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**DIRECT PRICE CONTROL AND IMPLIED MARKET POWER:
THE CASE OF THE U.S. NATURAL GAS MARKET**

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Although a direct measure of market power is seldom available to analysts and courts, where applicable, a direct measure can reveal the presence or absence of market power behavior. Furthermore, when a direct measure of market power is available, an analyst does not need to resort to the circumstantial evidence of market structure and exclusive behavior analysis. A recent study of regional natural gas markets revealed, at levels of measured statistical significance, systematic, asymmetrical price behavior that was consistent with price control and the presence of market power.¹ Conversely, this same analysis showed, again at levels of statistical significance, that systematic, symmetrical price behavior consistent with competitive markets existed in other regional natural gas markets. As an analytical time and cost benefit, this methodology also required less industry information than the common market concentration analysis.

I. Price Control

Market power on the seller-side of a market implies that a market participant has the ability to control prices, while maintaining them at a supracompetitive level for a significant period of time and, thereby, capturing economic rents and increasing profits.² Persistent supracompetitive prices also imply that competitors cannot enter the market to force prices down to marginal cost levels.³

¹ Murry, Donald and Zhen Zhu, "Asymmetric Price Response, Market Integration and Market Power: A Study of the U.S. Natural Gas Market," *Energy Econ.* (2006). Doi: 101016/j.eneco.2006.10.002. .

² United States v. E.I. du Pont de Nemours & Co. 351 U.S. 377, 391-92, 76 S.Ct. 994, 1005 (1956). See also Hovenkamp, Herbert, *Federal Antitrust Policy the Law of Competition and its Practice*, Third Edition, Thompson/West, (2005), p. 79.

³ Buyers with market power can withhold demand and force market prices to levels lower than competitive market clearing levels.

Prices maintained at levels greater than marginal cost suggest the presence of market power, and the greater the ratio of a firm's profit maximizing price to marginal cost, the greater its market power.⁴ Alternatively, the price elasticity of a firm's demand is indicative of its market power; the smaller the absolute value of elasticity, the greater the market power. However, both the marginal cost of supplying a product and the elasticity of its demand are extremely difficult to measure. Consequently, they are seldom useful in an antitrust proceeding as measures of market power or the ability to control prices at supracompetitive levels.

Because the direct measures of price control and market power are unrealistic in most instances, antitrust analysis typically relies on an economic analysis of market concentration and the presence of exclusionary market behavior. Market concentration, which is a ". . . function of the number of firms in a market and their respective market share,"⁵ provides a commonly accepted, indirect standard for determining the likely presence of market power. For example, following the 1992 *Horizontal Merger Guidelines*,⁶ the Herfindahl-Hirschman Index ("HHI"), which is a sum of the squares of the market shares of all of the market participants, is a commonly accepted, but imprecise, measure.⁷

II. AN HHI ANALYSIS

⁴ The "Lerner Index," defined as $(P-MC)/P$, where P is the market price and MC is the current marginal cost, is a quantitative measure of market power. In competitive markets, $P = MC$, so the Lerner Index would equal zero. Mathematically, the Lerner Index is also the reciprocal of the price elasticity of demand facing the firm. See Lerner, Abba P., "The Concept of Monopoly and the Measurement of Monopoly Power," *Review of Economic Studies*, June 1934, 157-75.

⁵ U.S. Department of Justice and Federal Trade Commission, § 15 *Horizontal Merger Guidelines* (1992 with 1997 revisions), republished at 4 Trade Reg. Rep. (CCH), ¶ 13, 104 at 20,573.5.

⁶ *Ibid.*

⁷ The *Guidelines* somewhat arbitrarily divide the HHI into the three following concentration categories: unconcentrated (HHI below 1000), moderately concentrated (HHI between 1000 and 1800), and highly concentrated (HHI above 1800). A monopoly has an HHI of 10,000.

From a practical standpoint, an HHI analysis has two principal drawbacks when used to measure the presence of market power. First, it has significant analytical demands, including detailed data requirements and critical analytical judgments. Second, at best, an HHI analysis is imprecise and produces only circumstantial evidence regarding the presence of market power.

