

1998

## Coming to Terms with *Daubert* in Sherman Act Complaints: A Suggested Economic Approach

Robert F. Lanzillotti

*Graduate School of Business, University of Florida*

Follow this and additional works at: <https://digitalcommons.unl.edu/nlr>

---

### Recommended Citation

Robert F. Lanzillotti, *Coming to Terms with Daubert in Sherman Act Complaints: A Suggested Economic Approach*, 77 Neb. L. Rev. (1998)

Available at: <https://digitalcommons.unl.edu/nlr/vol77/iss1/4>

This Article is brought to you for free and open access by the Law, College of at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Law Review by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

# Coming To Terms With *Daubert* In Sherman Act Complaints: A Suggested Economic Approach

## TABLE OF CONTENTS

I. Introduction .....	83
II. Standard Economic Indicia of Collusion.....	93
III. Oligopoly Models of Collusive Behavior .....	95
IV. The Test Model: Product and Market Characteristics ..	96
A. Bid Strategies .....	98
B. Bidding Constraints .....	99
C. Test Hypothesis .....	100
V. A Test Case Study: Bidding Patterns for School Milk Contracts .....	101
A. Bidding Patterns for School Milk Contracts Generated Under a Duopoly: Some Empirical Evidence .....	102
B. Bid Prices in Greater Cincinnati Area, 1992-1995 ..	106
VI. Summary and Conclusions .....	108

## I. INTRODUCTION

United States Supreme Court opinions handed down over the past fifty years appeared to have accepted and clarified the circumstances under which agreement (conspiracy) can be reasonably inferred from

---

Copyright held by the NEBRASKA LAW REVIEW.

\* The author is Professor of Economics and holds the chair of American Economic Institutions, Graduate School of Business, University of Florida; he served as economic consultant and expert witness for the Attorneys General of Kentucky and of Florida in recent school milk litigation, and to various municipalities in the chlorine litigation cited herein.

He acknowledges with thanks the helpful comments and suggestions of colleagues at the University of Florida and elsewhere: Walter Adams, Joel B. Dirlam, Kenneth G. Elzinga, Amanda K. Esquibel, Gordon Hamlin, Bayard Heath, Lars Noah, James T. McClave, Thomas R. Saving, Irwin M. Stelzer, and Sam Wu; also Info-Tech, which supplied special compilations, tabulations, and graphic presentations of the data utilized in the analysis.

circumstantial evidence.<sup>1</sup> These cases, however, have been placed under a cloud by recent court interpretations of the Federal Rules of Evidence. Invoking the 1993 *Daubert* rule,<sup>2</sup> defendants in several price-fixing/bid-rigging cases have successfully raised the bar on the "evidentiary high jump" governing the admissibility of economic and statistical evidence presented through expert testimony.<sup>3</sup> In each instance, defendants moved for summary judgment contending that expert testimony was inadmissible under *Daubert*. In *Ohio v. Louis Trauth Dairy, Inc.*,<sup>4</sup> *Tuscaloosa v. Harcos Chemical, Inc.*,<sup>5</sup> and *In re Aluminum Phosphide Antitrust Litigation*,<sup>6</sup> defendants argued in a pre-trial motion that economic expert testimony to be offered by plaintiffs should be excluded.

A recently published article argues that several antitrust trial courts since *Daubert* "have fulfilled their 'gatekeeping role' by scrutinizing expert economic testimony under the *Daubert* microscope," and

- 
1. The leading cases include: *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, (1986); *Monsanto Co. v. Spray-Rite Serv. Corp.*, 465 U.S. 752 (1984); *Theater Enter., Inc. v. Paramount Film Distrib. Corp.*, 346 U.S. 537 (1954); *Federal Trade Comm'n. v. Cement Inst.*, 333 U.S. 683 (1948); *American Tobacco Co. v. United States*, 328 U.S. 781, (1946); *United States v. Socony-Vacuum Oil Co.*, 310 U.S. 150 (1940); *Interstate Circuit, Inc. v. United States*, 306 U.S. 208 (1939). See also *C-O-Two Fire Equip. Co. v. United States*, 197 F.2d 489 (9th Cir. 1952); *Triangle Conduit and Cable Co. v. Federal Trade Comm'n.*, 168 F.2d 175 (7th Cir. 1948), *aff'd by an equally divided Court sub nom. Clayton Mark & Co. v. FTC*, 336 U.S. 956 (1949); *Bray v. Safeway Stores, Inc.*, 392 F. Supp. 851 (N.D. Cal. 1975), *dismissed on other grounds*, 403 F. Supp. 412 (N.D. Cal. 1975).
  2. In *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993), the Court rejected the "general acceptance" test by which expert testimony based on, or deduced from any scientific principle or discovery, or true in that particular field of knowledge or discipline must be generally recognized as authoritative. This test was ruled to be in conflict with FED. R. EVID. 702. Currently, under *Daubert* (a) the subject of an expert's testimony must be based on scientific, technical or special knowledge, and (b) an expert's testimony proper must be relevant to the task at hand, rest on a reliable foundation, and pertain to scientific knowledge. 509 U.S. 579, 592-93 (1993). Accordingly, the trial court judge now is expected to conduct a preliminary assessment as to whether or not the reasoning and methodology of the expert testimony is scientifically valid and can be properly applied to the facts in issue. *Daubert* concerned testimony of a medical expert regarding allegations that an anti-nausea drug marketed by defendant company and ingested by a pregnant mother caused birth defects in two children. Compare *Frye v. United States*, 293 F. 1013 (1923) with *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).
  3. See *Ohio v. Louis Trauth Dairy, Inc.*, 925 F. Supp. 1247 (S.D. Ohio 1996); *In re Aluminum Phosphide Antitrust Litig.*, 893 F. Supp. 1497, 1506 (D. Kan. 1995); *Tuscaloosa v. Harcos Chem., Inc.*, 877 F. Supp. 1504 (N.D. Ala. 1995).
  4. 925 F. Supp. 1247 (S.D. Ohio 1996).
  5. 877 F. Supp. 1504 (N.D. Ala. 1995).
  6. 893 F. Supp. 1497 (D. Kan. 1995). After an evidentiary hearing on defendants' motion in limine to exclude testimony of plaintiff's economic expert, the court ruled that the expert's opinion was "economically unreliable and therefore inadmissible under Rule 702." *Id.* at 1506.

concluding "[i]n the meantime, *Daubert* is already emerging as a significant evidentiary hurdle for expert economic testimony in antitrust cases."<sup>7</sup> A contrary interpretation of *Daubert*, also very recently published, observes that "[i]n recent years, the defense bar has mounted a legal offensive, euphemistically called 'the *Daubert* defense,' to skew the balance of 'expert power.' . . . A brief analysis of *Daubert* and its progeny will demonstrate the fallacy that *Daubert* has licensed courts to reduce litigation by excluding competent experts."<sup>8</sup> Moreover, the apparent current euphoria of the defense bar over recent *Daubert* challenges to expert economic testimony overlooks the possibility (probability?) of a "boomerang" effect when defense economic experts themselves become the targets of *Daubert* challenges. This is especially true in instances where their expert contribution amounts to little more than a simple critique of the work of others.

Care should be exercised in reading too much into these recent opinions since both the trial and appellate courts have not been consistent in their application and interpretation of *Daubert's* two-prong test. *Daubert* has been applied in literally dozens of cases since the 1993 United States Supreme Court opinion, most of which have involved product liability issues and the admissibility of testimony by medical, epidemiological, biostatistical, or chemical experts. Challenges to economic experts represent a relatively new extension of *Daubert*.<sup>9</sup>

To illustrate, (a) in *Aluminum Phosphide*, Judge Vratil sustained defendants' motion to exclude testimony of plaintiff's economic expert, after holding a full evidentiary hearing on defendants' motion that included a review of the economic reports prepared by plaintiff and defense experts, and a lengthy consideration of testimony at the hearing

---

7. See Christopher B. Hockett & Frank M. Hinman, *Admissibility of Expert Testimony in Antitrust Cases: Does Daubert Raise a New Barrier to Entry for Economists?*, *ANTITRUST*, Summer 1996, at 40, 42, 44.

8. See Larry E. Cohen, *The Daubert Decision: Gatekeeper or Executioner?*, *TRIAL*, Aug. 1996, at 53, 53.

9. Clearly, the appellate courts are sharply divided, with some reading *Daubert* as applicable only to "novel scientific evidence." *E.g.*, compare *Compton v. Suburu of Am., Inc.*, 82 F.3d 1513 (10th Cir. 1996), *cert. denied*, 117 S. Ct. 611 (1996), and *FDIC v. Suna Assoc., Inc.*, 80 F.3d 681 (2d Cir. 1996), *with* *Tyus v. Urban Search Management*, 102 F.3d 256 (7th Cir. 1996), *cert. denied*, 117 S. Ct. 2409 (1997). In *Tyus* the court states,

[w]e do not agree with the Tenth Circuit's decision in *Compton v. Suburu of America, Inc.*, that [*Daubert*] is limited to cases of novel scientific theories or methodologies. It is true, of course, that the measure of intellectual rigor will vary by the field of expertise and the way of demonstrating expertise will also vary. Furthermore, we agree with the implication in *Compton* that genuine expertise may be based on experience or training. In all cases, however, the district court must ensure that it is dealing with an expert, not just a hired gun.

