

Price Discrimination

Industrial Economics II

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What Is Price Discrimination?

Price discrimination is present when...

...similar goods are sold at prices that are in different ratios to marginal costs to the same consumer or to different consumers.

Distinguish three types of discrimination...

- **Perfect (1st degree):** Firm sells each unit of good at maximum price that consumer is willing to pay (by take-it-or-leave-it offer)
- **Direct (3rd degree):** Firm charges different prices to different segments of consumers, where each consumer faces constant per-unit price (prices depend on observable heterogeneity among consumers)
- **Indirect (2nd degree):** firm offers same (non-linear) price schedule to each consumer (unobservable heterogeneity)

Price Discrimination

Conditions

Necessary conditions for price discrimination...

- **Market power:** profitable to set price(s) different from marginal cost (perfect competition makes it impossible to set different prices unless marginal costs differ)
- **Consumer segmentation:** either direct selection by exogenous category (e.g. age, profession), or indirectly by self-selection in endogenous category (e.g. taste, time of purchase)
- **No arbitrage:** resale by consumers of discounted goods to other consumers should be infeasible (e.g. transportation cost, contract)
- **Commitment:** ability to make take-it-or-leave-it offers without room for renegotiation

Perfect (1st Degree) Price Discrimination

Basic effects

Firm sells each unit of good at maximum price that consumer is willing to pay (by take-it-or-leave-it offer)

Consider monopolistic market with inverse demand $P(q) = 60 - q$ which corresponds to consumer q 's willingness-to-pay; zero production cost

- **Uniform pricing:** Monopolist that cannot discriminate sells at monopoly price $p^m = 30$ to consumers in $[0, 30]$
- **Discrimination:** Monopolist sets price equal to willingness-to-pay, i.e. price $P(q)$ for consumer q and sell to all consumers in $[0, 60]$

Discrimination gives: **(1)** greater total welfare, **(2)** smaller consumer surplus, **(3)** greater consumer base that is served

Trade-off between total welfare (PD) and consumer welfare (UP)

Trade-off between accessibility of good (PD) and "fairness" (UP)

Direct (3rd Degree) Price Discrimination

European car market

Pretax prices for identical car models differ across countries.

Relative mark-ups (i.e. $[p - c] / c$ in %)...

model/country	Belgium	France	Germany	Italy	UK
Fiat Uno	7.6	8.7	9.8	21.7	8.7
Nissan Micra	8.1	23.1	8.9	36.1	12.5
Ford Escort	8.5	9.5	8.9	8.9	11.5
Peugot 405	9.9	13.4	10.2	9.9	11.6
Mercedes 190	14.3	14.4	17.2	15.6	12.3

Different explanations possible: different levels of collusion among countries, different import quota (e.g. Nissan in France and Italy), spatial price discrimination.

Higher mark-up for car in country of origin (e.g. Fiat in Italy). Possibly, national bias makes demand less elastic, which makes higher price in home market profitable.

Direct (3rd Degree) Price Discrimination

Multi-market discrimination

Third-degree price discrimination:

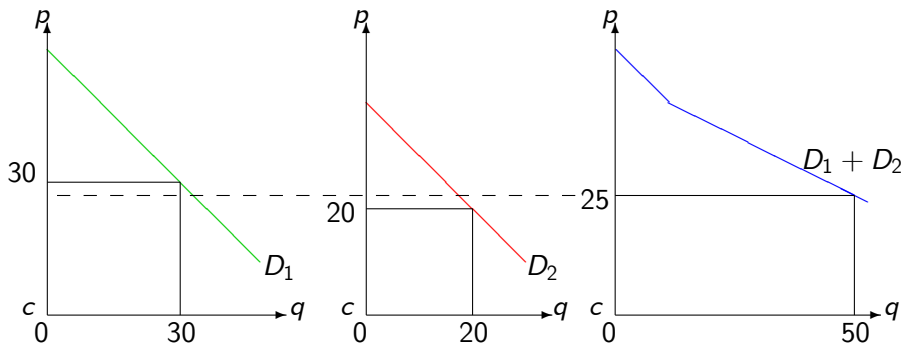
Firm charges different prices to different segments of consumers, where each consumer faces constant per-unit price.