Conceptually, an HHI calculation requires an analyst to define the product carefully and designate the geographic breadth of the market, identify all of the market participants and their respective market shares, determine ease or difficulty of entry by competitors, and study the nearness of product substitutes or emergent technologies. Each of these steps requires analytical judgment and presents potential data acquisition issues and topics for expert and court interpretation.

An HHI result can only imply a general likelihood or unlikelihood of the ability to control prices. It cannot show whether price control or rent capture has occurred in the market studied in the past or the probability that it will occur in the future. Because it is an imprecise measure, a market concentration study, such as the HHI, can error either by implying the presence of market power when it does not exist or by missing its presence when it does exist. That is, a “highly concentrated” HHI may imply the presence of market power even though price control does not exist. Likewise, an “unconcentrated” market structure may suggest that a market should perform as though it is competitive, when, in fact, significant market power and rent capture may exist, even if it is only temporary. Examples of both types of errors exist in the literature.

One example of a high HHI which proved to be misleading was pointed out by Hausman and Sidak (H-S). This example comes from their study of the mobile

telecommunications industry in Ireland.⁸ By comparing the level of prices in Ireland with prices in the similar industry in the United Kingdom, which earlier had been found to be competitive, H-S demonstrated that a very high concentration was insufficient to show the presence of market power. From this direct comparison of prices, they concluded that the Irish industry was competitive despite a two-firm joint market share of 94 percent and an industry HHI of 4682. H-S summarized their findings, as follows:

A competitive benchmark often allows straightforward comparisons of whether SMP [Significant Market Power] exists. Here benchmarks refuted the existence of SMP and, thus, joint dominance. The HHI approach to analyzing SMP, which we have shown often results in ambiguous findings, does not correspond to a correct economic analysis of market power.⁹

An interesting example of when traditional market concentration studies could miss identifying the presence of market power is during the California power crisis. For example, Borenstein, Bushnell and Knittel, in a study of the California power market during that period, found that firms with only a seven-to-eight per cent market share could exert market power during peak demand periods.¹⁰ These authors identified several factors inherent in dynamic markets that affect behavior other than market shares. They also specifically noted that dynamic markets may be in a long-term competitive equilibrium, but at the same time, some participants may possess and exert market power during that market's movement along the path to new equilibria.

III. Direct Price Control

⁸ Hausman, Jerry A. and J. Gregory Sidak, "Evaluating Market Power Using Competitive Benchmark Prices Rather than the Herfindahl-Hirschman Index," *Antitrust Law Journal* 74(2), 387-407.

⁹ *Id.* 407.

¹⁰ Borenstein, Severin, James Bushnell and Christopher R. Knittel, "Market Power in Electricity Markets: Beyond Concentration Measures," *POWER Working Paper – 059*, February 1999.

In contrast to the circumstantial evidence of an HHI analysis, in some instances, such as *United States v. Microsoft*, 253 F.3d 34 (D.C. Cir. 2001), courts have accepted direct evidence of firms exercising control over prices in a relevant market as proof of the presence of market power.¹¹ In *Microsoft*, the D. C. Circuit Court declared that showing maintenance of supracompetitive prices was sufficient to prove monopolization, as follows:

While merely possessing monopoly power is not itself an antitrust violation, *see Northeastern Tel. Co. v. AT&T*, 651 F.2d 76, 84-85 (2nd Cir. 1981), it is a necessary element of a monopolization charge, *see Grinnell*, 384 U.S. at 570, 86 S.Ct. 1698. The Supreme Court defines monopoly power as "the power to control prices or exclude competition." *United States v. E.I. du Pont de Nemours & Co.*, 351 U.S. 377, 391, 100 L.Ed. 1264 (1956). More precisely, a firm is a monopolist if it can profitably raise prices substantially above the competitive level. 2A PHILLIP E. AREEDA ET AL., ANTITRUST LAW ¶ 501, at 85 (1985) . . . Where evidence indicates that a firm has in fact profitably done so, the existence of monopoly power is clear. *See Rebel Oil Co. v. Atl. Richfield Co.*, 51 F.3d 1421, 1434 (9th Cir. 1995); *see also FTC v. Indiana Fed'n of Dentists*, 476 U.S. 447, 460-61, 106 S. Ct. 2009, 90 L. Ed. 2d 445 (1986). . . .¹²

The D. C. Circuit further noted that because direct-proof evidence of supracompetitive prices "...is only rarely available courts more typically examine market structure in search of circumstantial evidence of monopoly power."¹³ Although it may be unusual, surely when it is available, as in the H-S analysis of the Irish mobile telecommunications industry, a direct proof of monopolization surely has merit.