*Id.* at 263 (citation omitted).

by both plaintiff and defendant economic experts;<sup>10</sup> (b) similarly, in *Trauth Dairy*, Judge Spiegel held an evidentiary hearing that included affidavit testimony by both plaintiff and defense economic experts, but declined to exclude the proposed testimony;<sup>11</sup> (c) by contrast, in *Harcos Chemicals*, Judge Guin did not follow the guidelines or standards of *Daubert*. He did not convene an evidentiary hearing on defendants' pre-trial motion to determine whether the theory or techniques offered by plaintiffs' experts can be or have been tested, whether they had been subject to peer review, whether the theory or techniques have been generally accepted, whether the experts were proposing to testify about matters growing naturally and directly out of research conducted independent of the litigation, or whether they had developed theories or techniques expressly for the purpose of testifying in the instant litigation.<sup>12</sup>

The tremendous degree of diversity of *Daubert* interpretations among various district and appellate courts has been exhaustively reviewed and documented.<sup>13</sup> Hence, *Daubert* rulings on the admissibil-

- 
10. See *In re Aluminum Phosphide Antitrust Litigation*, 893 F. Supp. 1497 (D. Kan. 1995). The judge's ruling is based on a detailed critique of the methodology used and analysis performed by both experts, and thus provides a clear trail of reasoning demonstrating why plaintiff's expert conclusions were not considered reliable.
  11. The court found that plaintiff expert's "analysis is testable, generally accepted and reproducible." *Ohio v. Louis Trauth Dairy, Inc.*, 925 F. Supp. 1247, 1252 (S.D. Ohio 1996). However, the court imposed a restriction on plaintiff experts: They would be permitted to testify "how their analyses are consistent with other evidence of the conspiracy" but "may not express an opinion in the form of a legal conclusion regarding the existence of an illegal conspiracy." *Id.* at 1254. While it might appear that such circumscription serves to tie the hands of experts and weaken the impact of expert testimony, there is really nothing new here. Instructing experts that they can testify that their findings "are consistent with other evidence of conspiracy" but may not express a *legal* conclusion regarding the existence of an illegal conspiracy really amounts to a distinction without a difference. *Id.* at 1252. Economic analysis appropriately (a) focuses on an examination of economic and statistical time series data showing price level changes, individual company bids (particularly in sealed-bid procurement), winning/losing bidder patterns, output changes, costs, and other evidence (phone logs, meetings involving officials of competitor companies, internal memoranda, deposition testimony of officials, etc.). It does so in order (b) to reach an informed judgment and reasoned explanation, given the totality of the evidence analyzed, whether there is a high/low probability that the pricing, bidding and sales results were governed by normal market forces, or alternatively whether there is a high/low probability that those results had been artificially restrained in some manner. This is the necessary economic finding required to satisfy the *legal proof* of conspiracy. In short, the court in *Trauth Dairy* gave plaintiff (State of Ohio) the opportunity to present economic testimony which was considered relevant to the issue at hand, even though circumscribed as to the precise form in which the experts' conclusion might be couched.
  12. See *Tuscaloosa v. Harcos Chem., Inc.*, 877 F. Supp. 1504 (N.D. Ala. 1995).
  13. See Lisa M. Agrimonti, *The Limitations of Daubert and Its Misapplication to Quasi-Scientific Experts, A Two-Year Case Review of Daubert v. Merrell Dow*

ity of expert economic testimony reflect some of the same confusion and inconsistency that has characterized the application of *Daubert* in other areas involving expert testimony.<sup>14</sup> In *Joiner v. General Electric Company*, District Judge Evans deemed inadmissible all of the testimony of plaintiffs' experts and granted summary judgment for defendants. Judge Evans also denied both the plaintiffs' and defendants' requests for oral arguments on the defendants' joint motion for summary judgment.<sup>15</sup>

---

Pharm., Inc., 113 S. Ct. 2786 (1993), 35 WASHBURN L.J. 134 (Fall 1995); Bert Black, et al., *Science and the Law in the Wake of Daubert: A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715 (1994); Edward J. Imwinkelried, *Coming to Grips with Scientific Research in Daubert's "Brave New World": The Courts' Need to Appreciate the Evidentiary Differences Between Validity and Proficiency Studies*, 61 BROOK. L. REV. 1247 (1995); Michael C. Polentz, *Post-Daubert Confusion with Expert Testimony*, 36 SANTA CLARA L. REV. 1187 (1996); Linda Sandstrom Simard & William G. Young, *Daubert's Gatekeeper: The Role of the District Judge in Admitting Expert Testimony*, 68 TUL. L. REV. 1457 (1994); Jay P. Kesan, Note, *An Autopsy of Scientific Evidence in a Post-Daubert World*, 84 GEO. L.J. 1985 (1996).

14. The United States Supreme Court recently reviewed *Daubert* in response to the controversy raised by *Joiner v. General Elec. Co.*, 864 F. Supp. 1310 (N.D. Ga. 1994).
15. See *id.* at 1326. However, on review by the Eleventh Circuit, Judge Barkett held that in assessing the reliability of plaintiffs' expert testimony, the trial court improperly rejected two animal studies relied on by experts and that the trial court improperly made a determination of whether experts' opinions were correct rather than merely determining whether the bases supporting those opinions were reliable. *Joiner v. General Elec. Co.*, 78 F.3d 524, 531-34 (11th Cir. 1996). On March 17, 1997, the United States Supreme Court granted certiorari, 117 S. Ct. 1243 (1997), to defendant's appeal of the Eleventh Circuit opinion, seeking clarification, among other things, whether it is appropriate to apply *Daubert* in a "one-size-fits-all" manner to both "scientific" testimony (based on the traditional "bench" sciences, where laboratory experimentation and testing is feasible) and to quasi-scientific testimony (e.g., accountants, economists, engineers and lawyers).

In an opinion written by Chief Justice Rehnquist, the Supreme Court unanimously affirmed the "gatekeeper" role of trial judges. See *General Elec. Co. v. Joiner*, 118 S. Ct. 512 (1997). Early on the opinion (almost grudgingly) confirms that *Daubert* was intended "to allow district courts to admit a somewhat broader range of scientific testimony than would have been admissible under *Frye*," but a careful reading discloses (a) that the ruling principally addresses and affirms the long-recognized "abuse of discretion" standard for appeals courts (in reviewing a trial court's decision to admit or exclude expert testimony), and (b) that the Court passed on the opportunity to use *Joiner* to say more about *Daubert*, thus doing very little to clear up the confusion that still prevails about the *Daubert* process. *Id.* at 517. The opinion states: (1) "In applying an overly 'stringent' review (the appeals court) failed to give the trial court the deference that is the hallmark of abuse of discretion review." *Id.*; (2) The District Court did not err in excluding expert testimony at issue because the animal studies cited by respondent's expert "were so dissimilar to the facts presented that it was not an abuse of discretion for the District Court to have rejected the experts' reliance on them." *Id.* at 518. However, the Court also concluded "[w]hether *Joiner* was exposed to furans and dioxins, and whether if there was such exposure, the opinions of *Joiner's* experts

*Daubert* motions typically are based on challenges to the validity, testability or general acceptance by other scholars of the particular methodology employed by experts.<sup>16</sup> Yet, the district courts in *Joiner v. General Electric Company*<sup>17</sup> (medical experts) and *Harcos Chemicals* (economic experts) rested their decisions not on the *methodology*, that is, whether the methods, procedures, and information used by the plaintiffs' experts are scientifically reliable, but on the courts' conclusions that were contrary to that of proffered testimony.<sup>18</sup> As a factual matter, economic analysis grounded in modern oligopoly theory has

would be admissible, remain open questions." *Id.* at 519. Accordingly the Court reversed the court of appeals and remanded the case.

16. In *Harcos Chemicals*, defendants asserted that no economic methodology exists by which an illegal conspiracy can be inferred from data documenting bidding patterns, parallel behavior, and other circumstantial evidence, notwithstanding the fact that defendants' own economic experts utilized standard oligopoly theory to support their conclusion that the behavior of defendants was consistent with pure oligopolistic interdependence. *Tuscaloosa v. Harcos Chem., Inc.*, 877 F. Supp. 1504 (N.D. Ala. 1995).
17. 864 F. Supp. 1310 (N.D. Ga. 1994).
18. In *Joiner*, plaintiff's expert medical testimony was excluded because the court drew different conclusions from the research cited by plaintiff's experts. *Joiner v. General Elec., Co.*, 78 F.3d 524 (11th Cir. 1996), *rev'd*, 118 S. Ct. 512 (1997). In *Harcos Chemicals*, Judge Guin did not hold an evidentiary hearing on the scientific credibility of proposed economic testimony, and simply chose to accept the *conclusions* of defendants' economist that the circumstantial evidence was ambiguous, despite the fact that this same defense expert recently had published a scholarly treatise expressing unqualified support for the proposition embodied in plaintiff's expert's opinion and flatly contradicts the position he expressed in the instant case, to wit: "*Collusion can be inferred from circumstantial evidence. In other words, even if there is no hard evidence of an actual agreement, one can reach the conclusion that an agreement must have occurred based upon circumstantial evidence.*" ROGER D. BLAIR & DAVID L. KASERMAN, *ANTITRUST ECONOMICS* 206 (1985). Faced with the contradiction, the economist had testified in deposition as follows:

"A. Well, I think that this — you know, I mean, I'm obviously not going to apologize for some sloppy wording in, you know, 400 and some pages. . ."

Testimony of Roger D. Blair, Vol I, p.134 in *Tuscaloosa v. Harcos Chem., Inc.* 877 F. Supp. 1504 (N.D. Ala. 1995).

Moreover, on the economic meaning of tacit collusion, there was this deposition colloquy:

"Q. So you're saying tacit collusion is not collusion?"

A. Well, tacit collusion is a noncompetitive outcome that emerges without any agreement.

Q. Is tacit collusion collusion?

A. Well, it's certainly not collusion the way I defined collusion earlier as an agreement.

Q. So when you're saying tacit collusion; that is, collusion without a deeper actual meaning, that's an incorrect or at least not a statement that you adopt at this time?

