Notes 7—Price discrimination

1. **Price discrimination, defined**: Charging different buyers different prices for the same good, even though there is no difference in costs between customers.

2. **Price and output determination under price discrimination**

We can explain how price discrimination affects firm’s profits using ordinary demand and supply curves. Say that you own a bakery and produce, among other things, creampuffs, which you sell by the dozen. Let Figure 1 shows your demand and supply curves. The demand curve’s downward slope indicates that different customers have different willing-to-pay prices. You line them up in order, with the consumer with the highest willing-to-pay price—that’s Chrissie—at the left. Say that she is willing to pay, at a maximum, $10 for a dozen creampuffs rather than go without. (That’s how we derive the demand curve below.) The supply curve represents your production costs, which increase with output because of diminishing returns (i.e., in the usual way). Say that the equilibrium price and quantity are $5 and 550 dozen, respectively. If so, that’s because the Joe, your 550th customer—ranked in willing-to-pay price order—is just barely willing, kicking and screaming, to pay you a $5 for a dozen creampuffs. Now, you figure that the cost of producing that 550th dozen is $5, so you’re just barely willing to sell it to him (the cheapskate). Since we’ve lined the consumers up in willing-to-pay order, the next guy in line, Ralph, will not pay you $5, no way, don’t even ask. And diminishing returns (i.e., increasing marginal costs) mean that the 551st dozen will cost you a bit more than $5. So, that’s it. You stop production at 550 dozen.

Your total revenue TR = P x q = $5 x 550 = $2,750. Your costs, represented by the area below the supply curve, i.e., the green checkerboard area, are approximately $1,650. (See note 1 below.) So your producer surplus, labeled PS in the diagram, is $1,100. Not too bad. But hey—look at the consumer surplus (area CS) that your customers are walking away with. This represents value, i.e., utility, they received but didn’t pay for. (The more you think about it, the madder you get and the more you start thinking that maybe they’re thieves!)

Why does this happen? Because, in order to sell Joe his dozen creampuffs, you had to drop the price not only for him but for everybody. Even for Chrissie, who would have paid you $10 without blinking an eye.

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1 Find the area the triangle labeled PS as ½ x 4 x 550 = $1,100; subtract this from TR to get TC.
Now, how can you get this money back? Clearly, you can’t just raise the price to $10 across the board, because then you’ll only sell the one dozen creampuffs to Chrissie, which doesn’t sound like a profit-maximizing strategy. Ideally, you’ll sell Chrissie the creampuffs for $10, the next customer in line for $9.95 or whatever his maximum willing-to-pay price is, and so on, ’til you charge Tightwad Joe his miserable 5 bucks. You still won’t sell to Ralph, though, because you still can’t produce the 551st dozen at a cost above the price he is willing to pay. (Price discrimination has no effect on your production costs.)

How to do this? Well, you could auction off the creampuffs, one box at a time, just like they were a collection of Old Masters paintings at Sotheby’s. But you won’t, of course, because the transactions costs are too high for a bunch of creampuffs. You quickly realize that your ideal—capturing all the consumer surplus, as shown in Figure 2—just isn’t feasible in your case. So you examine possible lower cost methods of (a) identifying your customers’ maximum willing-to-pay prices and (b) charging them those prices. That’s what price discrimination requires. You realize, of course, that these lower-cost methods will also give poorer results, that is, you will be able to capture some of the consumer surplus but not all of it. But as long as the consumer surplus you capture is greater than the cost of the price discrimination to you, then your net profits will rise.

Note in Figure 2 that even though you capture all consumer surplus, output and consumption are the same as before. That’s because you aren’t charging any single customer a price higher than what he is willing to pay, and so you lose no sales. Your customers are probably grumbling to beat the band, but they’re still buying. But you might want to park your car in a well-lit place.

Three degrees of price discrimination

1st degree, or perfect, price discrimination. As noted above, this consists of charging each potential customer his or her absolute maximum willing-to-pay price. It’s “perfect” because you discriminate with perfect precision among your customers. It’s also pretty nice for you, because you truly maximize profit by capturing all the consumer surplus. Problem is, the cost of (1) obtaining information on customers’ willing-to-pay prices and (2) selling the goods at these differential prices is likely to be very high. Unless you are selling a very few items for very high prices, and hence with a likely very large difference between the market equilibrium price and the maximum willing-to-pay price of the most eager customers, it’s not worth the cost to the firm. Auctions are about the only example of this you’ll find. Note that eBay has become a big deal by selling a lot of low-price items because the online format greatly reduces...
the auctioning costs to the sellers (and buyers, too) and increases the demand for an item beyond your local neighborhood rummage sale queens.

2nd degree price discrimination: Quantity discounts Why does Wal-Mart pay a lower price for Purina Dog Chow than Joe’s Pet Shop? Simple. Purina wants Wal-Mart's massive business so badly that they're willing to accept a lower profit margin per bag in order to generate volume and gross profit. With Joe, well, they'll sell it to him, but at a higher price. (Actually, I'd bet that small pet shops don't carry anything other than Eukanuba or Science Diet or other premium dog foods that Wal-Mart doesn't sell. Can you guess why?) This is a very low cost method of price discrimination for the seller.

