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

Sticker Price of Tuition at Private
Four-Year Colleges
Adjusted for inflation

Sticker price
$35,830

$18,050

1990   2000   2010   2018

Stevenson/Wolfers, *Principles of Economics*, 1e, © 2020 Worth Publishers
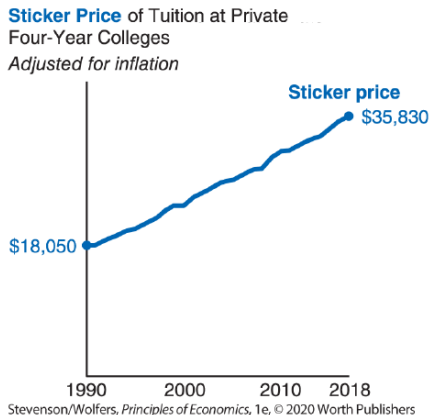
Figure 1: The Cost of Higher (Private) Education in the US, 1990 - 2018

Perfect Price Discrimination (PPD)

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

$\implies$ 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)
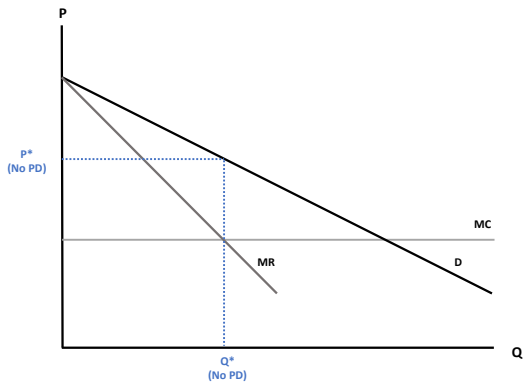
Baseline (No PD): Graphical illustration

Figure 2: Monopolist: No PD
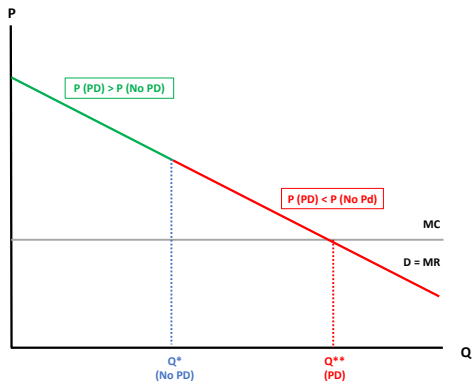
- Optimality: MR = MC

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
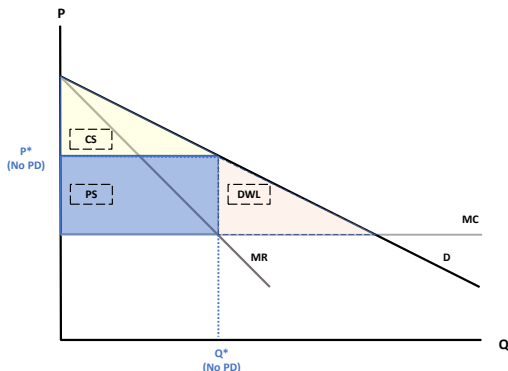- (C) Welfare unchanged, TS simply redistributed

Baseline (No PD): Welfare

Figure 4: Monopolist: No PD

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

PPD: Welfare
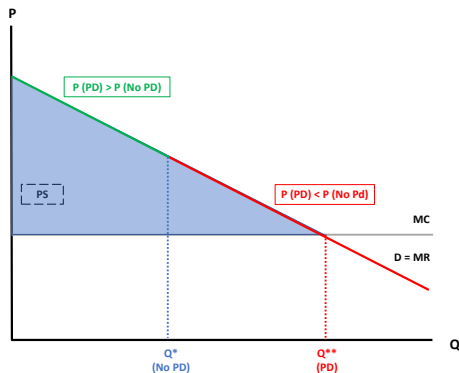

Figure 5: Monopolist: PPD

- 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?

- Ⓐ Give firms more information about your preferences
- Ⓑ Allow firms to set optimal prices
- Ⓒ Discriminate between online and offline prices
- Ⓓ 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
- $\implies$ 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
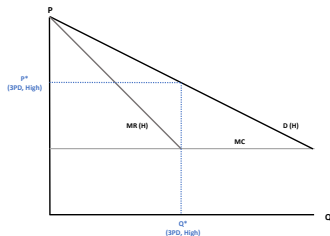 - $\implies$ Not always feasible or practical

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)
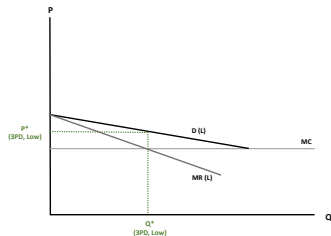
(a) Students (L)

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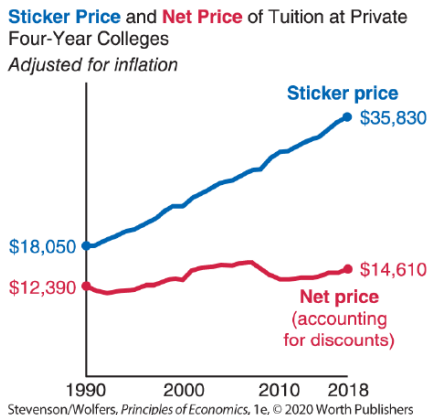
Figure 7: Price Discrimination in Higher (Private) Education in the US, 1990 - 2018