A. That's correct."

Testimony of Roger D. Blair, Vol I, p. 143 in *Tuscaloosa v. Harcos Chem., Inc.*, 877 F. Supp. 1504 (N.D. Ala. 1995).

been (a) exhaustively analyzed and tested under different assumptions and configurations, (b) copiously published in economic literature over the past five decades, and (c) widely accepted at face value for years by the courts as an essential, if not crucial element of proof in demonstrating the presence of price-fixing, bid-rigging and other horizontal agreements where only circumstantial evidence is available.<sup>19</sup> However, economics is not a "hard" science, and it is debatable whether economic testimony should be subjected to the same type of standard as expert testimony by laboratory sciences.<sup>20</sup>

Based upon other recent court interpretations of *Daubert*, there already exists good reason for the Eleventh Circuit to rule that the *Harcos Chemicals* court incorrectly applied the holding in *Daubert*.<sup>21</sup> Nonetheless, the *Harcos Chemicals* ruling underscores for all antitrust counsel and antitrust experts the importance of coming to terms with standing requirements of *Daubert* and the burdens of proof they must shoulder even when *Daubert* is correctly applied.

Aside from the relative merits of the complaint and defenses in *Harcos Chemicals*, the *Daubert* rule reflects a deep disagreement and confusion that permeates the literature with respect to the purposes and uses of theoretical constructs (both legal and economic) and the requirements of legal proof. Oligopoly theory instructs us that collusion (a tacit or overt agreement or mutual understanding among firms

---

In short, according to this testimony, "tacit collusion" is an oxymoron. See also Roger D. Blair & Richard E. Romano, *Proof of Nonparticipation in a Price Fixing Conspiracy*, REV. INDUS. ORGANIZATION 101 (1989) (arguing that if members of a conspiracy reached an understanding through wholly tacit means, and they reduce output, that will identify them as colluders). It is very difficult for one to have it both ways: i.e., (a) to take a position in scholarly publications that circumstantial evidence demonstrating firms reached an understanding through wholly tacit means will identify them as colluders, but (b) as a testimonial witness for defendants in a bid-rigging litigation to argue that tacit collusion really is not collusion.

19. See W. KIP VISCUSI, ET AL., *THE ECONOMICS OF REGULATION AND ANTITRUST*, (2d ed. 1995); Jonathan B. Baker, *Two Sherman Act Section 1 Dilemmas: Parallel Pricing, the Oligopoly Problem, and Contemporary Economic Theory*, 38 ANTI-TRUST BULL., 143 (Spring 1993); Richard Posner, *Oligopoly and the Antitrust Laws: A Suggested Approach*, 21 STAN. L. REV. 1562, 1578-83 (1969).
20. It is appropriate for economic experts to meet the tests for peer review, general acceptance, reproducibility and testability of methodology utilized, and an established record of publications in the specialized field of study on which expert testimony is based. However, it is doubtful that economic analysis can meet the same error-rate standard as the "bench" sciences, where repeated laboratory testing is feasible.
21. See *Ohio v. Louis Trauth Dairy, Inc.*, 925 F. Supp. 1247, 1253-54 (S.D. Ohio 1996) (denying defense motion to exclude economic and statistical expert testimony and stating (1) that "the experts analysis will assist the jury to assimilate complicated economic data," and (2) taking issue with the *Harcos Chemicals* ruling and *Dairies Can't Exclude Expert Statistical Analysis In Ohio Bid Rigging Litigation*, 70 Antitrust & Trade Reg. Rep. No. 1759 at 459 (1996)).



to coordinate their actions on some business objective, such as artificially raising price levels or allocating customers or markets) creates a "non-competitive" event, that is the necessary economic finding required to satisfy the legal proof of a Section 1 violation involving a combination or conspiracy in restraint of trade.<sup>22</sup> At the same time, some legal theory appears to argue that the firms in question should not be found guilty if that same result (a) could plausibly have occurred without an agreement (*even though some circumstantial or testimonial evidence of an agreement exists*), or (b) unless it can be demonstrated that the firms *intentionally* contributed to the contested results (rigged or higher than competitive prices, allocated customers, or arbitrarily divided geographic markets).

Short of "smoking-gun," or testimonial evidence confirming competitor agreements, proof of a violation in Section 1 cases inevitably requires an examination and evaluation of certain business phenomena that, by their nature, are largely economic, statistical, and full of complexities requiring expert exposition and explanations.<sup>23</sup> However, of late some judges apparently have become uncomfortable with such testimony as a form of proof, and availed themselves of the *Daubert* option. Thus, even though strong circumstantial economic evidence has been admitted in a given fact situation showing that an agreement of some sort existed (tacit, sophisticated or clumsy) it may not satisfy the "form" requirements considered essential in order to find liability. *Daubert* seems to hold that testing must be "scientific," but it is not clear on probative grounds just how this would differ from a demonstration that a certain pattern of behavior could only have occurred with collusion. The way the *Daubert* rule has been injected into antitrust litigation adds to the confusion surrounding the policies the courts believe they are enforcing. The confusion is twofold: firstly,

---

22. Section 1 of the Sherman Act reads [e]very contract, . . . or conspiracy, in restraint of trade or commerce among the several states, . . . is declared to be illegal. 15 U.S.C. § 1 (1994).

23. For many years judges have been comfortable making inferences regarding the presence of illegal agreements from circumstantial economic evidence, at least since *Interstate Circuit, Inc. v. United States*, 306 U.S. 208 (1939). See also *Federal Trade Comm'n. v. Cement Inst.*, 333 U.S. 683 (1948); *American Tobacco Co. v. United States*, 328 U.S. 781 (1946); *United States v. Socony-Vacuum Oil Co.*, 310 U.S. 150 (1940); *C-O-Two Fire Equip. Co. v. United States*, 197 F.2d 489, 494 (9th Cir. 1952); *Triangle Conduit & Cable Co. v. Federal Trade Comm'n.*, 168 F.2d 175 (7th Cir. 1948), *aff'd by an equally divided Court sub nom.* *Clayton Mark & Co. v. FTC*, 336 U.S. 956 (1949). And finally, as succinctly stated by Judge Carter in *Bray v. Safeway Stores, Inc.*, "[a]s is usual in cases such as this, there exists no proof of formal agreement. . . . Yet, the law contemplates that seldom will direct proof of a conspiracy be available. Accordingly, circumstantial evidence—even in a criminal case—provides a sufficient basis to support a determination of liability." *Bray v. Safeway Stores, Inc.*, 392 F. Supp. 851, 861 (N.D. Cal. 1975), *dismissed on other grounds*, 403 F. Supp. 412 (N.D. Cal. 1975)(citation omitted).

the rule of law and its application in an instant case; and secondly, the burden of proof requirements carried by plaintiffs.

Moreover, the ambiguity surrounding court interpretations of *Daubert* serves also to alert counsel and experts involved on behalf of plaintiffs or defendants in antitrust litigation to the possibility that some trial judges not only may have trouble understanding and accepting as "scientific knowledge" the basic economics of monopolistic competition, but also are not likely to recognize the particular circumstances under which oligopolists find it feasible and useful to engage in concerted actions on pricing, bid-rigging and customer allocation schemes. This is partly because even the most brilliant and exquisite expositions of the complexities of micro-economic theory generally, and oligopoly theory in particular, display and describe the *equilibrium* condition of a market when the governing demand/supply variables for example, the output-price-cost-profit margin relationships, have worked themselves out.<sup>24</sup>

As *Daubert* has been interpreted, evaluation of industry behavior based on a straightforward comparison of (a) expected prices predicted by the standard competitive model (where price adjusts as necessary to equate supply to demand) with (b) prices predicted by static oligopoly models, evidently no longer is adequate to satisfy the tougher standards set by the courts either in resolving issues raised in pre-trial motions or in trial demonstration proper. For example, if the counts of a Section 1 complaint allege (a) that prices have been raised artificially, (b) that sealed bids have been rigged, or (c) that customers or markets have been allocated and divided by agreement, the critical questions on the mind of the court still remain:

- A. "Just what is it about the pricing-bidding record of rival sellers in this case that proves a customer allocation and bid-rigging scheme must have been contrived and communicated among ostensible competitors?"
- B. "Can it be demonstrated that significantly different bidding patterns and level of bid prices would have emerged under a competitive regime?"
- C. "How can we, or a jury differentiate between (a) what appears from circumstantial evidence to reflect cooperative behavior that is tantamount to ex-

---

24. Standard economic analysis demonstrates graphically and descriptively the differences that emerge in output and price-cost-profit margins under alternative assumptions of competitive versus cartelized regimes, namely that under general non-factual assumptions that equilibrium conditions have been reached the latter will reflect higher prices and profits and restricted output relative to the former. However, it is widely recognized (a) that this simple description of oligopolistic behavior based on equilibrium models is sharply at odds with empirical evidence on pricing practices in few-seller markets, and (b) that industrial organization theory must come to terms with more complicated and contrived arrangements than models in which prices set by impersonal market forces alone allocate goods. See Dennis W. Carlton, *The Theory and the Facts of How Markets Clear: Is Industrial Organization Valuable for Understanding Macroeconomics?*, in 1 HANDBOOK OF INDUS. ORGANIZATION, 909 (Richard Schmalensee & Robert D. Willig, eds., 1989).

licit collusion (such as "conspiracy" under antitrust statutes), and (b) pure, very intelligent business behavior such as generated by game theoretic analyses (so-called 'noncooperative conduct') that arguably can generate results similar to explicit collusion?"

