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NATURAL GAS PIPELINES: RENT REVEALED

S. P. A. Brown\*

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# Research Paper

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**Federal Reserve Bank of Dallas**

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## NATURAL GAS PIPELINES: RENT REVEALED

After 1984, the wellhead prices for most sources of natural gas will be deregulated. Nevertheless, under current law, significant quantities of natural gas will remain under price controls far beyond 1984. In fact, during the first half of 1984, 47 percent of the domestically produced gas that was purchased by interstate pipeline companies came from reserves that are currently scheduled to remain under price controls indefinitely.

Consumer opposition to further decontrol remains a formidable obstacle to any new legislation that would completely deregulate natural gas prices at the wellhead. This opposition to decontrol appears largely based on the fear that consumer prices for natural gas would rise. This fear could be misplaced, however, because the total decontrol of wellhead prices could result in lower consumer prices for natural gas.

Binding ceilings on the wellhead prices for some sources of natural gas have accorded economic rent to its purchasers. Econometric evidence suggests that despite federal regulation of the interstate transport of natural gas, this rent has been retained at least in part by interstate pipeline companies--and has not been shifted forward to consumers--widening the gap between wellhead and delivered prices. The decontrol of wellhead prices would narrow this gap, possibly yielding both a higher average wellhead price and lower consumer prices for natural gas.

## REGULATION AND RENTS AFTER 1984

The regulation of the wellhead prices of gas from some production categories under the Natural Gas Policy Act of 1978 (NGPA) accords economic rent to the purchasers of gas with controlled prices. The way in which this rent is distributed determines what effect a total deregulation of wellhead natural gas prices would have on the delivered price of gas, the wellhead price of gas and the total quantity of natural gas produced.

To uncover the effect of price controls, it is useful to examine the case in which there are no price regulations. In the absence of price controls, the wellhead supply of natural gas would be the sum of "old," "new" and "high cost" gas brought forth at every wellhead price (shown as  $S_1$  in figure 1):<sup>1/</sup>

$$Q_s = q_o(p_n) + q_n(p_n) \quad (1)$$

in which

$Q_s$  is the total quantity of gas supplied.

$q_o$  is the quantity of old gas supplied.

$q_n$  is the quantity of new and high cost gas supplied.

$p_n$  is the wellhead price of new gas, which would be the wellhead price of all gas in the absence of price controls.

Delivered supply ( $S'_1$ ) equals wellhead supply plus the efficient cost required by natural gas middlemen to collect, transport and distribute the

gas. Given consumer demand, a market-clearing price and quantity of delivered gas is obtained (at  $P_1$ ,  $Q_1$ ).

With a binding price ceiling ( $po^*$ ) on old gas, wellhead supply is either shifted inward ( $S_2$ ) or outward ( $S_0$ ) from its free market construction ( $S_1$ ). The direction of the shift depends on who obtains the rent that is accorded to purchasers of old gas. The rent received by purchasers of old gas is the difference between the ceiling price on old gas and the price that producers of unregulated new and high cost gas can command when old gas is regulated. If this rent is wholly retained by natural gas middlemen, the supply curve shifts inward. If this rent is shifted completely forward to consumers, the supply curve shifts outward.

If natural gas middlemen were competitive and did not face government regulation of their profits, they would retain the rent arising from wellhead price controls and total wellhead supply would simply reflect the cost of incremental gas, comprised of new and high cost gas:

$$Q_s = qo^* + qn(pn); \quad (2)$$

in which

$qo^*$  is the quantity of old gas supplied at the price ceiling  $po^*$ .

$pn$  is the wellhead price of new and high cost gas.

Consequently, supply would be shifted inward (to  $S_2$ ).

If the regulation of old gas shifts supply inward, the delivered price of gas rises (to  $P_2$ ) and the total quantity of gas consumed falls (to  $Q_2$ ).

The price received by producers of new and high cost gas rises somewhat (to  $pn_2$ ) and their production of gas is stimulated (to  $qn_2$ ).

