5. Opportunism & Contract Choice

Natural Gas[1]

The natural gas industry offers a convenient setting to discuss unusual contractual arrangements involving both pricing and ownership of specific assets. The natural gas industry is composed of three parts: production, transportation, and distribution. From the turn of the century until 1940, the industry was integrated, presumably because that was the cheapest way to solve contracting problems. In 1935, the Public Utilities Holding Co. Act severed the relationship between pipelines (transportation) and distribution. Shortly thereafter the newly created Federal Power Commission began regulating the rates charged by interstate (but not intrastate) gas pipelines. This created an incentive to divest production from transportation, and created the necessity for contractual provision between the two. In 1954, the courts gave the FPC authority to regulate well head gas prices for gas that was shipped interstate. Hence, the period 1940-1954 is a perfect time to examine contracting for natural resources.

The best way to determine whether contractual provisions are good is to see if they survive. Contracts can be inefficient, like the contract between GM and Fisher Body; it didn't survive. In the natural gas industry, we can appeal to the average to assess efficiency by the survival criteria. Over the period of study there were in excess of 10,000 different contracts signed between well owners (producers) and pipelines.

Three different contractual provision stand out: 1) Who owns the feeder lines. 2) Price renegotiation provisions. 3) Take-or-pay provisions.

Feeder Lines: A natural gas field is a geographic area containing a number of producing units or wells. These wells are located proximate to each other and actually pump gas from the same gas reservoir. The field is served by one or more gas pipelines that buy the gas from the well owners and ship it to the end-user. Between the pipeline and each well, a feeder line must be constructed. The feeder line is a specialized asset.

Sometimes the feeder line is built by the well owner, sometimes by the pipeline. We expect that this ownership is determined by agency cost considerations. Specifically we expect that

a) *As the number of pipelines increases it increases the probability that the well will construct the feeder line.*

[1] Mulherin, Harold. "Complexity in Long Term Contracts: An Analysis of Natural Gas Contractual Provisions," *Journal of Law, Economics and Organization*, Spring 1986, 105-117. Masten, Scott, and Keith Crocker. "Efficient Adaptation in Long Term Contracts: Take or Pay provisions for Natural Gas," *American Economic Review*, 1985. Joskow, Paul. "Vertical Integration and Long Term Contracts: the Case of Coal Burning Electrical Generation Plants," *Journal of Law, Economics and Organization*, 1985.

This is because with alternative pipelines available, well owners can act opportunistically and refuse to sell their gas to the pipeline unless the pipeline increases the price. The feeder line acts like a bond by the well owner.

b) *As the number of wells increases it increases the probability that the pipelines will construct the feeder line.*

The more wells, the more leverage the pipeline has in refusing the gas of a particular well. The feeder line acts as a bond by the pipeline.

Mulherin finds this to be the case on both counts.

The Case of Petroleum Coke[2]

The petroleum coke industry provides additional insight into the contracting process. Petroleum coke is the processing of the residual oils left from refining crude petroleum. In the first stage a *coker* produces green coke. Next, a *calciner* makes calcined coke from green coke. Finally, an aluminum smelter makes electric anodes from the calcined coke. The petroleum coke industry is characterized by contracts between cokers and calciners with virtually no integration at this stage of production. Calciners are sometimes and sometimes not integrated with aluminum smelters.

Cokers value the flexibility of production rates because their raw material comes from the production of refined petroleum and the residual oils are a minimally valuable by-product. Hence production rates of green coke efficiently vary with the vagaries of the crude oil refinery industry not with the demand for green coke. However, variable production rates mean that inventory facilities must be available. The inventory facilities are always for green coke. Presumably, the residual oils must be processed immediately into green coke.

When the calciner buys coke from a number of different cokers it is efficient for it to own the green coke inventory facilities. However, with no inventory facilities the coker is at risk from the calciner refusing production. A build up of inventories can cause the coker to shut down. Hence, contracts in this case require that the calciner buy all of the output of the coker at the output rate determined by the coker and be responsible for its removal. Penalties are defined for shut downs as a result of inventory build up. Take-or-pay provisions are an alternative. The coker can vary its production at will even to the point of ceasing green coke production. However, if it produces green coke, it must sell to its calcining partner. This protects the calciner from price opportunism on the part of the coker.

