Appendix A

Law and Economics Approach

The economic analysis of law and contracts is one of the major movements in legal scholarship and analysis of the 20th century.[1] Founded originally in the works of Nobel laureate Ronald Coase[2] and U.S. Circuit Court Judge Guido Calabresi[3], this approach is now widely applied in legal decisions, taught in law schools, and articulated in textbooks by leading legal scholars.[4] The emphasis of the economic approach is on evaluating laws, contracts and governance systems based on how well they promote economically efficient outcomes. We have employed this approach to inform our own analysis of the contracting problems in Colombia's natural gas markets.

In long-term commercial contracts, including ones for natural gas production and delivery, there are typically far too many contingencies to be enumerated, described and agreed at the time of contracting. In natural gas production and distribution, the events that can affect suppliers' production or delivery decisions include scheduled and unscheduled maintenance, well problems, natural disasters, weather events and many more, and even these are not simples

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[1] Anthony Kronman, formerly dean of Yale Law School, wrote in *The Lost Lawyer* (1993, page 166) that "the intellectual movement that has had the greatest influence on American academic law in the past quarter-century" is law-and-economics.

[2] Coase, Ronald (1960). "The Problem of Social Cost". *The Journal of Law and Economics* **3** (1): 1–44.

[3] Calabresi, Guido (1961). "Some Thoughts on Risk Distribution and the Law of Torts". *Yale Law Journal* (The Yale Law Journal Company, Inc.) **70** (4): 499.

[4] Among these, two of the most prominent ones are those of Harvard Law professor Stephen Shavell (*Foundations of Economic Analysis of Law*. Harvard University Press, 2004) and US Circuit Judge Richard Posner (*Economic Analysis of Law* (Aspen, 7th edition, 2007).

"events" but categories of event types. Gas customers, too, confront contingencies that affect the value of gas and the type of performance that is most desired. They face variations in the demand for their products, from retail energy to fertilizers, which affect their ability and need to take delivery of natural gas.

The efficient response to these sorts of contingencies naturally depends on the costs of the alternative solutions, which vary among countries and over time. Sometimes, customers respond to production interruptions by seeking gas from alternative sources. Sometimes, producers respond to production interruptions by using stored gas or reserve production capacity, or variations in the amount or timing of deliveries. To the extent that production and demand are uncertain, at least some of the contracts need to provide flexibility for the buyer or supplier to curtail deliveries, and indeed such curtailments are common. Good contracts need to ensure that the flexibility they properly provide is not abused. Contracts may often contain both explicit exceptions, so that performance is not always required, and specific damages for non-performance.

As Shavell[5] has pointed out, damage measures have three main functions: *i*) to give incentives to performance, *ii*) to provide contracting parties with incentives to take actions relying on performance, and *iii*) to allocate risk. On these grounds, Shavell concludes that, "A full consideration of damage measures and efficient risk allocation would also take into account:

[5] Shavell, Steven. "Economic Analysis of Contract Law". NBER Working Paper 9696, May 2003.

i. whether the risk that a party bears is detrimental or beneficial… if a party wants to breach, not because he has run into costly production difficulties, but rather than because another party has bid more for what he has made, then risk – bearing considerations would not lead to lower damages for the seller.

ii. whether a risk is monetary or nonmonetary. If, for instance, the victim's loss is nonmonetary, financial compensation in the form of damages may not constitute an optimal form of insurance.

iii. An additional consideration is the availability of commercial insurance[6] to the parties for the losses due to breach; if such insurance is available, then the need for damages to compensate the victim is negated, and damages have a role mainly as an incentive device."

Besides these factors listed by Shavell, some authors add a consideration of "adverse selection," which leads to a preference to allocate risk to those who are best able to assess it (as well as to control it).[7] In that view, the role of damages is analogous to the role of a product warranty in helping the producer to assure the consumer about the product.