The rent is shifted forward to consumers, however, if federal regulation is successful in restricting the tariff charged by middlemen to a normal profit plus the cost of collecting, transporting and distributing natural gas. Under these regulations it is generally presumed that middlemen sell gas to consumers at the average wellhead price plus a competitive collection, transportation and distribution charge:

$$P_d = t + (p_o^* q_o^* + p_n q_n) / (q_o^* + q_n) \quad (3)$$

in which

$P_d$  is the delivered price of gas,

$t$  is the competitive collection, transportation and distribution charge.<sup>2/</sup>

Under an average cost pricing of natural gas and commonly assumed elasticities of supply, the production increase in new and high cost gas is greater than the decrease in old gas production. As a result, supply is shifted outward (to  $S'_0$ ).<sup>3/</sup>

The outward shift in supply results in a lower price for delivered gas ( $P_0$ ) and a greater quantity of gas consumption ( $Q_0$ ) than would result in a free market. New and high cost gas would receive a much higher price ( $pn_0$ ) than if middlemen retained the rent and, consequently, its production is greatly expanded (to  $qn_0$ ).

## MIDDLEMEN MAY RETAIN RENT DESPITE REGULATION

Because their market activities include buying natural gas from producers and selling it to consumers--and are not confined to collecting, transporting and distributing natural gas--natural gas middlemen are in a position to capture the rent resulting from the control of wellhead prices. Because the rent need not appear as accounting profit on the books of the companies, federal and state regulation of collection charges, pipeline transportation tariffs and distribution charges may prove ineffective in shifting the rent forward to natural gas consumers. Rent may be retained as profits in other companies owned by the company's corporate parent, dissipated through simple inefficiency or consumed in the costs of obtaining and protecting ownership of the rent.

Vertical integration with unregulated activities is one way in which this rent can be captured. Once a company is vertically integrated, transactions can be made "at-less-than-arm's-length" that enhance the profitability of unregulated companies under the same corporate banner. Higher than market prices may be paid for unregulated natural gas from the corporation's production company, and lower than market prices may be received from gas-using companies owned by the corporation. The validity of this argument is casually supported by the number of pipeline companies that have vertically integrated through holding companies.

Not all the economic rent captured by natural gas middlemen will necessarily become corporate profits. Richard Posner [1975] and Gordon Tullock [1967] have pointed out that obtaining and protecting the ownership

of economic rent can consume that rent. In addition to competing to obtain rents, middleman companies can be expected to raise a defense of their rent ownership that could cost as much as the expected value of successfully defending the rent.4/

Lobbying is one form of rent protection.5/ Financial contributions of the pipeline and gas utility industries to lobbying organizations--such as the American Gas Association and the Interstate Natural Gas Association of America--that oppose the complete decontrol wellhead natural gas prices provide some casual evidence that rent is being earned.

#### A TEST FOR PIPELINE COMPANY RETENTION OF RENT

As suggested above, economic rent may not be evident in the accounting profits of middleman companies. Nonetheless, if the rent accorded purchasers of old gas is retained, dissipated or consumed by the activities of middlemen, the rent should remain evident in the difference between the delivered and wellhead prices of gas. If natural gas middlemen generally face competition with oil products in their final delivery markets, those middlemen firms endowed with greater access to low cost natural gas should evidence a greater markup than those with poorer access if they retain the rent associated with access to low cost gas.

Passage of the NGPA endowed pipeline companies with varying contractual rights to buy price-controlled gas. Differences in these endowments have contributed to a variation in the average wellhead price of gas across pipeline companies.6/ This variation in average wellhead prices



can be exploited to test for pipeline company retention of rent. If pipeline companies retain the rent associated with purchases of price-controlled gas, there will be an inverse relationship across firms between the markup for transporting the gas to market and the average purchase cost of its gas that is independent of the difficulty in transporting that gas to market. Evidence of this relationship was revealed in a linear regression that used data pooled across 31 companies and four years following implementation of the NGPA:

$$\begin{aligned} \text{MARKUP}_i = & .2747 + .0159 \text{ D81}_i + .0822 \text{ D82}_i + .1409 \text{ D83}_i \\ & (5.11) \quad (.51) \quad (2.50) \quad (4.20) \\ & - .1083 \text{ AWP}_i + 2.4669 \text{ TRANS}_i - .4277 \text{ PGP}_i + e_i \\ & (-3.26) \quad (2.73) \quad (-3.11) \end{aligned} \quad R^2 = .26$$

in which

$\text{MARKUP}_i$  is the difference between the average real price at which a pipeline sold gas to distribution companies and other pipeline companies in a given year and the average real price it paid for gas in that year.<sup>8/</sup>

$\text{AWP}_i$  is the average real price that a company paid for gas in a given year. It includes wellhead purchases, purchases from other companies (including other subsidiaries of its corporate parent) and imports.

