

Traditional Oil

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Last Lecture

- ▶ We looked at the changes in oil prices from the point of view of a more competitive model with expectations and inventory demand driving changes.
- ▶ Has an Occam's razor advantage over the monopoly models commonly offered.
- ▶ But there is still room for a monopoly power explanation.

Monopoly in the short run

- ▶ $P_m > P_{pc}$
- ▶ $Q_m < Q_{pc}$
- ▶ Dead weight loss and increase in producer surplus.

Monopoly in the long run

- ▶ k adjusts so that where $MR = LRAC$
- ▶ $MC = MR = SRAC$
- ▶ Costs are still minimized

Monopoly Can Be Price Regulated

- ▶ Requires a ceiling below P_m and greater than or equal to P_{pc}
- ▶ Results in a welfare improvement
- ▶ Part of the logic behind CPI-X regulation
- ▶ Complicated kink in MR develops
- ▶ Kills monopoly if $P < AC$
- ▶ Cool property that as P_c decreases, Q^* increases. Opposite of perfect competition

Tax A Monopolist?

- ▶ Books says you can't tax a monopolist to be more efficient.
 - ▶ Has not stopped people from trying, note 50% tax rate in 1950s.
 - ▶ The tax is less about efficiency and more about equity and government revenue requirements.
- ▶ You can improve welfare with a subsidy
 - ▶ Fails on the equity criteria

Oil Independence Argument

I have oil and but you have more oil and it is cheaper.

- ▶ I become independent and use all my oil. Who has power now?
- ▶ I buy your oil and save mine. Now who has power?
- ▶ Look at the Hottelling Rule, extract so that the price increases at the rate of interest.
 - ▶ Funny that this doesn't happen very often.
 - ▶ Lots of assumptions.

Multi-plant monopoly

- ▶ Two plants: One with high and one with low marginal costs.
- ▶ Horizontal summation of individual MC results in joint MC.
 - ▶ Book shows a kink. Gets flatter as the higher cost plant starts to produce.
 - ▶ More plants, more kinks.
- ▶ Profit maximizing is as usual $MR = MC$.
- ▶ Individual plant production
 - ▶ Find AR^* then
 - ▶ Find the Q such that MC of each firm equals AR^*
- ▶ Note that profit maximizing production is allocated based on cost
 - ▶ Not reserves
 - ▶ Not population
 - ▶ Not revenue requirements

Why This is A Problem for OPEC or any Cartel

- ▶ Cooperation requires that each be at least as well off as they would be without participating.
 - ▶ At some levels of demand, some members of cartel should not produce.
- ▶ Many ways of splitting profits
 - ▶ By production
 - ▶ By reserves
 - ▶ By marginal costs
 - ▶ Other

How to Break Splitting Profits

- ▶ By production
 - ▶ Produce as much as you can and depend on the cartel to store or destroy.
 - ▶ Ocean Spray approach.
- ▶ By reserves
 - ▶ Madly explore
 - ▶ Hard to reach oil is as valuable as easy oil. Venezuela, UK
- ▶ By marginal costs
 - ▶ Need a lump-sum transfer to non-producers to work.

In the end, cartels mix methods and take into account political and government revenue needs.

Wait? Politics and Government Revenue?

- ▶ Assumes a lot of government control over oil, which is true in many places.
- ▶ Favorable prices can be used to build alliances
 - ▶ Cuba and USSR
 - ▶ Venezuela and the Caribbean Basin
- ▶ Explicitly removes the objective of profit maximizing and changes to:
 - ▶ Revenue maximization or
 - ▶ Profit maximization subject to revenue constraint

Connect Oil Revenue to Macroeconomics

- ▶ Marginal Efficiency of Investment
 - ▶ Macro concept. Relationship between internal rate of return on investment and the scale of investment.
 - ▶ Inverse relationship
 - ▶ Optimal is where the interest rate, marginal cost, is equal to MEI, marginal benefit.
- ▶ Optimal governmental investment determined by $MEI=r$
- ▶ Many combinations of P and Q satisfy
 - ▶ If revenue requirement can not be achieved, firms revenue maximize, $MR = 0$
 - ▶ If revenue requirement can be achieved, firm may reduce output from from MC splitting to allow others to have more revenue.

How this Allows Saudi Arabia to be “Swing Producer”

- ▶ Saudi Arabia has low extraction cost, <\$20 bl.
 - ▶ Under multiplant monopoly it would produce a lot.
 - ▶ It is also a “low absorption” country
 - ▶ Wide range of output levels meets the revenue requirement.
- ▶ They can meet the revenue requirements with low or high output levels.
 - ▶ They can increase output, like now, to reduce prices for strategic purposes
 - ▶ They can reduce output to hit OPEC quotas.

Does the Monopoly Argument Add Anything?

- ▶ OPEC only seems to be able to collude when there are macro expansions.
- ▶ Consistent with dynamic collusion arguments.
 - ▶ Decide if colluding now and receiving monopoly rents is worth more than
 - ▶ Not colluding and receiving more now but few monopoly rents in future.
 - ▶ Collusion when future demand is expected high
 - ▶ Collusion fails when future demand is expected low.

Simplified Dynamic Collusion

► Definitions

- c = Collude, $\sim c$ = Not Collude
- D_H high demand and D_L low demand.
- $\pi(c|D) < \pi(\sim c|D)$ If you break collusion now you gain. Both are lower when demand is low.
- $\beta E[V(c|D)] > \beta E[V(\sim c|D)]$ If you break collusion the expected discounted value of all future profits is smaller. Both are lower when demand is low.

► Four states of the world

- $D_{H,1}$ and $D_{H,2}$, Demand high now and High later
- $D_{H,1}$ and $D_{L,2}$, High now and Low later
- $D_{L,1}$ and $D_{H,2}$, Low now and High later
- $D_{L,1}$ and $D_{L,2}$, Low now and Low later

With a reasonable β , demand and cost functions.

► Results with best stories

- $\pi(c|D_H) + \beta E[V(c|D_H)] > \pi(\sim c|D_H) + \beta E[V(\sim c|D_H)]$ If demand is high and will stay high, better off colluding.
- $\pi(c|D_L) + \beta E[V(c|D_L)] < \pi(\sim c|D_L) + \beta E[V(\sim c|D_L)]$ If demand is low and will stay low, you better off not colluding.
- $\pi(c|D_H) + \beta E[V(c|D_L)] < \pi(\sim c|D_H) + \beta E[V(\sim c|D_L)]$ If demand is high and will fall, better off not colluding.
- $\pi(c|D_L) + \beta E[V(c|D_H)] > \pi(\sim c|D_L) + \beta E[V(\sim c|D_H)]$ If demand is Low and will increase, better off colluding.

► Many alternative values

- Collusion tends to vanish if the future benefit of collusion, $\beta E[V(c|D)] - \beta E[V(\sim c|D)]$, is small.
- Collusion also vanishes if the current benefit of not colluding, $\pi(\sim c|D) - \pi(c|D)$, is large.

Apply to Oil Markets

- ▶ Increase in commodity demand because of GDP growth makes it easier to collude.
- ▶ Decreases in commodity demand because of recession collapses collusion.
- ▶ When OPEC is large part of market, i.e., 1970s, then collusion is likely because the future benefits to collusion, $\beta E[V(c|D)] - \beta E[V(\sim c|D)]$, are larger.
- ▶ The dynamic component is missing in the traditional monopoly arguments.
 - ▶ Not being able to establish or keep to a target is seen as a political, rather than economic, problem
 - ▶ Demand for commodities is a key and explains the periods when OPEC could increase prices.