IV. A Market Behavior Test of Direct Price Control

Two authors of this current article, Murry and Zhu, (M-Z) demonstrated, with measured levels of statistical significance, the presence and absence of direct price control in the physical

¹¹ ABA Section of Antitrust Law, Antitrust Law Department (5th ed. 2002), p. 233.

¹² *United States v. Microsoft Corp.* 253 F.3d 34 (D.C. Cir. 2001)

¹³ *Id.*

spot market for wholesale natural gas.¹⁴ In a manner somewhat similar to H-S, M-Z also used a benchmark competitive market to determine the presence of market power in a studied market. However, the two approaches have some fundamental differences. H-S compared the price *levels* in a benchmark competitive market to the market studied; M-Z statistically isolated systematic deviations in one market from the competitive price behavior in a benchmark market.¹⁵ If these deviations in market behavior were consistent with the control of prices, they showed the actual systematic capture of economic rents. This finding implies the likely presence of market power, or at least it shows that participants have collected economic rents as though they possessed market power. Conversely, if a studied market's price behavior was systematically similar to that of the benchmark competitive market, this shows that participants in the investigated market do not exercise market power and clearly casts doubt upon its existence.¹⁶

Because M-Z studied several locations where traders price physical packages of gas, they could distinguish, at levels of statistical significance, that some regional markets functioned consistently as competitive markets, some functioned consistently as though the buyers possessed market power, and some functioned consistently as though sellers possessed market power. Although some of the regional markets did not exhibit swift price adjustments that one associates with ideally competitive markets, these markets still exhibited symmetrical adjustments over time. For this reason, these markets failed the statistical tests that would demonstrate the presence of market power.

¹⁴ Murry, Donald and Zhen Zhu, "Asymmetric Price Response, Market Integration and Market Power".

¹⁵ In a related study applying a somewhat similar methodology, Joskow and Kahn (2001) developed hypothetical, competitive electricity prices and then compared the prevailing market prices to these benchmark estimates. Joskow, Paul and Edward Kahn, "A Quantitative Analysis of Pricing Behavior in California's Wholesale Electricity Market during Summer 2000," *The Energy Journal* 23(4), 1-35, 2002.

¹⁶ The relative ease of entry into a market is hard to measure definitively; however, threat of entry may deter the exercise of market power even in very concentrated markets. Nevertheless, the M-Z methodology can determine if rent capture has actually occurred in markets with high HHIs.

V. Regional Natural Gas Price Behavior

In M-Z's study of the behavior of market prices at 19 regional "trading hubs," where natural gas buyers and sellers trade physical natural gas supplies, they determined whether the price patterns at the trading hubs systematically deviated from the competitive market standard. The study, which covered the period from January 2001 through December 2003, was based on publicly available physical gas price information for trading hubs reported in *The Gas Daily*, and the New York Mercantile Exchange ("NYMEX").

The NYMEX was the benchmark competitive market, and by comparison, M-Z showed statistically whether systematic economic rent capture had occurred at a trading hub by showing a price asymmetry consistent with the presence of market power. As a practical matter, this measurement of systematic, competitive and non-competitive market performance required only identifying the traded product and its price pattern.

