

Monopoly

Chapter 24 (cont.)



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

Taxation and Monopoly

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:

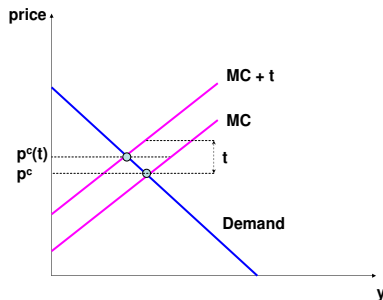
$$p^t = 10 - \left(3 - \frac{t}{2}\right) = 7 + \frac{t}{2}$$

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 :

$$\frac{\partial p}{\partial t} = \frac{\partial MC}{\partial y} \frac{\partial y}{\partial t} + 1 \leq 1$$

- 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 :

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

Monopoly Taxation: How much is passed to the consumer?

Ugly:

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

What does this mean?

- Let's consider the worst case for the consumer: perfectly elastic supply, i.e. constant MC $\rightarrow \frac{\partial MC}{\partial y} = 0$.
- Simplify expression:

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

- 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 ?

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

- 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?

Monopoly Taxation: How much is passed to the consumer?

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 $\frac{\partial[junk]}{\partial t} = 0$ 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 $MC(y) = 4$

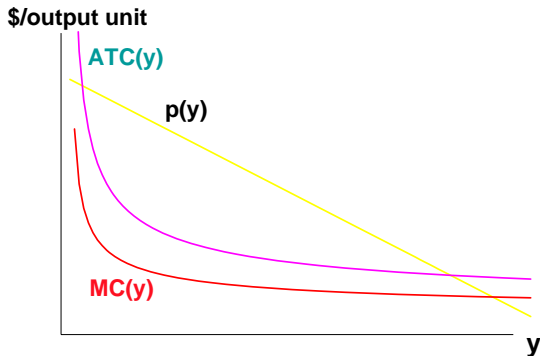
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$$P(y^t) = \left[\frac{1}{1 + \frac{1}{-2}} \right] [4 + t] = 2[4 + t] = 8 + 2t$$

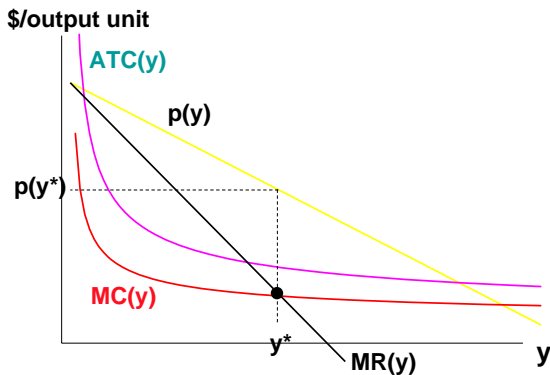
- $p^m = 8$ with no tax, so the tax raises the price by $p^t - p^m = 2t$, i.e. the price rises by twice (markup = 2) the amount of the tax
- *The monopolist exploits the tax to increase her profit margin.*
- This can be very bad for consumers.

Natural Monopoly

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.



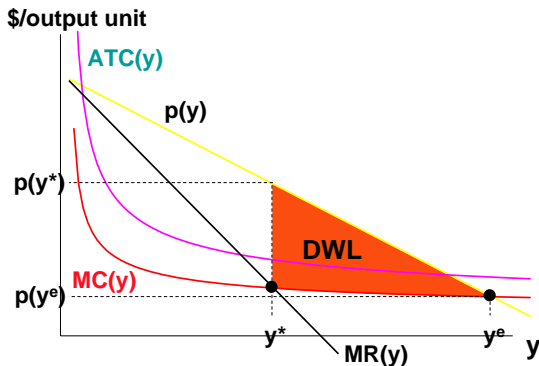
Natural Monopoly



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.

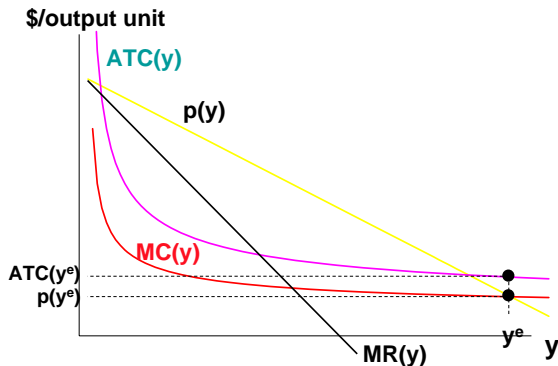
Inefficiency of a Natural Monopoly

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



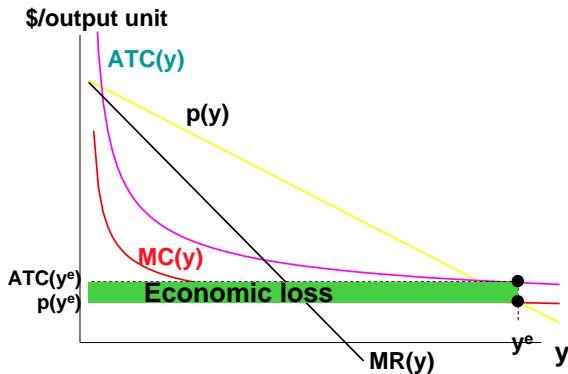
Regulating a Natural Monopoly

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