In short, these questions address the *pricing/bidding process*, not the *equilibrium outcome*.<sup>25</sup> Equilibrium can result simply from oligopolists' individual decisions either to (a) follow the leader, (b) not to bid successfully, (c) to maintain a differential, or (d) some other option. Economic theory does not pretend to describe or predict any particular, or general *behavioral process* utilized by ostensible competitors to effectuate a collusive arrangement or equilibrium. However, various models of firm behavior, particularly monopoly and oligopoly models, provide clues and special insights regarding the nature of production-price-cost relationships one can expect under both a competitive regime and a collusive ("fixed" or "rigged") regime.

Although oligopoly theory does not provide a formal model of collusion describing a "step-by-step" behavioral process through which collusive arrangements are consummated, extensive empirical literature exists that discloses in detail the operations of many collusive industry agreements that have been exposed in the United States and Europe, and identifies the economic context which generates collusive practices. These studies demonstrate that firms have displayed unusual skill, if not genuine artistry, inventing schemes and processes for implementing and maintaining collusive protocols.<sup>26</sup>

---

25. For an interesting treatment of the importance of distinguishing *process* and *equilibrium* results, see Baker, *supra* note 19.

26. Well-known examples include (a) the Addyston Pipe and Steel Company which provided the leadership for allocating certain southern and central U.S. cities to six manufacturers of cast iron pipe. See *United States v. Addyston Pipe & Steel Co.*, 85 F. 271 (6th Cir. 1898), *aff'd*, 175 U.S. 211 (1899); (b) the famous "Gary dinners" held for steel industry executives from 1907-1911 by the chairman of U.S. Steel's board of directors, Judge Elbert H. Gary, (who is reported to have remarked that the "close communication and contact" provided by those dinners generated such a high degree of "mutual respect and affectionate regard" among steel industry leaders that all felt an obligation to cooperate with rivals and avoid destructive competition "to be more binding. . . than any written or verbal contract," FRITZ MACHLUP, *THE POLITICAL ECONOMY OF MONOPOLY*, 87 & n.6 (1952)); and (c) the "phases of the moon" system used to allocate low bidder status in the electric equipment conspiracy of the 1950s (with a new seller allocated the "low bidder" position every two weeks in cycle with changes in the configuration of the moon). See the following for a discussion of operational details of various cartels: JOHN H. SHENFIELD & IRWIN M. STELZER, *THE ANTITRUST LAWS: A PRIMER* (1993); GEORGE W. STOCKING & MYRON W. WATKINS, *CARTELS IN ACTION* (1948); Peter Asch & J. J. Seneca, *Is Collusion Profitable?*, 58 *REV. ECON. & STAT.* 1 (Feb. 1976); Walter B. Erickson, *Economics of Price Fixing*, 2 *ANTITRUST L. & ECON. REV.* 83 (Spring 1969); Arthur G. Fraas & Douglas F. Greer, *Market Structure and Price Collusion: An Empirical Analysis*, 26 *J. INDUS. ECON.* 21 (Sept. 1977); John M. Kuhlman, *Nature and Significance of Price Fixing Rings*, 2 *ANTITRUST L. & ECON. REV.* 69 (Spring 1969); Willard F. Mueller, *Effects of Antitrust Enforcement in the*

Among the clues and insights indicative of noncompetitive behavior suggested by economic theory are: (a) the presence of any special, artificial, or unique institutional arrangements that are conducive to and supportive of cooperative behavior (so-called "plus factors"); (b) the presence of bidding, non-bidding, and winning-bid patterns that on their face are too complex or inconsistent with independent decisions and exceed the bounds of behavior envisaged in "noncooperative" game theory; and (c) the probability that such arrangements could be implemented and maintained without explicit understandings or communications among sellers. Additionally, certain types of noneconomic evidence can be helpful in demonstrating the presence of communications among ostensible competitors. Examples would be telephone logs, presence of company officials at meetings, guilty pleas of company officials, as well as affidavits by officials outlining the origins and workings of a scheme and acknowledging participation.

The purpose of this article is to suggest a straightforward method of utilizing circumstantial output-pricing evidence, grounded in generally-accepted economic analysis to (a) differentiate bid rigging and customer/market-allocation schemes, based on some form of explicit communications or explicit agreements among rival sellers, from non-cooperative tacit collusion (sheer sophisticated business acumen as hypothesized in various game-theoretic models), and (b) to identify the collusion process with greater precision.

## II. STANDARD ECONOMIC INDICIA OF COLLUSION

It is now well established by economic analysis and numerous empirical studies that certain structural characteristics of a market are conducive to and indicative of a *predisposition* toward effective price fixing.<sup>27</sup> Moreover, two prominent judicial scholars have explained

---

*Retail Food Industry*, 2 ANTITRUST L. & ECON. REV. 83 (Winter 1968-69); Robert H. Porter, *A Study of Cartel Stability: The Joint Executive Committee, 1880-1886*, 14 BELL J. ECON. 301 (1983); Robert H. Porter, *On the Incidence and Duration of Price Wars*, 33 J. INDUS. ECON. 415 (1985); Jeffrey Sonnenfeld and Paul R. Lawrence, *Why Do Companies Succumb to Price Fixing?*, HARV. BUS. REV. July-Aug. 1978, at 145; Richard Austin Smith, *The Incredible Electrical Conspiracy* (pts. 1 & 2), FORTUNE, April 1961, at 132, FORTUNE, May 1961, at 161.

27. For example, Posner identified the following characteristics which he contends demonstrate a market's predisposition to price fixing: (a) number of sellers (the fewer the number the lower the costs of coordinating their activities), (b) homogeneity of product, (c) elasticity of demand (the less elastic the demand the larger the profits from acting like a monopoly and the greater the incentive to collude), (d) entry conditions, (e) relative importance of price versus nonprice competition, (f) whether the market is growing, declining or steady over time (a steady or declining market is more favorably disposed to cartelization), and (g) the structure of the buying side of the market (with many buyers and many transactions, cheating is difficult). See RICHARD POSNER, *ECONOMIC ANALYSIS OF LAW* 267-68

how certain types of economic evidence serve as earmarks indicating a market *has been, or is being successfully cartelized*.<sup>28</sup>

More recently, an argument has been advanced using a simple output test to identify *nonparticipation* (and inferentially, *participation*) in a price-fixing conspiracy.<sup>29</sup> This Article demonstrates how the relationship between capacity utilization rates and pricing behavior can serve as an effective indicator of a collusive agreement, express or

(4th ed. 1992) and Richard Posner, *Oligopoly and the Antitrust Laws: A Suggested Approach*, 21 STAN. L. REV. 1562, 1578-83 (1969).

28. In 1969, Posner identified certain types of economic evidence believed to be probative of collusion, namely: (a) presence of systematic price discrimination, (b) prolonged excess capacity over demand, (c) refusal to offer discounts (i.e., lower prices) in face of substantial excess capacity, (d) less frequent changes in prices of noncompeting sellers than prices of competing firms, (e) abnormal (i.e., higher than normal) profits, (f) price leadership, and (g) the presence of fixed market shares for a substantial period of time. See Richard Posner, *Oligopoly and the Antitrust Laws*, 21 STAN. L. REV. 1562, 1578-83 (1975).

In 1981, Posner and Easterbrook argued that

if the economic evidence warrants an inference of collusive pricing, there is neither legal nor practical justification for requiring evidence that will support the further inference that the collusion was explicit rather than tacit. From the economic point of view, proof of hotel meetings and the like is a detail, and conspiracies organized so that they do not produce evidence of actual communications are no less harmful than conspiracies that leave a trail of such evidence.

RICHARD POSNER & FRANK EASTERBROOK, *ANTITRUST CASES, ECONOMIC NOTES AND OTHER MATERIALS* 341 (2d.ed. 1981).

Finally, in 1992, Posner restated essentially the same kinds of evidence he identified in 1969 as probative of collusion: (a) market-wide price discrimination, (b) decline in market share of the largest firm, (c) industry-wide resale price maintenance, (d) market shares that are too stable to be a product of normal competitive activity among sellers, (e) regional price variations that cannot be explained by regional differences in cost or demand, (f) a price rise coupled with a reduction in output, (g) a fairly high elasticity of demand at current market price, (h) a sudden and unexplained increase in profit levels, and (i) the presence of a negative correlation between number of firms in the market and price level. POSNER, *ECONOMIC ANALYSIS OF LAW*, *supra* note 27, at 288-90.

29. The simple output test boils down to the proposition that if the *output* of a firm that claims to be innocent of participation in a price-fixing scheme *rises* during the period a conspiracy has artificially raised prices, that evidence should be accepted as exoneration. Conversely, if members of a conspiracy reached an understanding through wholly tacit means, and they reduce output, this test will identify them as colluders. However, the condition required for this conclusion may not follow in cases where "demand" is institutionally determined and by its inherent nature relatively price inelastic (e.g., a requirements contract for (a) chlorine "demand" is determined by the amount of water or sewage to be treated, (b) school milk "demand" is determined by the number of children eligible for school lunch milk, or (c) other WIC (women, infants, and children) program "demand" requirements are given by the number of eligible families). Hence, in such instances the colluders will not necessarily have to reduce output in order to raise prices, and thus by the simple output test would be exonerated. See Roger D. Blair and Richard E. Romano, *Proof of Nonparticipation in a Price Fixing Conspiracy*, REV. INDUS. ORG., Spring 1989, at 101.

tacit, particularly in markets having certain product and structural characteristics.