These analyses are general ones, raising possibilities of varying importance in different markets. For the purpose of developing standardized natural gas contracts for Colombia, many of these considerations can be set aside.

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[6] In law and economics, insurance is a form of risk management primarily used to hedge against the risk of a contingent, uncertain loss. Insurance is defined as the equitable transfer of the risk of a loss, from one entity to another, in exchange for payment.

[7] Shen-fa Wun and Wei Xiaoping. "The Rule and Method of Risk Allocation in Project Finance." 6th *International Conference on Mining Science and Technology, Procedia Earth and Planetary Science* 1 (2009), 1757-1763.

For example, consider first the "risk-allocation" function of contracts. For commercial contracts, the relevant risks are pecuniary. Terms bearing on non-pecuniary losses, such damage to health or loss of life, were not found in our review of natural gas contract in Colombia.

We also found no evidence that financial risk sharing was a primary concern reflected in the language of Colombian natural gas contracts. This is natural. Financial-risk sharing in the Colombian context potentially involves many parties – not just the parties to the standard commodity or delivery contract. Firms' financing decisions determine how risk is shared with investors and lenders. The substantial variations in firm size and financing arrangements mean that their abilities to bear risk also varies widely. Including idiosyncratic terms in supply contracts would complicate negotiations unnecessarily, and we see no evidence that this is done.

Further, standardized contracts cannot be crafted to serve contracting needs that vary in that way. Rather, standardized contracts are best designed to be deal with standard issues that are common to most or all contracting relationships, applying to firms of all sizes, without regard of their sources of financing.

Next, consider the analysis of "actions relying on performance," to which Shavell alludes. Such actions refer mainly to investments and similar commitments by one or both of the contracting parties. To enable reliance, contracts need to limit performance failures that threaten the returns on these sorts of investments. In the Colombian context, investments in gas-fired electrical generation that is only occasionally used need to be backed up by contracts that

support such investments, both for private and social reasons. Here, the question of damages is not a central issue, but planning and coordination are. The central issues are how to enable option contracts and "conditional firm" contracts that allow Colombian industry to anticipate and plan for its most economically significant risks.

Considerations of adverse selection, in which a supplier has better information about the reliability of production and the buyer about the reliability of its demand, have the same implications as consideration of incentives. Both to mitigate adverse selection and to promote reliable supply and demand, suppliers should be held *accountable* for the expected losses caused by supply disruptions when buyers mitigate their losses optimally, and buyers should be held accountable for expected losses caused by failures to take as promised when sellers mitigate their losses optimally. Damages based on this principle are called "expectation damages" and, in the hypothetical case where measurement of these damages is costless, can represent a perfect theoretical solution to the problems of providing proper incentives and avoiding adverse selection.

Given our assessment of the contracting situation in the Colombian natural gas industry, our report focuses on performance incentives that are uniformly relevant for the contracting parties in this industry. For the reasons described above, the other elements – risk sharing and encouragement to rely – are not properly the subject of standardized contract terms, and adverse selection is mitigated or minimized by the same kinds of terms that mitigate or minimize performance incentive problems.

Economic analysis helps us to identify the particular conditions in Colombia that might make its optimal contracts different from those in other places. The optimal contracts, and the proper interpretation of existing contracts summarized in our previous report, depend on details of the economic environment in ways that we now analyze.

We begin by discussing contract damage provisions in an idealized, competitive, highly developed natural gas market, with multiple sources of supply and demand and active spot trading. In such a setting, a buyer who has a firm supply contract can dispose of its excess supply in spot trading, so it gains little value from an ability to refuse or delay deliveries. Similarly, if the penalty for failure to deliver gas is linked to the spot price, then the supplier is led to take correct account of the damage it does to the buyer by any supply interruption. If the supplier fails to deliver gas, the buyer can replace the shortfall in the spot market at a known cost. In both of these cases, theoretically ideal expectation damages are ones just sufficient to enable that purchase make the buyer whole. If the supplier can avoid a supply disruption at a lower cost than these damages, it has the incentive to do so. Otherwise, it finds it more profitable to breach its obligation. In summary, the supplier has proper incentives for what legal scholars call “efficient breach,” meaning that it breaches exactly when doing so is efficient, increases the total profits summed over all participating parties.