On the other hand, some calciners are small and located near a coker. In this case, it is efficient for the calciner to buy exclusively from the coker, which puts the calciner at risk. In these cases, the calciner typically has a guaranteed quantity contract. The coker agrees to supply a fixed amount

[2] Goldberg, Victor P., and Erickson, John R. "Quantity and Price Adjustment in Long-Term Contracts: A Case Study of Petroleum Coke," *The Journal of Law & Economics*, October 1987, pp. 369-398.

and to deal with the excess removal problem on its own. Of course the calciner has to agree to take the stipulated quantity. That promise is bonded by the calciner leasing the land for its plant from the coker.

In the case where a relatively small calciner is located adjacent to a coker and is buying on an exclusive basis, we might wonder why the coker does not integrate with the calciner to solve the potential opportunism problem. However, integration always brings some inefficiency because of increased shirking and agency cost. Hence, if explicit contracts can resolve a problem of opportunism, this is the more efficient solution.

The Case of Transoceanic Shipping[3]

The bulk oceanic shipping market is characterized by three basic contracts between shippers (S) and carriers (C). Carriers are the ships and ships owners. Shippers are the agents who want a product to be transported.

The three contracts are: voyage charters, time charters, and contracts of affreightment (COAs). Voyage charters are specific contracts between S and C to move merchandise from one point to another. The contract specifies the dates and the money paid for the transportation package.

For time charters, on the other hand, the shipper takes control of the ship for purposes of dates and ports of call. The carrier provides the ship with crew. S pays the variable costs, which generally are fuel and port fees. S also pays C a daily rental on the ship. The cargo is not specified (though, inappropriate cargoes are no doubt excluded).

COAs are more elaborate contracts. They specify a ship, cargo, and points of the voyage, but also a time table of shipments. COAs are long term contracts in the sense that the number of shipments and the volume of shipment over a given time period is fixed by the contract. Presumably, if S does not present merchandise for shipment when scheduled, there is a penalty, though there may be some flexibility so long as a certain volume is met over a given period.

There are two time dimensions to the problem. The first is the time over which the actual shipping takes place. Voyage and time charters may be very close on this dimension. Possibly time charters are a bit longer but not necessarily. COAs are definitely longer. The second time dimension is how far in advance of the actual shipping the contract is made. Here voyage charters are the most immediate, time charters are longer, and COAs are longer still.

The explanation of the shipping contracts is the voyage charters are used when there are a lot of ships serving given ports and specific merchandise at those ports. If the market is thick, then voyage charters, which are like spot contracts, are used. When the market is thin, then time charters, COAs, or shipper owned vessels dominate the market. See his Table 1. Thick markets are grain, oil (post ’73), fertilizer, and scrap iron.

[3] S.C. Pirrong, Contracting Practices in Bulk Shipping Markets, JLE, Oct. 93, 937

This all seems fairly transparent in broad-brush terms. For time charters, S takes responsibility for paying for a boat whether or not there is anything to ship. This is because S cannot be confident that there will be boats available when the time comes to ship. Hence, S contracts in advance for a boat. However, this puts the boat, C, at risk when it shows up at the designated place and time, so the contract calls for payment on a daily basis rather than tonnage. Also, S takes responsibility for filling the dance card on the turn around and thus needs flexibility on ports of call.

The explanation of COAs is, in my opinion, driven by financing. My guess is that most COAs are debt financed ships. The debt holders require that in new boat construction before they give the money, the C must have a contract to supply shipping services that will more or less pay back the debt. Lenders don't want to pay for a boat that the owner will drop in the water and go searching for work. The sailor may take off on a pre-paid fishing trip or turn to piracy. My prediction is that most COAs are debt financed and probably not necessarily by a S. Time and voyage charter boats probably have little or not debt outstanding.

Cat Fish

Cat fish farming has the potential for opportunism. Cat fish are raised in big ponds. When they weigh about a pound or so, they are ready to go to the processor. However, they are not marketable if they taste fishy. The cat fish farmer samples the stock in the field. (They carry a microwave and cook up a fish on the spot.) If the fish does not taste fishy, the farmer seines the pond and trucks the fish to the processor. The processor also tastes the fish. If they still don't taste fishy, the processor accepts the load. (The processor runs the fish through a machine that cleans and prepares the fish without being touched by humans.)

One would expect that there is the potential for opportunism in this arrangement. When the fish are taken out of the water, they must be processed immediately. The cat fish farmer would seem to be at risk. The problem may be solved simply by long term dealing. However, there may be a more complicated contractual arrangement.