Monopoly
Chapter 24 (cont.)
About Midterm 1

• Out of 50:
  • Mean $\approx 35$
  • Median $= 36$
  • Standard Deviation $\approx 8.3$

• *Approximate* grade cutoffs:
  
  A range: 43
  B range: 36 (median)
  C range: 29
About Midterm 1

MT1: % of class scoring < or = to x (and above the next lowest bin)
About Midterm 2

• Coming up soon

• Quiz 2 in section this week!

• **Clicker vote:** What should MT2 look like?
  
  A) Keep the same format: 8 MC + 2 BB  
  B) Cut down on MC and add to BB: 4 MC + 3 BB  
  C) All BB: 4 BB
Motivating Questions

• What price and quantity does a monopoly choose?

• What are the welfare effects of monopoly?

• What are the effects of taxes on monopolies?

• Is monopoly ever justified/efficient?

• Monopoly Behavior: price discrimination
Consider a quantity tax, $t$ per unit

- Consumers pay $p = P(y)$, but monopoly only gets $P(y) - t$

- Profit maximization problem:
  \[
  \max_y (P(y) - t)y - C(y) = \max_y P(y)y - C(y) - ty
  \]

- Optimal condition:
  \[
  MR(y) = MC(y) + t
  \]
Example: Linear Demand

- Inverse demand: \( P(y) = 10 - y \); cost: \( C(y) = 4y \)
- Find MR: \( MR(y) = 10 - 2y \)
- Find MC: \( MC(y) = 4 \)
- Optimality condition:

\[
MR(y) = MC(y) + t \iff 10 - 2y = 4 + t,
\]

- So \( y^t = \frac{6-t}{2} = 3 - \frac{t}{2} \)
- Find price by plugging into inverse demand:

\[
p^t = 10 - (3 - \frac{t}{2}) = 7 + \frac{t}{2}
\]

Notice: with \( t = 0 \), \( p^m = 7 \), so the tax raises the price by \( p^t - p^m = \frac{t}{2} \), i.e. less than the full amount of the tax.
Monopoly Taxation

General (not just for monopoly) question: how much of a tax is passed to the consumer?

Recall our analysis of tax incidence competitive firms: the price rises by less than the amount of the tax.

Also, recall how elasticity influences tax incidence: the more elastic supply, the more of the tax is borne by the consumer.
Monopoly Taxation

General (not just for monopoly) question: how much of a tax is passed to the consumer?

- Let’s answer this question more rigorously and more generally.
- Start with the perfectly competitive case, where \( p = MC(y) + t \) is the profit maximizing condition.
- Differentiate w.r.t. \( t \):
  \[
  \frac{dp}{dt} = \frac{dMC}{dy} \frac{dy}{dt} + 1 \leq 1
  \]

- The first term is negative, except when \( MC \) is constant, in which case supply is perfectly elastic and \( t \) is passed completely to the consumer.
Monopoly Taxation: How much is passed to the consumer?

Is this as bad as it can get for the consumer, bearing the full incidence of the tax?

- Let’s look at the monopoly case
- In our example, \( p^t - p^m = \frac{t}{2} \), so the price only goes up by half the amount of the tax
- For a more general answer, start with the profit maximizing condition, \( MR = MC \).
- Recall that we can rewrite the profit-maximization condition in terms of elasticity:

\[
P(y^t) = \left[ \frac{1}{1 + \frac{1}{\epsilon}} \right] [MC(y^t) + t]
\]

- Differentiate w.r.t. \( t \):

\[
\frac{dP}{dt} = \left[ \frac{1}{1 + \frac{1}{\epsilon}} \right] \left[ \frac{dMC}{dy} \frac{dy}{dt} + 1 \right] + [MC(y^t) + t] \frac{d[junk]}{dt}
\]
Monopoly Taxation: How much is passed to the consumer?

