Traditional Oil

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Next Topic

- Financial Markets. Black-Scholes and the odd products that are available with electricity and oil.
- Intro to Externalities and Public Goods. Carbon taxes, cap and trade and renewable portfolio standards.
- Natural Gas Outside the US. Reading in syllabus is minimal but will expand.
- Price Controls and Subsidies (Not Carbon Taxes and Implicit Subsidies). Reading in syllabus is minimal but will expand.
- Market Monitoring. EIA reports and the possibility of reading through the Enron scandal in the Fortnightly.
- Hotelling's Rule and Dynamic Extraction.
- Supply and Cost Curves. Book has a lot of present value calculations and will give some of the how to on creating the levelized cost estimates.
- Energy Demand. My favorite topic. This includes energy efficiency.
- Distributed Generation. Lots of dockets in NY about this as well as the reactions of Hawaii to massive rooftop solar.

Last Week

- 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 expect 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 How 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.