$\text{TRANS}_i$  is a measure of the difficulty that the pipeline faces in transporting the gas to market. The gas consumed in transmission per unit of total gas sold by the pipeline company served as a proxy for transportation difficulty.

$PGP_i$  is the percentage of total gas obtained by a pipeline that is produced from reserves that the pipeline company itself owns. This variable does not include purchases of gas from production companies owned by the pipeline's corporate parent.<sup>9/</sup>

$D81_i$  is a dummy variable for observations in 1981.

$D82_i$  is a dummy variable for observations in 1982.

$D83_i$  is a dummy variable for observations in 1983.

It should be noted that this econometric test has a bias against finding evidence of pipeline rent retention. The data used did not permit the identification of gas purchased from production companies owned under the same corporate banner as the purchasing pipeline. This data limitation prevents direct consideration of one means in which pipeline companies could retain and hide rent.

Nevertheless, evidence of pipeline rent retention was found. The coefficient on  $AWP_i$  is negative and significant at better than the 99 percent level. In addition, the transportation variable is significant at better than the 99 percent level, providing confidence that the regression differentiates between rent and efficiently costly transportation. Furthermore, the yearly dummy variables indicate that the real markup on natural gas has increased over time, perhaps indicating that pipeline companies have increasingly availed themselves of the rent.

## CONCLUSION

Federal control of wellhead prices for natural gas yields economic rent to the purchasers of the price-controlled gas. For a number of reasons government regulation of natural gas middlemen may not be effective in shifting this rent forward to consumers. Econometric evidence indicates, in fact, that some of this rent is retained by pipeline companies. Collection and distribution companies may also retain some of the rent.

Middleman retention of the rent created by natural gas price controls serves to widen the gap between the delivered and wellhead prices of natural gas. The complete deregulation of wellhead natural gas prices would narrow this gap. The delivered price of natural gas could fall while the average wellhead price rose.

Wellhead deregulation may not be sufficient to assure lower consumer prices and higher wellhead prices, however. Pipeline companies own government franchises to transport gas along specific routes and they act as marketing agents (buying and reselling most gas). As a result of their franchises, pipeline companies have monopsony buying power in some production regions and monopoly selling power in some consumption regions. In addition, gas utilities own government franchises to distribute natural gas in particular regions or locales. Additional competition could be introduced by shifting pipeline and distribution companies into contract carriage or by allowing the free entry of new companies along existing pipeline routes and in existing distribution regions.

## NOTES

1. When enacted, the NGPA created over 20 pricing categories of natural gas to which different ceiling prices were applied. For purposes of analysis, these categories are lumped into two groups: "old gas" and "new plus high cost gas." (See table 1.) After 1984, the wellhead price of old gas will remain controlled and the wellhead prices of new and high cost gas will be deregulated.
2. Note that  $S_0$  is constructed from  $S_1$ .
3. With a sufficiently greater elasticity of old gas supply, a sufficiently lower elasticity of new and high cost gas supply, or a combination of both,  $S_0$  could lie above  $S_1$ . Nevertheless, in such a case,  $S_2$  would still lie above  $S_0$ .
4. The efforts of natural gas producers to eliminate the ceilings on the price of old gas would also contribute to the social cost of the price controls.
5. Federal regulation and long-standing contracts inhibit competition to obtain the price-controlled gas, perhaps limiting this means of converting rent to costs.
6. Of course transportation costs also contribute to the variation in wellhead prices. In a competitive market, natural gas that is farther from its consumption market than a competing source of gas can be expected to have a higher transportation cost and lower purchase price than the competing source of gas.
7. Figures shown in parenthesis are t statistics. An F statistic of .36 (with 9, 108 degrees of freedom) justifies pooling the data across years.
8. Inquiry was limited to sales for resale to avoid the consideration of distribution costs for a pipeline companies that have retail customers.
9. With the exception of price deflators, annual data for all variables for each company were compiled from Federal Energy Regulatory Commission (FERC) Form No. 11, "Natural Gas Pipeline Company Monthly Statement." Prices were deflated with the the implicit GNP deflator.

## REFERENCES

- Posner, Richard A., "The Social Costs of Monopoly and Regulation," Journal of Political Economy, 83 (August 1975):807-27.
- Tullock, Gordon, "The Welfare Costs of Tariffs, Monopolies and Theft," Western Economic Journal, 5 (June 1967):224-32.