In this study of the spot market prices, M-Z confirmed, at a measure of statistical significance, that 15 of the 19 trading hubs functioned symmetrically; this was consistent with the expected price behavior of competitive markets.¹⁷ This statistical finding rejected the hypothesis that either buyers or sellers had market power at these trading hubs. M-Z showed, also at a level of statistical significance, that two of the trading hubs performed asymmetrically and consistently as though participants on the buyer's side of the market had market power. Also, two of the trading hubs performed consistently, again measured at a level of statistical

¹⁷ Murry and Zhen tested the presence of market power at levels of statistical significance of .01, .05 and .10. Murry, Donald and Zhen Zhu, "Asymmetric Price Response, Market Integration and Market Power." Although the study of the market behavior of the individual trading hubs is more precise, the finding that the majority of the natural gas trading hubs is competitive agrees with earlier studies of the overall U. S, wholesale natural gas market that found it to be competitive.

significance, as though sellers had market power.¹⁸ Moreover, this analysis produced indices that measured the likelihood of whether market power existed at a particular trading hub. As a relative measure, it also illustrated the likelihood of market power existing at each of the various hubs.

Consequently, with statistical certainty, this technique determines whether or not participants in the regional trading hub markets systematically captured rents, or increased profits, consistent with the existence of market power.

VI. The M-Z Direct Price Control Measure

The M-Z analysis of the U.S. natural gas market showed, with statistical precision, the presence of rent capture that was consistent with market power at certain trading hubs. Conversely, again with statistical precision, it succeeded also in showing trading hubs with systematic price behavior that was consistent with competitive markets.

The M-Z methodology relies only on measuring deviations from a benchmark competitive pricing standard. In this way, the M-Z method is similar to H-S's approach that compares price levels in one market to those in a benchmark market. However, the M-Z method reveals more information about relative market behavior and its consequences. For example, it showed actual economic rent capture in the dynamic natural gas market. A comparison of price levels, as in the case of the H-S method, is less likely to reveal the presence of temporary market power. Moreover, comparing price levels may fail to reveal a market's relative competitiveness because cost differences may account for the prices differences between a studied market and a benchmark market.

¹⁸ The measure of price behavior consistent with the presence of market power in each of these four cases was statistically significant at the .05 or the .01 levels. Murry, Donald and Zhen Zhu, "Asymmetric Price Response, Market Integration and Market Power."

Both the H-S and M-Z direct price analyses have relatively low data requirements related to an HHI analysis. As explained above, the traditional HHI analysis requires market data to support multiple analytical estimates and judgments regarding the relevant product and geographic market.

The M-Z method, as applied in the study of the U.S. natural gas trading hubs, also meets certain *Daubert* requirements, i.e., it has been tested, subjected to peer review and publication, and, in particular, because of its inherent tests for statistical significance, has a known, potential error rate.¹⁹ The latter distinguishes the M-Z analysis of the natural gas market from both the H-S and HHI methodologies. By comparison, an HHI analysis cannot show, with any measured probability, that participants in the relevant market actually have market power or if, or when, they may have exercised it. It can only provide the circumstantial evidence that participants may possess the ability to control market prices and capture economic rents.

Although the M-Z method reveals some precise price behavior of the markets studied, it has some analytical limitations. It requires an effective benchmark market for analysis, and this limits its application; however, it is especially applicable in industries with developed futures markets. It may also require further investigation to determine which firm(s) benefits from rent capture, and a market concentration analysis may be an effective complement to an M-Z analysis. Furthermore, because the M-Z method shows price behavior for the period studied, traditional analyses of entry barriers and emergent technologies may be necessary to evaluate the longer-term implications of the market findings.

VII. CONCLUSIONS

¹⁹ Hovenkamp, Herbert, *Federal Antitrust Policy the Law of Competition and its Practice*, Third Edition, Thompson/West, 2005, pp. 644-645.

The Murry-Zhu analysis showed, with measured statistical significance, which U.S. natural gas trading hubs had prices that systematically performed as though they were competitive and which had prices that systematically performed as though either buyers or sellers had market power. Moreover, this method revealed systematic price behavior consistent with competitive or noncompetitive markets irrespective of the level of market concentration. In this way, an M-Z direct price analysis may confirm or contradict the implications of an HHI level in a particular market.

Because it is a direct measure of price behavior consistent with the presence of market power and a proof consistent with *Microsoft*, the M-Z method could supplant the need for a traditional market concentration analysis. However, market concentration analysis may be useful to reveal which participants have or are likely to benefit from the identified rent capture. In any event, where feasible, the M-Z method can augment any traditional market concentration analyses by showing the presence or absence of effective rent capture.

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