3rd degree price discrimination: Different prices for different markets This is by far the most common type. Cents-off coupons, senior citizen discounts, kids eat free, you name it, it's everywhere. All these have a common characteristic: They segment the market by readily identifiable characteristics, i.e., by characteristics that can be observed at very low cost to the seller. If you walk up to the counter at McDonalds and look like you're a senior citizen, then you get the senior discount. If you don't get it, just ask, and they'll give it to you unless you look like you're nothing but a 25-year-old smart aleck. Airline ticket pricing, which we'll discuss in class and in the example below, is an important instance. Colleges do it, too. Desirable students, whether because they're smart or talented or help the college achieve some kind of notional affirmative-action/diversity/whatever goal it has set, are given discounts on their tuition called scholarships.

Necessary conditions for price discrimination

OK, so what conditions must a situation meet in order for the firm to pull of price discrimination successfully? Three, it turns out: (1) You must be able to identify each consumer's maximum willing-to-pay price at a reasonable cost. (2) You must be able to charge each consumer this price at a reasonable cost. ("Reasonable" means that the cost is less than the extra revenue you earn as a result of price discriminating.) (3) Customers must not be able to resell the goods easily. (This explains why new car dealers practice price discrimination shamelessly.)

Does price discrimination benefit consumers?

From the above it's clear that price discrimination can raise firm's profits. Can it do anything beneficial for consumers? Surprisingly (or perhaps not), yes. Specifically, it can increase output and hence consumption—it can even mean that a good that benefits consumers will be produced when, in the non-price discriminating case, it would not.

Consider the case of airline ticket pricing, which is a classic case of price discrimination. Refer to the table below.

Say that for a particular market (i.e., a flight) there are two sets of customers: Suits, who are willing to pay up to $900 for a ticket, and Grannies, who are willing to pay no more than $250 per ticket. There are 40 suits and 80 Grannies in the example.

The costs of operating the flight (TFC and MC) are given in the table. The key in this example is that TFC is a large proportion of TC, and hence charging customers a price equal to the marginal cost alone, as in scenario 2, will result in a huge loss for the firm.

Now, in scenario 1 below: The airline decides to skim the market, charging $900 per ticket, which implies that only the Suits will fly; the Grannies will either stay home or take a Greyhound. TR for the airline is $900 x 40 tickets, or $36,000. TC = TFC + TVC = $35,000 +$3,000 = $38,000, since TVC = sum of marginal costs = $75 marginal cost x 40 passengers. Thus the airline makes a $2,000 loss; it will respond by dropping this flight from its schedule.

In scenario 2, the airline sets the ticket price low enough, at $250, to attract all the Grannies, too. But it thereby gives up $650 ($900 - $250) in revenue from each of the 40 suits who would have paid the full $900 price. It nets only $30,000 revenue, with costs of $44,000 (higher because of the $75 marginal cost for each of the Grannies who are now flying), incurring a loss of $14,000. Again, the airline won't be willing to offer this flight. Note that the price is more than enough to cover the marginal cost of a passenger, and hence total revenue is larger than total variable costs. But it's those darn fixed costs that keep the airline in the red.

Now, in scenario 3: The airline figures out some way to charge each of the Suits their maximum willing-to-pay price of $900 but still let the Grannies fly at $250 each. Result? TR becomes $56,000 with costs the same as in scenario 2, for a net profit of $12,000 on the flight. As a result, the airline not only maximizes its profit, but since it is now willing to offer the flight, it increases output as well. Had it not been for price discrimination, there would have been no service and all customers—both Suits and Grannies—would have been worse off.

Think of the applications of this analysis to, say, prescription drugs (insured vs. uninsured customers).
How price discrimination can raise profits and increase production—the case of high fixed costs

Product: Round-trip flight from Huntsville to NYC/LaGuardia

Assume 2 sets of customers:

<table>
<thead>
<tr>
<th></th>
<th>Suits</th>
<th>Grannies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willing to pay</td>
<td>40 willing</td>
<td>80 willing</td>
</tr>
<tr>
<td>$900</td>
<td>$250</td>
<td></td>
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</tbody>
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TFC for flight $35,000  
MC (constant) of a customer $75

1. Set price at $900 (Suits only will fly)

TR = P_sq_s = $900 * 40 = $36,000
TVC = MC * q_s = $75 * 40 = 3,000
TC = TFC + TVC = 38,000
profit = TR - TC = $ (2,000) EEK

2. Set price at $250 (both Suits and Grannies will fly)

TR = Pq = $250 * 120 = $30,000
TVC = MC * q = $75 * 120 = 9,000
TC = TFC + TVC = 44,000
profit = TR - TC = $ (14,000) EEK again

3. Now—charge Suits $900 and Grannies $250 (i.e., price discrimination)

TR = P_sq_s + P_gq_g = $900*40 + $250*80 = $56,000
TVC = MC*q = $75*120 = 9,000
TC = TFC + TVC = 44,000
profit = TR - TC = $ 12,000 Profit at last!