### III. OLIGOPOLY MODELS OF COLLUSIVE BEHAVIOR

Oligopoly theory examines a number of issues related to the behavior of firms under market structures having a relatively small number of firms, sometimes characterized as "competition among the few."<sup>30</sup> In these situations various theories of oligopoly behavior indicate how and why each firm (appropriately) takes into account both the initial actions and expected future responses of its rivals in deciding (a) how much to produce and sell and/or (b) at what price the output will be sold. Ever since the models of Cournot and Bertrand (in neither of which did firms ever reach joint profits-maximization under their postulated assumptions) various writers have revisited both (a) the "how" problem confronting oligopolists, (how firms could achieve higher joint profits), and (b) the "why" problem, (why oligopolists are likely/not likely to adhere to collusive outcomes involving "cooperative" price-output decisions (*agreements under antitrust law*) versus "non-cooperative" price-output decisions (per game theoretic postulates)).<sup>31</sup>

---

30. See WILLIAM F. FELLNER, *COMPETITION AMONG THE FEW* (1949).

31. The simple duopoly models assume two firms of equal size and protected from new entry. Cournot's early solution assumed that firm A first selects an *output* in the expectation that firm B's *output* will remain the same from one period to the next. Obviously, this is an artificial and implausible assumption, that leads the duopolists to an output equal to two-thirds of the competitive output level. Eventually, Cournot derived the conclusion that increasing the number of equal-sized firms resulted in bringing price closer to marginal cost (the competitive result), but not necessarily joint profits-maximization. Bertrand suggested that *price* should be the decision variable in the duopoly game, rather than quantity. Finally, Stackelberg reasoned that when duopolists are assumed to be more sophisticated in the sense that each firm recognizes and acts on the anticipated reactions of the other firm, they may both lose as a result of constant undercutting of one another's prices. Under very simple assumptions, Chamberlin argued that these firms will soon learn to each produce one-half the monopoly output, with both selling their respective outputs at the monopoly price. All of the models developed by these writers illustrate the principle of interdependence, and that the lessons of recognizing firms' interdependence under oligopolistic structures can favor actions conducive to joint maximizing, or make the solutions fragile, depending upon the number of firms and the degree of complexity of the sales game (type of product, whether the product is sold under conventional quoted price arrangements, at auction, or under sealed bidding, and number of bidding opportunities involved). See AUGUSTIN COURNOT, *RESEARCHES INTO THE MATHEMATICAL PRINCIPLES OF THE THEORY OF WEALTH* (Nathaniel T. Bacon trans., Macmillan Co. 1927) (1838); EDWARD CHAMBERLIN, *THE THEORY OF MONOPOLISTIC COMPETITION* (5th ed. 1946); HEINRICH VON STACKELBERG, *MARKTFORM UND GLEICHGEWICHT* (Wien & Berlin 1934); Wassily Leontief, *Stackelberg on Monopolistic Competition*, J. POL. ECON. Aug. 1936, at 554, 554-559; J. Bertrand, *Book Review*, 67 JOUR. DES SAVANTS 499 (1883)(reviewing *THEORIE MATHÉMATIQUE DE*

The upshot of this review—given the apparent judicial trend toward requiring the production of “smoking gun” evidence to prove a conspiracy to fix prices, rig bids, or allocate markets—underscores the problem federal and state antitrust authorities, as well as private plaintiffs all face in differentiating *cooperative collusion* (price fixing agreements under the Sherman Act) from *noncooperative collusion*, (no agreement), or what some characterize as “pure, rational oligopoly behavior.” The data presented herein disclose that (a) as a practical matter, the bid-price levels and customer allocations which emerge in an alleged “noncooperative” (no agreement) model really have to be “arranged” in some manner; and (b) under the profit-maximization rule postulated in all of the various oligopoly models cited above, empirical data on day-to-day price-output decisions of oligopolists can be used to demonstrate the presence of price-fixing agreements that are proscribed by the Sherman Act.

#### IV. THE TEST MODEL: PRODUCT AND MARKET CHARACTERISTICS

The test model used in this analysis is based on empirical data compiled for the 1980s and 1990s for regional markets around the United States in which various dairies bid for public school districts' annual supply contracts for milk and other products.<sup>32</sup> The markets typically display the following characteristics:

- A. The product(s) involved are homogeneous, (sold and purchased on the basis of certain specifications as to product content),<sup>33</sup> and on average account for approximately 10% to 15% of the total revenue of competing firms;
- B. Industry structure consists of regional and local firms with a primary service area having a radius from the plant of 75-150 miles; at least two firms are present in each market, and at least one potential entrant, located at the edge of all markets, is eligible and capable of entering into the bidding;
- C. Sales are made principally on a supply contract basis to public agencies for a specified period of time (usually 9-10 months), and suppliers are determined through a sealed-bid process;
- D. Sellers do not face a demand “schedule,” as such, rather they are bidding for the right to supply a **fixed quantity** of products, principally half-pints of white and chocolate milk (a requirements contract, to be awarded on an “all or nothing” basis). A given school district demand is shown in Figure 1 as “**dd**” (the buyer is interested in awarding a fixed requirements contract for the quantity **Om** which will be awarded on an “all-or-nothing” basis to the lowest

---

LA RICHESSE SOCIALE AND RECHERCHES SUR LES PRINCIPES MATHÉMATIQUES DE LA THÉORIE DES RICHESSES).

32. For a more detailed description of the source data for this paper, see Robert F. Lanzillotti, *The Great School Milk Conspiracies of the 1980s*, 11 REV. INDUS. ORG., 413 (1996).
33. School districts typically purchase a range of products for their school lunch program; the bulk of purchases are half-pints of whole, lowfat, chocolate and skim milk, but contracts also may include buttermilk, milkshake mix, orange juice, fruit-flavored drinks, sour cream and yogurt.

bidder).<sup>34</sup> In these kinds of markets the buyer (i.e., the school district) is prepared to award the contract at the lowest bid price emerging from the bidding process. As a practical matter "dd" is truncated at some upper bound, say at  $P_2$ , above which the buyer might reserve the right either not to award the contract or to submit it for re-bid;

E. A given seller can expect to receive numerous invitations to bid during a given bidding season, involving up to fifty or more bidding opportunities;

F. Prior to each bidding opportunity during the bid season and prior to the deadline for submission of bids each seller has access to the following market information: (a) total volume requirements of the buyer for the 9-10 month supply period; (b) last year's winning bid and volume sold to that buyer; (c) earlier winning bids announced during the current bidding season; (d) the due bid date; and (e) contract award date;

G. Contract proposals involve a commitment to deliver the product requirements on an agreed-upon schedule over a 9-10 month period, with deliveries commencing a few months after award of the contract. In effect, from the standpoint of sellers, the bidding process consists of selecting a strategy for filling each firm's advance "order book," which affords important operational advantages to the firm;<sup>35</sup>

- 
34. See Appendix, Figure 1. Strictly speaking, the relevant body of "oligopoly theory" that is most useful in understanding and predicting pricing of oligopolists under sealed-bid conditions is the theory of auctions. Under the first-price auction, the lowest bidder receives the bid. Under these market conditions, it is highly likely (as Nobel laureate George Stigler noted years ago) that collusion is facilitated in few seller markets where public agencies promptly and accurately report all bids. Both economic theory and empirical findings indicate that when bidders compete to sell a good, as the number of sellers increases, the expected level of bids will be lower. This result follows principally as a function of the number of sellers, but in dairy markets it is affected by two other important economic characteristics: (a) bidders (dairies) in each market have substantial sunk costs in existing plants, and (b) they have substantial excess capacity, notably productive capacity, for processing and bottling milk in half-pint containers. School milk contracting thus is a case of *first-price auction*, with the school district buyer (alter ego of consumers in a price competition model) having a unit demand, and each seller (dairy) knows its costs of supplying one unit of the product. See VISCUSI *supra* note 19; Lance Brannman, et al., *The Price Effects of Increased Competition in Auction Markets*, 69 REV. ECON. STAT. 24 (1987); Timothy F. Bresnahan, *Empirical Studies of Industries with Market Power*, in II HANDBOOK OF INDUSTRIAL ORGANIZATION 1011 (Richard Schmalensee & Robert Willig eds., 1989); Dennis W. Carlton, *The Theory and the Facts of How Markets Clear: Is Industrial Organization Valuable For Understanding Macroeconomics?*, in I HANDBOOK OF INDUSTRIAL ORGANIZATION 909 (Richard Schmalensee & Robert Willig eds., 1989); and George J. Stigler, *The Economic Effects of the Antitrust Laws*, 9 JOUR. L. ECON. (October 1966), reprinted in THE ORGANIZATION OF INDUSTRY 259-95 (1968). For extensive surveys of the literature on auctions, see Eric Maskin & John G. Riley, *Auction Theory with Private Values*, 75 AM. ECON. REV., PAPERS & PROC. 150 (1985); R. Preston McAfee and John McMillan, *Auctions and Bidding*, 25 JOUR. ECON. LITERATURE 699 (1987); Paul R. Milgrom, *Auction Theory*, in ADVANCES IN ECONOMIC THEORY: FIFTH WORLD CONGRESS 1, 1-32 (Truman F. Bewley ed., 1987).
35. Economists classify markets according to the manner in which sales and production are organized. For example, firms may produce first, and then build and hold inventories in the expectation of selling off the inventory over time. In these cases, firms are characterized as producing to "stock." Alternatively, firms may



H. All firms rely on a standard production technology, involving a single raw material that (a) usually is in abundant supply, (b) whose supply is subject to government regulation, (c) whose basic raw material cost constitutes 50% to 60% of total costs of end product(s) involved in the contract bidding, and (d) whose production technology is "lumpy" in the sense that the minimum efficient scale of plant for producing the product in question can easily supply 50%, 75%, or even 100% of the total demand requirements for the relevant geographic market (including school districts, other institutional buyers and the retail commercial market);

I. Production functions of all firms yield short-run cost curves similar to those displayed in Figure 2, and are characterized by the principal feature that marginal cost falls sharply at relatively low rates of production and remains virtually constant until the plant is fully utilized, (90% to 100% utilization based on a work day of two eight-hour shifts (sixteen-hours per day));<sup>36</sup>

J. All sellers are qualified and eligible to bid on all available contracts, that is, no supply limitations are present;

K. All sellers are assumed to be profit-maximizing entities, and act independently in establishing bid prices;

L. All sellers regard the product in question as a marginal cost/marginal revenue type of business—meaning that, as long as the incremental revenue generated by another unit of sales exceeds incremental costs, it pays for the firm to bid for and book the business.<sup>37</sup>

## A. Bid Strategies

Since the nature of the business "game" in question concerns the rate at which various sellers choose to fill their respective order books (commit their capacity) alternative bidding strategies are feasible, provided all sellers follow the dictates of the short-run profit-maximization rule.

