

1 Monopoly

- There is only one firm in the market.
- So firm treats demand curve as given (rather than price).
- Let demand curve be $P(Q)$, $P' < 0$.

How much output should the firm produce?

$$\begin{aligned}\pi(Q) &= R(Q) - C(Q) \\ &= P(Q)Q - C(Q)\end{aligned}$$

What is the increase in revenue from increasing Q by ΔQ ?

$$\begin{aligned}MR(Q)\Delta Q &= P(Q)\Delta Q + Q\frac{\partial P}{\partial Q}\Delta Q \\&= \left\{1 + \frac{Q\partial P}{P\partial Q}\right\}P\Delta Q \\&= \left\{1 + \frac{1}{\varepsilon_D}\right\}P\Delta Q \\&< P\Delta Q\end{aligned}$$

- So you know that monopolist will not produce at inelastic portion of demand curve.
- We can plot $MR(Q)$ as a function of Q . Note that $MR(Q) < P(Q)$. Marginal revenue can be negative.
- Monopolist wants to solve

$$\max_Q \pi(Q) = P(Q)Q - C(Q)$$

- At the optimum monopolist will choose Q^m such that,

$$MR(Q^m) = MC(Q^m)$$

- Since $MR(Q) < P(Q)$, know $MC(Q^m) < P(Q^m)$. So we already know that there is a deadweight loss to monopoly. Why? marginal social cost of production is $MC(Q^m)$ which is less than $P(Q^m)$ which is what the marginal consumer is willing to pay for that unit.
- How does monopoly output compare with competitive output?
- Look at the special case where $MC(Q) = c$ for every firm in the industry. In this case, $P(Q^*) = c$ in competitive case (where we sum up supply of all competitive firms).

- But monopolist will produce $MR(Q^m) = c$, $P(Q^m) > c$ and $P(Q^m) < P(Q^*)$.
- Deadweight loss under monopoly.
- We know that competitive output level is efficient.
- With monopoly, less consumer surplus but more producer surplus. The difference is the deadweight loss due to monopoly.
- How much monopoly is there?
- There are usually two forms of monopolies.
 - 1) Government sanctioned monopolies.
 - 2) Natural monopolies.

- Natural monopolies are industries with declining average cost curves. So each firm wants to expand output and drive competitors out.
- How many natural monopolies are there? Post office? Fire protection? Roads? Software?
- The market test for a natural monopoly is that it should drive all but one firm out of the market.
- It turns out that there are few natural monopolies using that metric. We forbid private firms to deliver first class mail.
- Is Microsoft windows a natural monopoly? If the government develop software, how many consumers will use it? But what about open source software such as linux?

- Linux can get users but its free. So can a private software company charge a positive price for operating system and compete with Microsoft?
- The standard argument for government intervention is that, we have natural monopolies. It is efficient to have one firm and so the government will prevent other firms from entering. In return, the government will regulate price which almost always does not work. There are two reasons: Firm has much more information than the govt. Second, its easy to bribe the government.
- What about patents? Patents and copyrights create monopolies. Here the issue is more interesting. Consider AZT. Here is a drug that provides benefits. Production cost is trivial. So why dosent a government not respect the patent and allow other firms to compete. The reason is that nobody will invest in research if they cannot appropriate the gains at

least for a short time. Drug companies are putting a lot of money in today for AIDS research and only AZT has hit it big. So the average company is losing money. If it sees that it cannot make back at least in expected returns, it will not invest. So here the govt has to think about the tradeoff between creating a monopoly and suffering welfare losses versus no patent where you will have much less inventions.

- There are few patents for basic research which is done mostly by universities. But applied research is mostly patented. This is not a simple problem. Patent policies are very important for creating incentives for research and development.

1.1 Welfare cost of monopoly

- Estimate the welfare cost of monopoly by Air Canada in flights between Toronto and Montreal. There are approximately 19 non-stop flights by AC and 3 from WestJet from Toronto to Montreal per weekday.
- Assumption of constant marginal cost industry: reasonable for airline industry for one route. You need one plane and one crew for one trip.
- Welfare loss:

$$\begin{aligned} WL &= ABC \\ &= \frac{1}{2}(P_m - P_c)(Q_c - Q_m) \end{aligned}$$

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$$\begin{aligned} WL &= \frac{1}{2}(P_m - P_c)(Q_c - Q_m) \\ &= \frac{1}{2} \left[\frac{P_m - P_c}{P_c} \right]^2 \frac{(Q_c - Q_m)P_c}{Q_c(P_m - P_c)} P_c Q_c \\ &= -\frac{1}{2} \left[\frac{P_m - P_c}{P_c} \right]^2 \varepsilon_D P_c Q_c \\ \frac{WL}{P_c Q_c} &= -\frac{1}{2} \left[\frac{P_m - P_c}{P_c} \right]^2 \varepsilon_D \end{aligned}$$

- Want estimate of P_m , P_c , ε_D
- Use Air Canada price to approximate monopoly price. Use West Jet price to approximate competitive price. Note that we expect monopoly price to be higher and competitive price also to be lower. So we underestimate welfare loss.

