Microeconomics
Segment 30

Three Types

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Analytics of price discrimination

- Economists actually have specified three different types of price discrimination, helpfully labeled 1st, 2nd, and 3rd degree.
- 1st degree is sometimes called "perfect."
- 2nd degree is sometimes called "self-selected."
- 3rd degree is sometimes called "observable-based."
- I will define all three and sketch out models to help you understand them.

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Actually, I'm not sure that that's true. *I* sometimes call them those terms because I find the degree stuff unhelpful.

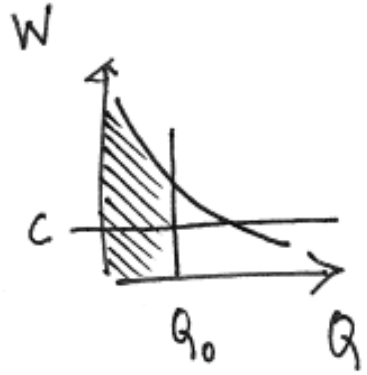
1st degree

Each consumer's preferences are completely known to the monopolist.

Monopolist can make a different take-it-or-leave-it offer to each.

Monopolist has constant marginal cost c.

Consider a single consumer's



This curve represents willingness to pay per unit, so willingness to pay for Q_0 units $\int_0^{Q_0} W(t)\,dt$ ntire shaded area, or

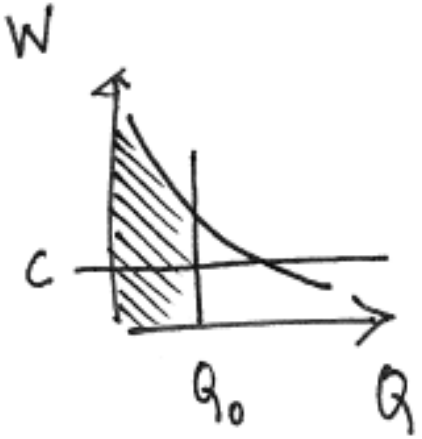
Think about this curve as representing your demand for something that comes in continuous amounts, like coffee. You are willing to pay 15 cents for the first ounce, 14 cents for the second, etc.

1st degree

Monopolist, for each consumer separately, choo

$\max_{P,Q}$ P-cQ subject $\int_0^Q W(t)dt \geq P$

Clearly, $P^* = \int_0^{Q^*} W(t)dt$ and $W(Q^*) = c$



1st degree

producer surplus, willing to buy

consumers must be constant marginal cost

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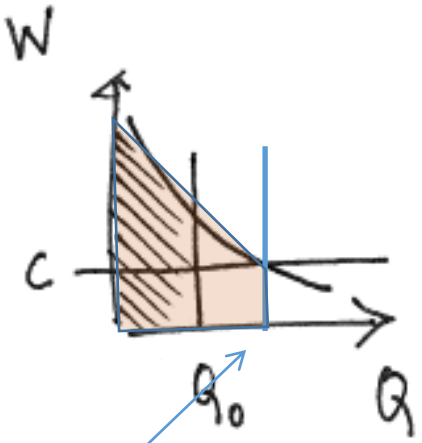

This is the optimal quantity, and the shaded area is the corresponding price.

Why? Think about the marginal unit sold--- monopolist will lose money to the right and leave money on the table to the left. And shaded area is exactly what the monopolist can charge.

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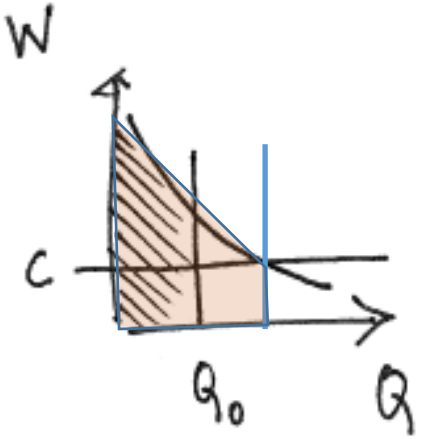

For instance, a monopolist would want to sell 9 ounces of coffee for 99 cents to this consumer if she valued the first ounce at 15 cents, second at 14 cents, etc., and the marginal cost per ounce is 7 cents.

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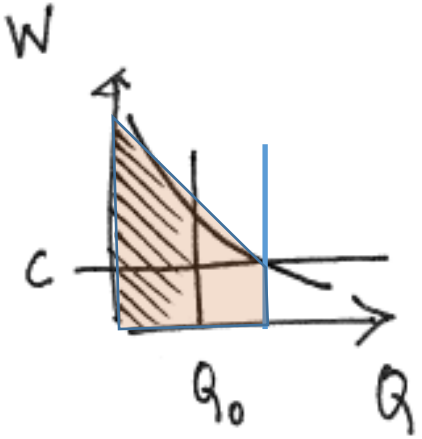

Another way to think about this solution: sell until price is equal to marginal cost but charge higher prices for the inframarginal units.

Note also that the solution is simpler when consumers only buy 0 or 1 unit of a good, as opposed to a continuous amount---then just charge each consumer his or her willingness to pay, as long as it's greater than the marginal cost.