Some obvious seller strategies include:

1. *Bertrand/Cournot strategy*: sellers attempt to reach a 50/50 sharing of the quantities involved in successive winning bids, in a two-firm game, a 1/3, 1/3, 1/3 sharing in a three-firm game, a 1/4, 1/4, 1/4, 1/4 sharing in a four-firm game, etc;

---

bid for sales (produce "to order") in an auction or bid situation. In that case they bid to fill advance order books, as is true for public school milk contracts. The latter, bidding to fill advance order books, has many advantages for a firm, notably the opportunity to develop a bidding strategy to fill its advance order book and rationalize future production schedules, thus minimizing costs of inventory holdings. Moreover, in cases where risk of spoilage of product exists, such as in milk products, production "to order" or for contract sales may provide additional cost savings to the firm.

36. See Appendix, Figure 2. Some dairies operate their plants twenty hours, seven days per week (two and one-half eight-hour shifts, and one-half of a shift (four hours) for cleaning/maintenance). That means they are capable of half-pint production in excess of the capacities shown in Figures 3-7 and Table A-1 in the appendix.
37. This description of the decision strategy for school milk business is found in deposition testimony of several managers of various dairies involved in antitrust litigation covering school milk contracting in the Southeast during the 1980s. See Lanzillotti, *supra* note 32.

2. *Early "high-bid" strategy*: a given seller may test the market in the early bid opportunities with a high bid-price strategy relative to the last known winning bid in a given market or current winning bids in adjacent markets;
3. *Early "low-bid" strategy*: a seller may adopt an early low-bid strategy (relative to prior year's prices) in order to place some initial orders on its books;
4. *"Mixed-bid" strategy*: a firm may follow a "mixed" strategy, (for example, pursue strategy (1) and strategy (2) in such a manner that sales are "split");
5. *Selective account strategy*: a firm may elect to bid only for school district contracts that the firm won in the preceding year;
6. *Early "no bid" strategy*: a firm may elect not to bid on early bid opportunities in the expectation (hope?) that its rival(s) will fill their order books, thus permitting a firm with an open order book to win contracts at bid prices higher than previously offered. The wisdom of this strategy is highly questionable since each firm generally has operated during the school year with substantial excess plant capacity, and each is capable of supplying most (at least 75% to 80%) of foreseeable school district and other institutional requirements.

Strictly speaking, the model should also consider the bid strategies of the buyers, in this case, school districts. The typical school district strategy in the past has been to rely on the expectation that the district would receive the best competitive (lowest) price under a sealed-bid auction arrangement. Buyers would not shop around a bid but would award the contract to the lowest bidder. Another strategy, used in the past by some public entities, and adopted in recent years by some school districts, consolidates bid dates so that sellers are obliged to bid for a group of school district contracts on a given date, rather than to bid for school district contracts one-by-one. The optimum version of this buyer strategy is to consolidate all school district contracting into a single bid date.

## B. Bidding Constraints

1: Contract commitments for utilization of productive capacity at price  $P$  or higher up to output  $0m_1$  in Figure 2 are profitable, since throughout this range  $MC$  of the firm is  $<$  "industry"  $MR$  (which we assume is  $\leq$  to the most recent/last winning bid price). Average variable costs ( $AVC$ ) and incremental costs ( $MC$ ) per half-pint are constant up to near the full capacity utilization of  $m_2$ .<sup>38</sup>

2: All firms are free to bid or not bid.

3: All firms' bids remain sealed until publicly opened prior to award. At that time all bids are made public, including the winning bid and winning bidder.

4: Winning bidders are free to sub-contract for supply, but contract supply responsibility cannot be shifted to sub-contractors.

According to standard economic theory and the profit-maximization principle, it is profitable for the firm engaging in sealed-bid (auction) sales of school milk contracts to commit capacity utilization per

---

38. Of course, average variable costs are still "variable" throughout the range of output, in the sense that total dollar costs rise as half-pint production is increased.

week for an entire school year, as long as incremental revenue (**MR**) per half-pint  $\geq P$  ( $\geq$  **AVC**) in Figure 2. Likewise, it is profitable for the firm to commit additional capacity up through weekly utilization rates of **0m**, **0m<sub>1</sub>**, **0m<sub>2</sub>** etc., so long as incremental revenue (**bid price P**)  $\geq$  incremental cost **MC**. This means that in the range of capacity commitments up through **0m<sub>1</sub>** bid prices (**MR**) at **P** or higher are profitable since the firm is covering all direct costs (**AVC**) as well as part of indirect (fixed) costs as shown by the position of **ATC**.

Thus, at any given time during the bidding season, while order books are being filled through auctioning of school milk contracts, it is profitable for the firm to offer a bid price **P**  $\geq$  incremental costs **MC**. Whenever a firm (a) has committed only a fraction of its capacity (e.g., has uncommitted excess capacity of 50% or higher), and (b) tenders losing bid prices in the range **P<sub>1</sub> - P<sub>2</sub>**, a question can be raised whether the firm is participating in a collusive arrangement, because a bid anywhere above **P** would be profitable and more likely to win. The issue may be resolved by looking at capacity utilization and the **P-MC** or the **MR-MC** margin.

### C. Test Hypothesis

The basic hypothesis to be tested is as follows: *Collusion may be inferred from circumstantial evidence disclosing the pattern of rival sellers' (a) actual bid prices, and (b) non-bidding or refusals to bid, in relation to (c) advance commitments of production capacity relative to the level of uncommitted capacity (magnitude of excess (unused) capacity).*

This hypothesis, which might be viewed by the trier of fact as a *rebuttable presumption*, will be tested utilizing circumstantial evidence covering price levels, bidding practices, and commitment of productive capacity, based on the following general standard:

If, for an extended period during the bid season, a seller (*bidder*) in any given market, meets the conditions listed below, that seller is in a *de facto* collusion mode:

1. a bidder's bookings for the season (a) total less than 70%-75% of its rated productive capacity, (b) expected incremental revenue (**MR**)  $>$  expected incremental cost (**MC**), and (c) the bidder fails to bid;
2. a bidder frequently sets its bid price at a significantly higher level (10%-20%) than expected **MC**, and that bidder consistently wins those contracts; or
3. a bidder frequently sets its bid price at a significantly higher level (10%-20%) than expected **MC**, and that bidder consistently loses those contracts; and
4. a bidder's expected **MR** associated with any given bid during the bidding season is  $>$  **MC**, and that bidder bids only for new supply contracts with accounts on which it was the winning bidder in past (last year's) competition.

## V. A TEST CASE STUDY: BIDDING PATTERNS FOR SCHOOL MILK CONTRACTS

This analysis will test the foregoing proposition in a two-firm (duopoly) market structure, but it is testable under various other market structure settings. In accordance with the early Cournot/Bertrand/Stackelberg models and modern game theory discussed above, sophisticated businessmen in a *noncooperative (noncollusive)* game will select a level of output for each firm that results in each firm maximizing its profits, given the output (sales) of its rival(s), in effect a Nash equilibrium.<sup>39</sup> Duopoly constitutes the market structure most favorable to a defendant in order to test the proposition that under a Cournot (or other game theory model involving infinitely repeated iterations of that model) competitors *a priori* should be able to reach and sustain a *noncooperative* Nash equilibrium based purely upon their recognized interdependence. It is important to note that the first order equilibrium conditions for duopolists to reach and sustain the joint profit-maximizing price and output solution are that in each bidding opportunity both bidders must *simultaneously* select a price and an output commitment that will maximize joint profits (or, more appropriately, the sum of discounted expected joint profits).

Since the context of the test hypothesis is a sealed-bid game, involving contract auctions at different times and different buyers with varying requirements, knowledge of *past* prices and *past* sales of rivals will not necessarily represent accurate and reliable information regarding any seller's *next* bid price (without some form of communication), especially, if either or both sellers (a) have uncommitted capacity, and (b) recent winning bid prices were significantly higher than current marginal costs. Thus, whenever either firm has substantial uncommitted (excess) capacity and expected incremental revenue of either firm exceeds its current marginal cost, it will be profitable for that firm to lower bid prices (to the point where price = marginal cost) in order to book the business.<sup>40</sup> The crucial differentiating character-

---

39. Economists define a Nash equilibrium as a pair of outputs (sales) such that each firm's output (sales) maximizes its own profits, given the expected output (sales) of the other firm.

40. An appropriate question is whether firms pursuing this MR/MC pricing rule for its products (setting bid prices that cover all direct costs (AVC) but do not fully cover fixed (capital) costs) over the "short-run" would be able to remain in business in the "long-run" (that period of time in which entry of new firms and exit of established firms are possible). First, as noted above, school milk sales typically constitute only 10% to 15% of total dairy revenues. Second, school milk contracts provide dairies with valuable joint-production advantages (including pasteurization-production schedules and the opportunity to package excess processed milk as school milk products versus having to use the excess processed milk for lower-valued products). Third, school milk contracts also provide valuable commercial advertising/promotional advantages with many "captive" markets consisting of large numbers of future customers. In short, this model should be appropriate for

istic of sealed bidding versus other traditional market sales is that "posted" or "list prices" as such do not exist, and past bid prices of rivals do not necessarily represent current joint profits-maximizing prices.<sup>41</sup> Also, in a "non-cooperative" situation, each firm must estimate what its rivals will do in *future* bid situations.

