{PS}}$

Poll

How do recent technological advancements in Big Data affect PD?

A. Give firms more information about your preferences
B. Allow firms to set optimal prices
C. Discriminate between online and offline prices
D. Make PPD fully practical

PPD Application: Big Data

Technological Innovations

- Does Big Data lead to Price Discrimination?
  - Personalization technologies (e.g., Cookies on the Web)
  - Access to credit history, earnings profile, ...
  - Social Media
- Price discrimination based on web browsing increases profits by 12.2% compared to demographic information with 0.8% (Shiller 2014)
- However, technology appears not advanced enough yet to make PPD fully practical
  - Up to 30% of firms' pricing decision do not deliver optimal price (Baker, Kiewll & Winkler 2014)
  - Prices collected online and offline are identical in 72% of cases (Cavallo 2017)
- Other related factors preventing PPD are managerial inertia and concerns about brand image (DellaVigna & Gentzkow 2019)

Is PPD feasible?

- Key problem: Incomplete Information

  $\Longrightarrow$ Do not observe consumer's reservation price

PD: Non-linear pricing (2nd degree PD)

- 2PD relies on various forms of self-selection
  - Quantity Targeting ("Hurdle method ")
    - Quantity discounts ("2 for 1")
    - Bundling (Package deals)
  - Quality Targeting
    - Flying Economy (E) vs. First-Class (FC)

Example:
Discriminate between Business Travelers (B) & Tourists (T)

- (i) Individual rationality constraints (Participation)
  - $u_{FC}^{B} - P_{FC} > 0$
  - $u_{E}^{T} - P_{E} > 0$
- (ii) Incentive-compatibility constraints (Self-selection)
  - $u_{FC}^{B} - P_{FC} > u_{E}^{B} - P_{E}$
  - $u_{E}^{T} - P_{E} > u_{FC}^{T} - P_{FC}$

PD: Group-specific pricing (3rd degree PD)

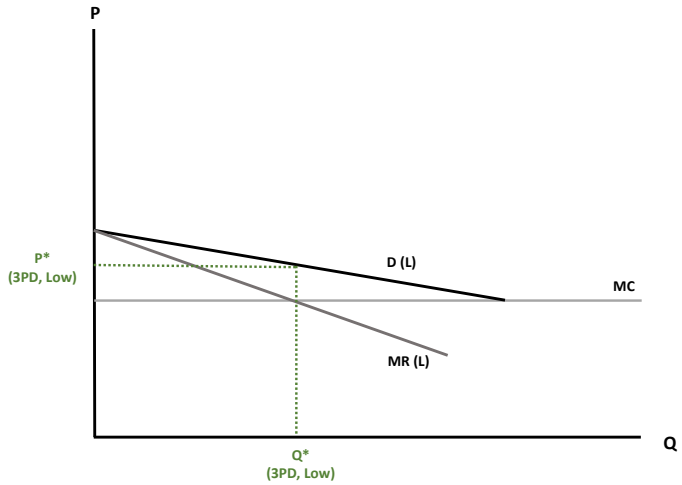
- Welfare under 2PD lower than PPD
  - Challenging to identify different types of consumers (despite Big Data)
  - 2PD requires lots of detailed information on customers

$\Longrightarrow$ Not always feasible or practical

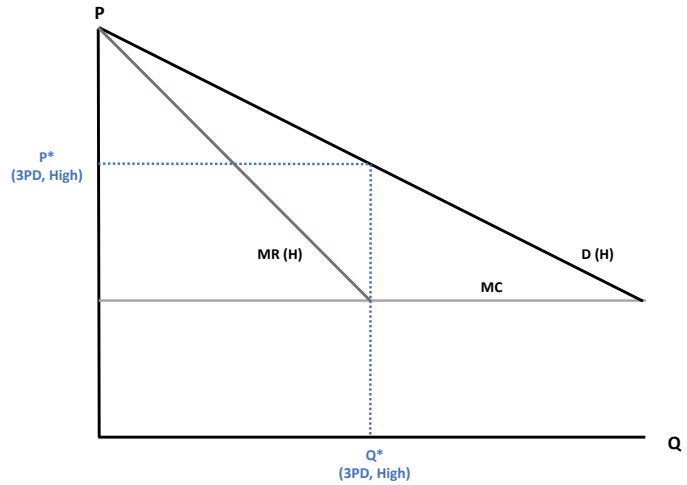
More convenient strategy:

- Group pricing
  - 3PD relies on broad market segmentation
    - Student/ Seniority discounts
    - New Customer Bonus ("Teaser")
    - Geographic discrimination
  - Group-specific optimization

PD: Group-specific pricing (3rd degree PD)



(a) Students (L)



(b) Professionals (H)

Figure 6: Price Discrimination for Economic Conferences

- Optimality requires: $MR_H = MR_L = MC$
- Welfare? Ambiguous!
  - 3PD leads to higher output, yet, net effects depend on degree of misallocation in response to redistribution of CS

Motivational Example Revisited

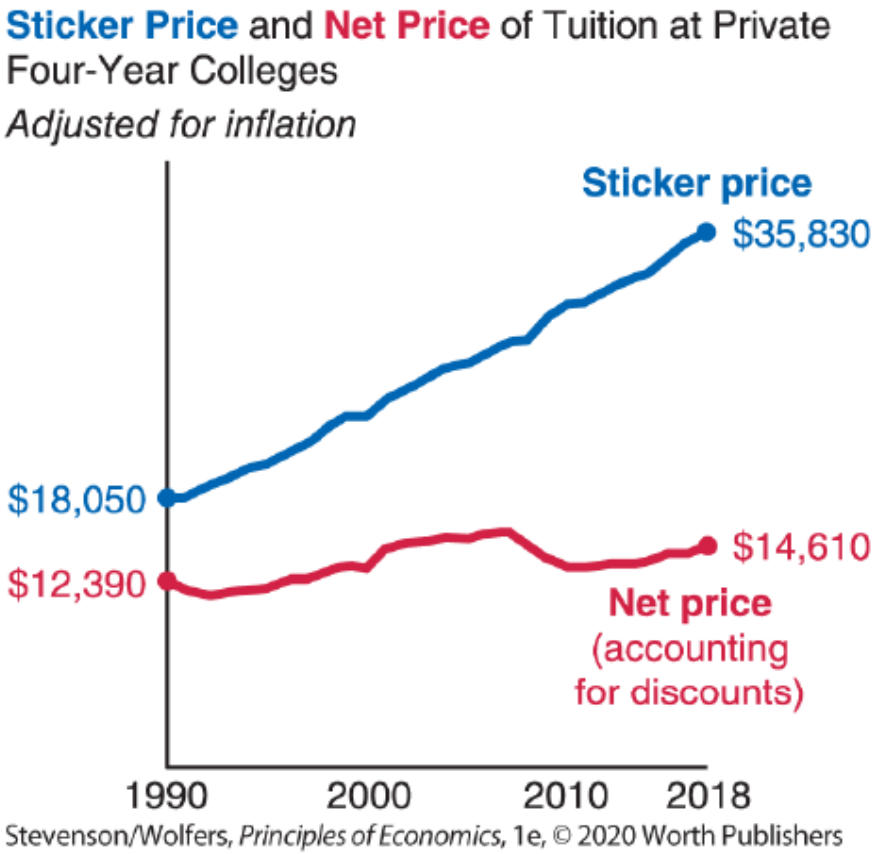


Figure 7: Price Discrimination in Higher (Private) Education in the US, 1990 - 2018