Monopolist can discriminate between groups, but not within each group. Limited pricing instruments (no fixed fee). Example: student discounts
Take **2 separate markets**, with direct demands $D_1(p) = 60 - p$ and $D_2(p) = 40 - p$ (i.e. $D_1(p) > D_2(p)$ for all p)

- Discrimination: $p_1^d = 30 > 20 = p_2^d$, i.e. discount for consumers with lower willingness-to-pay (e.g. student discount)
- Uniform price $p^u = 25$: $p_1^d > p^u > p_2^d$, i.e. banning discrimination hurts students, benefits others

Direct (3rd Degree) Price Discrimination

Welfare effects



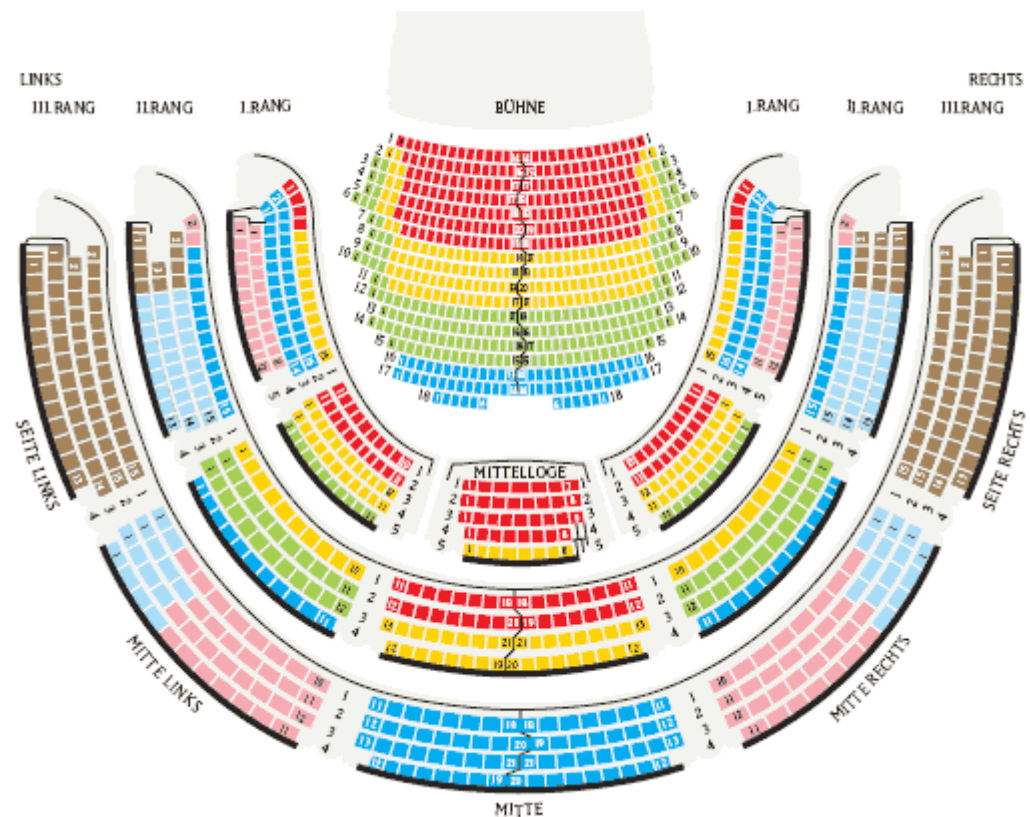
Welfare loss from discrimination: loss in mkt. 1 outweighs gain in mkt. 2
Welfare gain if discrimination opens up new market (e.g. $D_2(p) = 20 - p$)

Indirect Discrimination

Berlin State Opera

Price group	I	II	III	IV	V	VI	VII*
A-Prices	42	35	27	18	14	9	5
B-Prices	53	45	37	27	19	11	6
C-Prices	66	58	49	39	29	16	7
D-Prices	84	72	57	44	33	20	8
E-Prices	126	105	90	63	45	29	16
F-Prices	160	130	110	80	55	33	17

* Seats with limited view
Prices in Euro



Offer different qualities at different prices to all consumers

Indirect (2nd Degree) Discrimination

Non-linear prices

Firm offers same nonlinear price schedule to all consumers, i.e. menu of unit-price/fixed-fee combination.

Firm cannot distinguish different consumer groups. Examples: quantity discounts, flat rate

First, let consumers be identical, i.e. they have same demand $D(p)$

- **Simple (linear) price** of monopolist is p^m .
- **Two-part tariff:** monopolist extracts surplus $S(p^m)$ with fixed fee
- **Optimal non-linear price:** At any unit-price p monopolist can extract corresponding surplus $f = S(p)$. Monopolist's profit at unit price p is $\pi(p) + f = \pi(p) + S(p) = W(p)$, so set $p = c$

Maximize surplus with unit price, and extract all with fixed fee!

Indirect (2nd Degree) Discrimination

Incentive compatibility

Second, let there be **two types** of consumers: low-demand and high-demand, i.e. $D_H(p) > D_L(p)$ for any p

Let's do same trick...