Hence, under this situation it will be extremely difficult, if not impossible, to provide the necessary algorithms for a Nash equilibrium without some form of communication or agreement between sellers. It is demonstrated below that even in the duopoly situation, pure recognized interdependence (for example, Chamberlin's "conscious parallelism") without more, cannot explain bidding patterns. Moreover, a *noncooperative* Nash equilibrium becomes increasingly difficult with larger and larger numbers of firms involved in a sealed-bidding situation. Put differently, such an outcome is highly unlikely without some form of overt communication or agreement.

### A. Bidding Patterns for School Milk Contracts Generated Under a Duopoly: Some Empirical Evidence

The accompanying charts present a chronological display of the bid-price patterns of a duopoly for school milk contracts in the greater Cincinnati market (encompassing three counties in Kentucky and

---

testing a broad range of public procurement contracting conducted under sealed-bid auctions.

41. Of course, copious empirical evidence exists indicating the frequency with which firms using various and imaginative arrangements, have attempted and succeeded in reaching agreements with competitors. However, aside from legal risks of such behavior, many other obstacles stand in the way of firms being able to sustain agreements based on tacit arrangements ("non-cooperative" equilibria of various game theoretical models which are highly sensitive to the assumptions postulated). Nonetheless, some economists continue to assert that non-cooperative collusion is a perfectly reasonable expectation of rational profit-maximizing business firms, that are sophisticated enough to recognize their mutual interdependence and to attain joint profit-maximization. In reality, when uncertainty and other realistic assumptions are introduced, matters become much more complex and a cartel breakdown is almost inevitable without the presence of overt agreements, monitoring devices and penalties for cheating.

Moreover, notwithstanding, guilty pleas by corporate executives, plus criminal convictions of both individuals and corporations in the dairy industry, one economist has testified that the obverse is true; that is, notwithstanding their having pleaded guilty to a bid-rigging complaint, rational business officials would not engage in collusive arrangements because of legal risks, the threat of penalties and damage to personal reputation: "Everyone knows that guilty pleas are a cheap way to buy out governmental plaintiffs, who have vast (taxpayer-provided) resources." *Kentucky ex rel Gorman v. U.C. Milk Co., Inc.*, Civ. A No. 4:92-CV-47-M, 1996 WL 179571 (W.D. Ky. Feb. 2, 1996), "Supplemental Report of Fred S. McChesney for Defendant U.C. Milk Company, Inc.," October 21, 1994, p. 6.

three in Ohio) during the period 1983-1990,<sup>42</sup> compiled from bidding records.<sup>43</sup> The figures display for each duopolist the relationship between its (a) bid prices for lowfat white ("LFW"), the normal indicator price in determining winning bidder, (b) raw milk cost to the dairy, per federal marketing order ("FMO" price), (c) marginal cost per half-pint ("dock cost"),<sup>44</sup> (d) cumulative contracted volume,<sup>45</sup> and (e) excess (uncommitted capacity).<sup>46</sup>

- 
42. See Appendix, Figures 3A-7B. For similar data disclosing bid prices during the 1983-1990 bidding seasons for 3-firm, 5-firm, and 7-firm structures in other school milk markets in the Southeast, see Lanzillotti, *supra* note 32.
  43. Various data on bid prices, sales, production, and costs were obtained through the discovery process in a pending companion case to *Ohio v. Lewis Trauth Dairy, Inc.*, 952 F.Supp. 1247 (S.D. Ohio 1996), filed earlier by the Commonwealth of Kentucky, involving the same two defendants. One defendant company (Meyer Dairy) pleaded guilty to bid rigging in Ohio and Kentucky. However, the other defendant company (Trauth Dairy) has maintained its innocence, and was acquitted in a criminal case in Ohio. The Kentucky civil case is still pending on appeal to the Sixth Circuit against Trauth Dairy. See Appendix, Table A-1 for detailed tabulation of bid "let" dates, incumbent bidder, school district and county involved, dock cost data, current and prior duopolists' bid prices, duopolists' rated productive capacity (per week) and cumulative excess capacity (per week).
  44. The major cost components consist of raw milk (including an "over/under" premium), processing, containers, transportation, and overhead (plant, equipment and general sales/administrative costs). Based upon confidential capacity and cost data made available to the author, short-run average total costs per half-pint ("ATC" in Fig. 2) in the 1980s were in the range of 11.5 to 12.5 cents and what dairies call "dock costs" (marginal costs ("MC" in Fig. 2)) were in the range of 9.0 to 9.5 cents through the summer of 1989, and rising to 11.0 to 11.5 cents in 1990. In a few instances where monthly dock costs were not available, they were estimated from known FMO-dock cost differentials. The only additional cost items in ATC not included in "dock costs" are distribution (driver) costs and general sales and administration (GSA).
  45. It should be noted that the two dairy companies bid on school contracts and serve commercial accounts in a much broader market than the six-county metropolitan area of Cincinnati, that is the geographic focus of pending litigation on alleged bid-rigging on school milk contracts. Trauth Dairy's sales radius extends as far south as Lexington, Kentucky and as far north as Columbus, Ohio. Likewise, Meyer Dairy serves a broader area north into a large part of Ohio and south into central Kentucky. Since several other dairies were operating in the area outside metropolitan Cincinnati, both in Kentucky and Ohio, it apparently was more difficult to extend and maintain the alleged conspiracy in the broader market.
  46. Certain other relevant data are available for determining whether the bidding patterns emerged out of pure tacit (non-cooperative) behavior or whether the bidding reflects explicit collusion, including:
    - (a) prior year bids of each company;
    - (b) estimated current marginal cost per half-pint ("dock cost");
    - (c) estimated weekly capacity for Trauth Dairy is assumed to have been approximately 612,000 half-pints, between 1983-84 and 979,000 half-pints after 1984; for Meyer Dairy 1,463,000 half-pints for the entire period studied; it is further assumed that the companies operated with two eight-hour shifts (sixteen-hour work day), and a five-day work week; those capacity estimates are based on an 85% efficiency factor;
    - (d) cumulative contracted volume;

Displayed in each of these figures are several different types of chronological data pertaining to the respective productive capacity and cost and bids of the duopolists. They are as follows:

1. the number of bid opportunities is shown **below** the horizontal base line of each figure (1, 2, 3 . . . 9; bid opportunities 10 and higher are stacked (e.g. 1 1 1 2 2)). Instances where duplicative bid opportunities occurred on 0, 1, 2, . . . 0  
a given date are shown with a letter beneath the bid opportunity number

1	1
(e.g., 6 (=16A),	6 (=16B), etc.);
A	B

2. a capital letter designating the incumbent bidder (the firm that won the previous (last year's) contract with that school district) is shown **above** the horizontal base line ("T" or "M");
3. an asterisk above the letter indicates that the incumbent was the winning bidder;
4. the letter "Z" indicates that some firm other than one of the duopolists typically supplying this market won the contract;
5. the percentage of uncommitted capacity existing on a given bid opportunity date is designated with "dashed" lines and letters for each duopolist ("T—T—T" and "M—M—M"); the uncommitted capacity displayed is based on a one-day lag, that is, bid prices on a given day are paired with excess capacity existing at the end of the previous day;<sup>47</sup>
6. marginal cost (dock cost for low fat white milk) is shown as indicated;
7. bid prices for each duopolist are displayed with "solid" lines and letters ("T—T—T" and "M—M—M").

Figures 3A, 3B and Table A-1 in the Appendix display these data for the years 1983 and 1984.<sup>48</sup> For 1983, the data show: (1) active bidding between the duopolists for contracts, (2) bid prices trend toward marginal (dock) costs, that remained constant throughout the year at approximately 9.5 cents, (3) winning price margins (relative to dock costs) averaged 10.4% for the bid season, (4) no consistent pattern of winning bidders, that is, incumbents did not necessarily win

(e) cumulative "excess" (uncommitted) capacity on any given date during the bid season;

(f) bid prices are displayed for lowfat white milk ("LFW") in half-pint containers; the LFW bid price is used to indicate winning bidder; data for lowfat chocolate milk ("LFC") and whole white milk ("WW") generate figures similar to those displayed for LFW. Dock costs for these products would be somewhat higher because they cost more to produce.

47. Although Trauth Dairy and Meyer Dairy school milk bids are displayed only for the six-county Cincinnati metropolitan area (which is the focus of the alleged conspiracy) the **uncommitted capacity** figures are based on **all sales** of the two dairies, both inside and outside the six-county area, with certain exceptions (no data are available for sales by several distributors of Meyer Dairy and Trauth Dairy). However, the magnitude of these sales is estimated not to be sufficiently large to affect the **uncommitted capacity** figures by more than 5% to 10%.
48. The conspiracy is alleged to have run from the 1984 school year through the 1988 school year. Accordingly, the years lying outside that period are referenced herein as "pre-" or "post-" conspiracy.

bids, and in several instances an outside company won the bid, and (5) the duopolists ended the bid period with 65% to 47% excess capacity, respectively for T and M.

The bidding patterns for 1984, the first year of the alleged conspiracy period (1984-1988) reveal the following: (1) some variability of bid prices; (2) winning bid prices yielded an average gross margin of 33% on dock costs of 9.5 cents (1.5 cents to 4.5 cents) and a gross margin of 3.5 to 6.5 cents above raw (FMO) cost; (3) the incumbent was the winning bidder in all except 3 of 28 bid opportunities; and (4) the duopolists ended the bid season with 45% and 70% excess capacity, respectively.