Besides the incentives for efficient breach, these damages give the supplier a proper incentive to invest in improved capital equipment or to do preventive maintenance, or to manage its portfolio in such a manner that its obligations can

be met. The reason is that the supplier who makes the investment enjoys the full benefits that result, measured correctly by the spot price, and incurs the full costs.

In the highly developed markets of both the US and Western Europe, standard contract provisions link liquidated damages to spot prices or to a "cover" standard, as described in our earlier report about these practices.[8] In Colombia, however, conditions are quite different. Currently, the spot market is illiquid, with few participants and little transparency. Contract prices from the Guajira field are regulated and not set by the forces of supply and demand. Buyers of Guajira gas have no good way to substitute other sources if gas supply from the Guajira field is interrupted. These features make spot prices unavailable or unreliable as a measure of damages from interrupted supply.

In less developed markets of this sort, other contract provisions must substitute for the absence of spot markets and an accurate liquidated damages provision. Several provisions can help take up the slack. When a limited spot market makes it difficult for buyers to dispose of its excess gas, take-or-pay contracts introduce needed flexibility to reduce or postpone some gas deliveries. On the flip side, supply interruptions that cannot be replaced by other sources in a spot market may be made up by additional later gas deliveries, substantially reducing damages. If buyers find delayed gas deliveries to be good substitutes

[8] "History and Development of Standardized Natural Gas Contracts," Auctionomics-FTI report, 2011. See especially the discussion of the Performance Obligation on page 13.

for immediate deliveries, then a "make-up" or "make-good" provision can be a valuable contract term.[9]

When liquidated damages are difficult to specify, terms that improve predictability of performance are often valuable. These might include terms that limit the number of interruptions that are allowed, by the buyer, the supplier, or both. Force Majeure clauses, reducing the supplier's obligations in certain exceptional circumstances outside its control, are typically included to reduce the bite of other limits, particularly when performance standards are otherwise high (as in "firm" contracts).

Weather events significantly affect prices and resource uses in natural gas markets. In Colombia, where El Niño years lead to high demand by gas-fired electricity generators, conditional firm contracts and option contracts provide ways to plan systematically for the necessary diversion of resources.

One of the most important general principles of contracting, which applies equally to Colombia gas markets, is that contracts should lead the parties to a common expectation about their rights and obligations. This is one reason that standardization is so important. Standardization of contracts reduces the cost of negotiating terms, minimizes disputes about meaning, frees the parties from the need to administer contract variations, and improves the comparison and tradability of different contracts.

[9] The storability of natural gas contributes increases the likelihood that substituting deliveries over time is viable and distinguishes gas from electricity, because electrical power is more difficult to store.

One device to explore the needs of the Colombian market is to review existing contracts, as we did in our previous report.[10] This review provides evidence, for example, of the importance of optional and condition firm contracts to deal with the needs of electricity generators.

In a market with regulated prices, however, there are important limits on what can be learned about efficient contracting from such a contract review. When prices are limited at less than market-clearing levels, bargaining between suppliers and buyers may result in contracts that appear to "favor the supplier" compared to more efficient provisions. For example, even if the provision of gas in a competitive market would make extensive use of firm supply contracts sold at a premium price, the bargain between suppliers and buyers at a lower, regulated price might lead to fewer firm and more interruptible contracts. The reason is simple: in the bargaining between buyer and supplier, when price cannot be used to transfer value, other terms get used, even if adopting those other terms leads to a loss in total value.

[10] Report on Existing Natural Gas Contracts in Colombia, Auctionomics-FTI report, 2011.