- **Unit price** maximizes surplus: $p_L = p_H = c$
- **Fixed fee** extracts all surplus: $f_H = S_H(c) > S_L(c) = f_L$

High-demand consumer prefers to take offer of low-demand consumer
No **self-selection**, since both types choose (p_L, f_L) , and “lost” profit of:

$$[S_H(c) - S_L(c)] \times (\text{No. of high-demand consumers})$$

What to do?

Indirect (2nd Degree) Discrimination

Quantity discount

Monopolist chooses menu of two-part tariffs $\{(p_L, f_L), (p_H, f_H)\}$ carefully.

- **Fixed fees** satisfy...

- ▶ **Participation constraint:** Give low-demand consumer incentive to buy:

$$S_L(p_L) - f_L = 0$$

- ▶ **Self-selection constraint:** Resolving incentive compatibility problem, set fee of high-demand consumer that makes it self-select:

$$\begin{aligned} S_H(p_H) - f_H &= S_H(p_L) - f_L \\ f_H &= S_H(p_H) - [S_H(p_L) - S_L(p_L)] \end{aligned}$$

Remaining constraints satisfied if $p_L \geq p_H$.

- **Unit prices** set optimally...

- ▶ **High-demand** $p_H = c$ to maximize high-demand consumer's surplus
- ▶ **Low-demand** p_L trades off: low-demand consumer's surplus, $S_L(p_L)$, and high-demand consumer's info. rent, $S_H(p_L) - S_L(p_L)$: $p_L > c$

Indirect (2nd Degree) Price Discrimination

Bundling

Multiproduct monopolist supplies 2 goods, where demand for each good at most 1. Willingness-to-pay v_1 for good 1, v_2 for good 2, and $v_1 + v_2$ for bundle. For example,

User type	No. Users	Good 1	Good 2
Specialist 1	50	4	0
Specialist 2	40	0	5
Generalist	20	3	3

Options to monopolist...

- 1 **Pure components:** individual price for each good $(p_1, p_2) = (3, 5)$
- 2 **Pure bundling:** offer only bundle at price $\tilde{p} = 4$
- 3 **Mixed bundling:** separate goods and bundle $(p_1, p_2, \tilde{p}) = (4, 5, 6)$

Different pricing strategies, give different segmentation of market.

Mixed bundling maximizes profit of firm

Indirect (2nd Degree) Discrimination

Versioning

Another way to segment market is to offer goods of **different qualities** (e.g. premium and basic editions of software, first- and second-class train-coaches)

Extreme strategy is to downgrade premium product, and sell **damaged good** at discount. Damaged good costs more to produce, but is sold at discount to segment market.

Indirect (2nd Degree) Discrimination

Dynamic discrimination

Firm can charge different prices for good bought at different times.
Potential differences with previous problems...

- **Myopia:** Consumers may not know preferences in future
- **Commitment:** Firm may not be able to commit to price policy

2-period setting: Past consumer behavior helps monopolist to segment market: p_1 , price for unit in period 1; p_2 , price for unit in period 2 if consumer did not buy in period 1; \hat{p}_2 , price for unit in period 2 if consumer bought in period 1

Two basic models...

- 1 **Single-sale:** consumers buy at most one unit of good (intertemporal discrimination, $p_1 \neq p_2$), e.g. durable good
- 2 **Repeated-sale:** consumers may want to buy in both periods (behavior-based discrimination, $p_2 \neq \hat{p}_2$), non-durable good

Indirect (2nd Degree) Discrimination

Intertemporal discrimination (durable good)

Firm learns from sales in first period: consumers who did not buy then, are low-demand consumers. Firm has incentive to reduce price in second period to attract some of low-demand consumers.

But if consumers anticipate better deal in second period, some will wait.

Firm can attract more consumers to buy in first period by reducing first-period price. **Erosion of monopoly power** (monopolist “competes against” future self since it cannot commit credibly)

Similar effects in repeated-sales model (non-durable goods)

Ban on dynamic discrimination would give monopolist commitment to high price now and tomorrow.

Other solutions: lowest-price guarantees, leasing instead of selling

Summary

- **Perfect Discrimination:**

Discrimination increases producer surplus (profit), increases customer base, but decreases consumer surplus.

- **Direct Discrimination:**

Discrimination gives welfare loss if total output stays equal, but welfare increases if discrimination opens new market.

- **Indirect Discrimination:**

Non-linear pricing schemes, bundling, versioning, dynamic pricing schemes can be used for market segmentation, with ambiguous welfare effects.

We focused here on discrimination by monopolist. However, in practice also **competing firms** use price discrimination. Effect of competition on prices is ambiguous. Need for **case-by-case analysis**.

Readings and Outlook

- **Readings:**

Motta (2004), Subsections 7.3.2.1-4, and section 7.4

- **Further readings:**

Cabral (2000) "Introduction to Industrial Organization" MIT Press, Chapter 10

- **Tomorrow:** Competition Policy and Innovation