Table 1  
 NATURAL GAS PURCHASES  
 OF MAJOR INTERSTATE PIPELINE COMPANIES  
 DURING THE FIRST HALF OF 1984

Analysis Category	Purchases (billions of cubic feet per day)	Average wellhead price per thousand cubic feet
Old gas.....	10.63	1.41
New + high cost gas....	12.07	3.93
All gas*.....	22.77	2.76

\*As a result of rounding error, total does not agree.

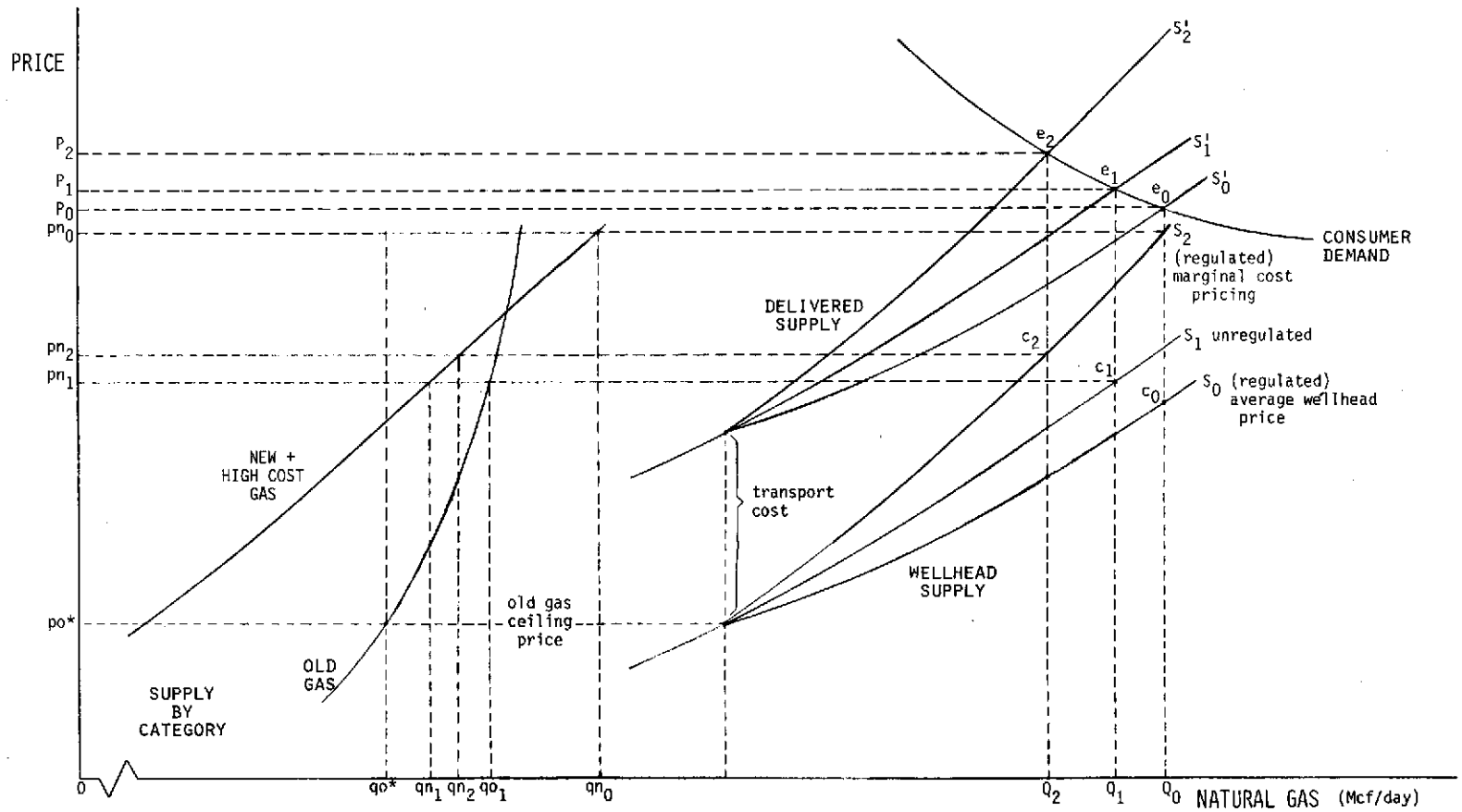


FIGURE 1 THE MARKET FOR NATURAL GAS