Ugly:

\[
\frac{dP}{dt} = \left[ \frac{1}{1 + \frac{1}{\epsilon}} \right] \left[ \frac{dMC}{dy} \frac{dy}{dt} + 1 \right] + \left[ MC(y^t) + t \right] \frac{d[junk]}{dt}
\]

What does this mean?

- Let’s consider the worst case for the consumer: perfectly elastic supply, i.e. constant MC \(\rightarrow \frac{dMC}{dy} = 0\).
- Simplify expression:

\[
\frac{dP}{dt} = \left[ \frac{1}{1 + \frac{1}{\epsilon}} \right] + \left[ MC(y^t) + t \right] \frac{d[junk]}{dt}
\]

- First term: increasing tax increases effective MC, so price increase is proportional to markup
- Second term: but moving along demand curve can change elasticity, size of the markup.
Monopoly Taxation: How much is passed to the consumer?

Original question: does $p^t$ increase by the full amount of $t$?

\[
\frac{dP}{dt} = \left[ \frac{1}{1 + \frac{1}{\epsilon}} \right] + [MC(y^t) + t] \frac{d[junk]}{dt}
\]

- First term: increasing tax increases effective MC, so price increase is proportional to markup
- Second term: but moving along demand curve can change elasticity, size of the markup.
- With linear demand, we’ve seen the second effect dominate (example)
- When is the second effect not so important?
Moving along the demand curve doesn’t necessarily change elasticity.

- Recall: constant elasticity demand curve $D(p) = p^\epsilon$
- With this kind of demand, elasticity doesn’t change along curve, markup multiplier is constant
- So $\frac{d[junk]}{dt} = 0$ and first term dominates
- This means that price increases by multiplier ($> 1$) times tax
Monopoly Taxation: How much is passed to the consumer?

Example: constant demand elasticity

\[ P(y^t) = \left[ \frac{1}{1 + \frac{1}{\epsilon}} \right] [MC(y^t) + t] \]

- Suppose \( D(p) = p^{-2} \) so \( \epsilon = -2 \) and \( C(y) = 4y \) so \( MC(y) = 4 \)

\[ P(y^t) = \left[ \frac{1}{1 + \frac{1}{-2}} \right] [4 + t] = 2[4 + t] = 8 + 2t \]

- \( p^m = 8 \) with no tax, so the tax raises the price by \( p^t - p^m = 2t \), i.e. the price rises by twice (markup = 2) the amount of the tax

- *The monopolist exploits the tax to increase her profit margin.*

- This can be very bad for consumers.
A natural monopoly arises when the firm’s technology has economies-of-scale large enough for it to supply the whole market at a lower average total production cost than is possible with more than one firm in the market. In other words, ATC is decreasing, so a smaller producer would have higher costs.
A natural monopoly deters entry by threatening predatory pricing against an entrant. Setting \( p \) closer to \( MC \) will force the entrant to exit, because it has higher costs.
Inefficiency of a Natural Monopoly

Like any profit-maximizing monopolist, the natural monopolist causes a deadweight loss.
Regulating a Natural Monopoly

Why not command that a natural monopoly produce the efficient amount of output? Then DWL = 0, right?
Regulating a Natural Monopoly

At the efficient output level, $y^e$, $ATC(y^e) > p(y^e)$ so the firm makes an economic loss.

A natural monopoly cannot be forced to use marginal cost pricing. Doing so makes the firm exit, destroying both the market and any gains-from-trade.
Government & Monopoly

- Because of the inefficiency of monopoly, government has an interest in discouraging abuse of monopoly power.
- For a natural monopoly, this may mean regulatory schemes that induce the efficient output level, without exiting.
- Or, the government become the provider of the natural monopoly good, providing it at below the profit-maximizing cost.
- Because it’s difficult to prevent people from stealing intellectual property, the government grants patents/copyrights which give monopoly power.
- This gives firms the ability to capture the profits from the new technologies they produce, giving them the incentive to innovate.
- The government trades off the inefficiency of monopoly for the private provision of knowledge/R&D, a public good.