$$P_m = 400$$

$$P_c = 300$$

$$-1.5 < \varepsilon_D < -0.7$$

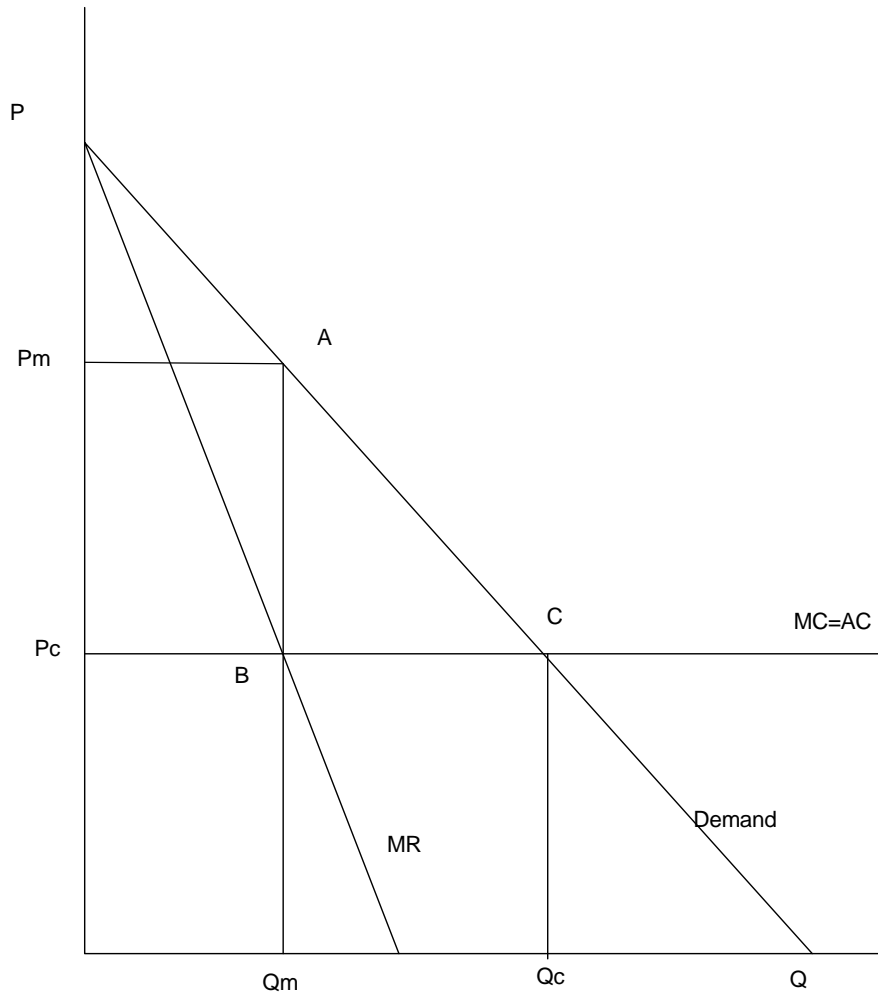
- Economists have generally estimated a elasticity of demand of -1.5 for leisure and -0.7 for business travel. We will assume an upper bound of -1 because demand for monopolist cannot be inelastic.

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$$\frac{WL}{P_c Q_c} |_{\varepsilon_D = -1.5} = \frac{1}{2} \left[\frac{100}{300} \right]^2 1.5 = 0.083$$

$$\frac{WL}{P_c Q_c} |_{\varepsilon_D = -1} = \frac{1}{2} \left[\frac{100}{300} \right]^2 = 0.056$$

- So a ball park estimate of the loss from Air Canada having an approximate monopoly is 5 to 8% of expenditure of a competitive industry. Is this a big number?
- Note the welfare loss is not the % difference in price which is 33%.



2 Price discrimination.

- Perfect price discrimination. If you have perfect price discrimination, you should charge each customer their reservation price. I.e. charge the demand curve. In this case, for the last unit you charge marginal cost. So you have all the surplus but outcome is efficient.
- In general , price discrimination leads towards efficiency.
- Pricing two markets
- You have two demand curves $P_1(Q_1)$ and $P_2(Q_2)$.
- A cost curve, $C(Q) = C(Q_1 + Q_2)$.
- How do you allocate output between the two markets?

- First consider a fixed output level Q .
- Let the initial allocation be Q_1 and Q_2 to the two markets respectively.
- Now consider switching ΔQ units from the first market to the second.
- What is the change in profits?

$$\begin{aligned} & -MR(Q_1)\Delta Q + MR(Q_2)\Delta Q \\ & = (-MR(Q_1) + MR(Q_2))\Delta Q \end{aligned}$$

So at the optimum,

$$MR(Q_1^m) = MR(Q_2^m)$$

When output is endogenous as well, at the optimum:

$$MR(Q_1^m) = MR(Q_2^m) = MC(Q_1^m + Q_2^m)$$

In general, $P_1^m \neq P_2^m$.

- What about the problem of resale or arbitrage between the two markets?
- Problem of re-import of prescription drugs to the US from Canada.
- Why is the Canadian government moving to reduce internet sales of drugs from Canada?

- Why are drug prices lower in Canada? Are Canadian buyers acting as monopsonists or is our demand more elastic?
- Due to resale, firms bundle goods. E.g. tourist class travel versus business class travel. This discrimination is inefficient but better than no discrimination.
- Universities also price discriminate by using scholarships.
- Governments usually forbid outright price discrimination. I.e. you cannot charge different prices to different people for the same good.