1^{st} degree

The monopolist can achieve the same outcome with a two-part tariff $A_i + cQ_i$, where A_i is consumer i's surplus when price is set to marginal cost.

1^{st} degree price discrimination is socially optimal (achieves the greatest amount of total welfare for market participants), but *all* surplus goes to the monopolist.

Not so common, really, because monopolist needs so much information about each consumer and has to be able to prevent arbitrage (reselling).

Can we think of any market where the seller gathers consumer-by-consumer information that could allow them to estimate individual demand curves or willingness-to-pay?

1st degree

Examples of two-part tariffs? Rental cars, some amusement parks, cover charge + drinks, ...

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And it's more profitable than straight monopoly pricing for the firm.

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College financial aid?

Online retailers?

"Catalog retailers play this game. An old trick is to send out catalogs that sell identical goods except at different prices. The unlucky consumers who live in a more free-spending zip code may see only the higher prices. Victoria's Secret has used these tactics. Staples brazenly sends out different office supply catalogs with different prices to the same customers. The price-sensitive buyers know which to buy from. The inattentive ones pay extra."

This quote from Forbes also illustrates how certain sellers, like catalog and online retailers, r
an easier time price discriminating than traditional retailers, both through the price-setting
through the detailed information they have to be able to estimate your demand.

3rd degree

Monopolist can make take-it-or-leave-it offers to different observable classes.

Assume there are two populations, i = 1,2.

They have independent demands $Q_i(P)$ and no way to arbitrage.

Let's consider unit demands for simplicity:

$$\max_{P_1,P_2} (P_1-c)Q_1(P_1) + (P_2-c)Q_2(P_2)$$

There are two first order conditions, one involving P_1 and the other P_2, so this is solving two unrelated monopoly problems.

So, $\frac{P_i^* - c}{P_i^*} = \frac{-1}{\varepsilon_i}$

demand elasticity for group i

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ε_i: demand elasticity for group i

This is like senior or student discounts.

3rd degree

Relative to uniform pricing, there is an inefficiency with this type of price discrimination: some people will be served who have lower valuations than some who are not served.

If the monopolist is forced to set a uniform price, she may set a price between P_1^* and P_2^*, or may just set $P^* = P_i^*$ (the higher of the two) and only serve one market, depending on the shape of the demand curves and the distance between them. Welfare effects are ambiguous. Deadweight loss might be mitigated with price discrimination relative to uniform pricing if output goes up, but there is still the misallocation.

Even if the misallocation is inefficient, we sometimes invoke a social or broader economic justification for it: "Seniors have spent their lives contributing to society, so society can give something back to them by

3rd degree

Think of the 64-year-old who loves the opera but cannot quite justify the $100 ticket price and the 65-year-old who doesn't care much for the opera but is willing to spend $40 for the senior discount ticket.

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Why do we care? Suppose the 64-year-old had a valuation of $99 for the opera and the 65-year-old had a valuation of $40. Suppose also that the marginal cost of a seat is $40. How much surplus (consumer + producer) results from a sale to the 64-year-old relative to the 65-year-old?

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3rd degree

Examples: Italian grocery shopping, student and senior discounts, academic pricing for software and data (where you need a university email address), differential cover charges by gender at clubs, etc.

2nd degree

This case is the most difficult, both for us to analyze and for the seller to pull off. Here types or willingness-to-pay are not observable and/or cannot be enforced.

Seller, therefore, must rely on self-selection.

How could that work?

2^{nd} degree

Setting up and solving the problem of the monopolist who wants to engage in 2^{nd} degree price discrimination is informative and interesting, but pretty complicated, even in the simplest case of two types of consumer.

I will leave the analytics of 2^{nd} degree price discrimination to a more advanced class, like industrial organization or ecommerce.

Instead, I will try to offer some intuition for how it might work and also state some welfare results.

2nd degree

As I said, the seller must rely on self-selection.

How could that work? Consumers are not going to voluntarily pay more for something because their (unobserved) willingness-to-pay is higher.

The seller has to set up a system where high WTP types select into paying a higher price because the higher priced product is higher quality or quantity. (Formally, the analysis is the same whether the difference is quality or quantity.)

Examples: first class v. coach ticket, premium memberships, personal v. enterprise software

2nd degree

There are a bunch of assumptions about the utility of the high and low types and their relative willingness-to-pay for higher quality (quantity).

If those assumptions are met, the monopolist can offer two goods, high and low quality, at two different prices, get the high types to select into high quality, and extract more surplus by virtue of the fact that the two groups have been effectively separated.

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This is what makes it price discrimination, as opposed to just charging a higher price for a good that, perhaps, costs more to produce.

2^{nd} degree

Some results:

The quality for the high type is not distorted by price discrimination---they get precisely the efficient level of quality given costs and valuations---but quality is distorted down for the low type.

This distortion is necessary to keep high types from wanting to masquerade as low types, getting somewhat lower quality but a much better deal.

High types receive surplus, low types do not.

Overall welfare lower than in 1^{st} degree price discrimination, comparison with uniform pricing is ambiguous.

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