Figures 4A, 4B and Table A-1 in the Appendix display data for the same variables for the school years 1985 and 1986, showing: (1) bid prices ranging from roughly 12 to 15 cents per half-pint in 1985 and 1986; (2) gross margins over dock costs for the winning bidder averaged 48.3% in 1985 and 51.7% in 1986 (3.3 to 6.0 cents), and 5 to 8 cents over (FMO) cost; (3) the incumbent dairy was the winning bidder in 31 of 34 and 31 of 33 bid opportunities in 1985 and 1986, respectively (yielding incumbency rates of 91% and 94%); in the few instances when the incumbent did not win the bid, an outsider was the winning bidder; and (4) in both years, T ended the bid season with an estimated excess capacity of more than 70%, while M had 40% to 50%.

Figures 5A and 5B shows the bidding results for 1987 and 1988 (the last full year of the alleged conspiracy period): (1) some variability of prices in both years, but at an even higher average level than during 1984-1987; (2) winning bid prices yielded average gross margins on dock costs of 53.3% and 54.9%, respectively for 1987 and 1988 (4 to 7 cents) with dock costs running around 9 cents throughout the bid season and 6.5 to 9.5 cents above raw (FMO) cost; (3) the incumbent was the winning bidder in 28 of 32 and 32 of 34 bid opportunities, respectively, yielding incumbency rates of 88% and 94% (in two instances in 1988 the winning bidder was an outsider); and (4) duopolist T ended up the 1987 and 1988 bid seasons with excess capacity of 67% and 51%, respectively and duopolist M with 31% and 11%.

In sum, the data disclose that during 1984-1988 (a) winning bid prices, (b) gross margins on dock costs, and (c) incumbency rates all rose substantially. Moreover, the duopolists frequently violated the profit-maximization rule in setting their respective bid prices, because each consistently allowed its rival firm to win contracts at prices considerably higher than marginal (dock) costs, and at much higher margins than in 1983, despite the fact that each had considerable uncommitted capacity.<sup>49</sup>

---

49. As noted earlier, our estimates of uncommitted (excess) capacity may be slightly on the high side, because only limited sales data are available for certain companies that served as distributors for the duopolists for customers in Kentucky,



Figures 6A and Table A-1 in the Appendix display the bidding results for the 1989 bid season, the first alleged "post-conspiracy" year: (1) prices are more volatile than in 1988; (2) winning bid prices generally yielded average gross margins over dock costs of 23.7% (2 to 4 cents) with dock costs running at approximately 9.5 cents (and a margin of 5 cents above raw (FMO) cost); (3) the incumbent was the winning bidder in 21 of 30 bid opportunities, with both **T** and **M** taking contracts away from one another, especially the latter part of the year; and (4) the duopolists ended the bid year with approximately 29% and 15% excess capacity, respectively.

Finally, the bidding results for 1990 (Figure 6B) disclose: (1) winning bid prices are considerably more volatile throughout the year, varying from 14 cents to 17 cents (with one win at 18.5 cents); (2) winning bid prices yielded average gross margins of 36.3% on dock costs (which had risen by 1.5 to 2 cents over 1989) and 6.5 to 9.5 cents above raw (FMO) cost;<sup>50</sup> (3) the incumbent was the winning bidder in about 65% of the contracts (21 of 30 bid opportunities); and (4) seller **T** ended the season with 47% excess capacity and seller **M** with only 4% excess capacity, evidently due to more aggressive bidding (winning in 17 of 30 bids, and taking contracts away from incumbent **T** in four instances, and **T** returning the favor by taking an equal number of contracts away from incumbent **M**).

## B. Bid Prices in the Greater Cincinnati Area, 1992-1995

An appropriate question concerns the pattern of bid-price data for what has been identified as the alleged post-conspiracy period. Such data for the same duopolist dairies in the Greater Cincinnati area for the school bid years 1992-1995 are displayed in Figures 7A and 7B and Table A-2 in the Appendix. A comparison of the bidding patterns

---

Ohio and Indiana. Meyer Dairy's Kentucky distributor accounted for annual sales of 1,000,000 half-pints (28,000 per week), or the equivalent of 1.4% of Meyer Dairy's indicated capacity. Likewise, Trauth Dairy's distributor in Kentucky accounted for annual sales of 300,000 half-pints (8,500 per week) or 1.2% of the weekly capacity indicated for Trauth Dairy. Similarly, sales by both dairies' distributors in Ohio accounted for sales that constitute only a small fraction of the two firms' indicated capacity displayed in the appendix tables and the various figures referred to earlier. In summary, even if both companies' uncommitted (excess) capacity is reduced by two or three-times these sales, the adjusted level of uncommitted capacity is still too high to be consistent with a profit-maximizing bidding posture.

50. The higher margins over dock costs reflect general uncertainty concerning expected increases in raw milk costs. This uncertainty was occasioned by the extraordinary volatility of raw milk costs in the winter of 1989-90. At that time raw milk costs rose sharply to unprecedented levels, squeezing profit margins of dairies committed to firm-price supply contracts. This episode resulted in markedly higher school milk prices throughout the Southeast.

for these years and the patterns for the 1984-1988 period reveals the following:<sup>51</sup>

1. Bid prices were generally lower during the 1992 bid season than the 1984-1988 bid seasons, ranging from 13.5 to 15.5 cents per half-pint, and show a slight decline over the bid year. Likewise in 1993, bid prices were similar to 1992, and the winning bid price declined over the bid year. Bid prices declined during 1994, ranging from 12.75 to 14.50 cents, and following a slight rise then decline during the bid year. Finally, average bid prices were even lower in 1995, ranging from 12.7 to 14.0 cents per half-pint, and generally declining over the bid year. It is notable that the end-of-season bid prices in 1995 were approximately two cents lower than end-of-season bid prices in 1992;

2. Incumbency rates were much less stable than during the period 1984-1988, falling to 71%, 64%, 47% and 61% in 1992, 1993, 1994 and 1995, respectively. It can be seen that Meyer Dairy and Trauth Dairy underbid one other on incumbent accounts in many instances;

3. Average winning bid margins on dock cost were 33.3%, 42.6%, 37% and 34.7%, respectively in 1992, 1993, 1994 and 1995. Moreover, an examination of bid prices versus raw (FMO) costs,<sup>52</sup> disclose gross margins of 83% to 87% which were clearly higher than the 39% in bid-year 1983,<sup>53</sup> arguably a "pre-conspiracy" year, 69% and 85% in 1984

---

51. It should be noted that following the exposure of school-milk bid rigging conspiracies of the 1980s (in Florida and elsewhere), various school districts in Kentucky, Ohio and elsewhere consolidated bid-letting procedures to minimize the opportunity for bid rigging. Some examples include the C.K.E.C. (Central Kentucky Educational Cooperative, consisting principally of several hundred schools in Nicholas and Harrison counties, and the largest co-op buying group in Kentucky and Ohio), the E.P.C. (Educational Purchasing Cooperative centered in Dayton, Ohio), and the H.C.C.A. (which began co-op buying operations in 1991 for 226 schools in Hamilton, Clermont, Butler and Brown counties). Under the new buying arrangements, dairies currently are obliged to bid on a consortium of school districts with a single bid date, as contrasted with the earlier period when the dairies were able to pick off, rig and allocate school districts one-by-one. In consequence, since a larger bloc of business is at stake on each bid it has led to more aggressive bidding generally, and particularly large consolidated contracts up for bid early in the bid season. Another result is that the total number of bid opportunities for the 1992-1995 period is smaller than during the 1984-1988 period. This, in turn, also affects the incumbency rate comparisons for the two periods. Finally, it should be noted that the data available documenting the winning bidder in Ohio for 1991 are incomplete; hence, it was not possible to compute the incumbency rate for 1992. See Table A-2 in the Appendix.

52. Dock costs shown for 1992-95 are based on confidential information made available to the author, which, based on known dock cost/FMO cost relationships he believes are representative of dock costs for Trauth and Meyer dairies for the 1992-1995 period.

53. Any interpretations of the changes in average winning bid margins relative to dock costs and FMO raw milk cost should factor in that both dairies incurred extraordinary litigation costs during the 1992-1995 period. Meyer Dairy incurred

and 1985, and generally lower than the 96% and 111% margins found at the height of the alleged conspiracy (1987-1988);

4. Data on committed and uncommitted capacity are not available for this period, so it is not possible to compare the bid-price levels versus uncommitted capacity. Nonetheless, during the 1992-1995 period a somewhat more aggressive bidding pattern is in evidence, that is, more like 1983 than 1984, and sharply different from 1988.

## VI. SUMMARY AND CONCLUSIONS

The impact of the 1993 United States Supreme Court's ruling in *Daubert* relative to the legal status and economics of price-fixing behavior in the absence of documentary evidence containing direct proof of a conspiracy (agreement in restraint of trade) has been examined. The analysis disclosed that while ostensibly intended to impose more rigorous standards governing the admissibility and weight accorded to expert testimony, the Court's ruling has provided defendants with a new opportunity to challenge, preclude and exclude altogether the offering of expert economic analysis and testimony in Sherman Act Section 1 cases.

Prior to *Daubert*, plaintiffs typically and successfully relied on inferences drawn from price behavior comparisons with hypothetical competitive situations. As noted above, subsequent to *Daubert*, faced with making a choice between two alternative explanations of certain interfirm price behavior, some judges have rejected outright proposed expert testimony through approval of summary judgment motions (without convening an evidentiary (*Daubert*) hearing) or have accorded zero weight to expert economic testimony supporting plaintiff allegations of collusion based on circumstantial evidence. These judges have essentially adopted defense contentions that the circumstantial evidence was *ambiguous*, that is, the evidence was not clear or was consistent with two or more possible meanings.<sup>54</sup> Such rulings

---

heavy litigation costs and a \$5,000,000 settlement of the antitrust claim by the Commonwealth of Kentucky, and Trauth Dairy has incurred more than three years of heavy litigation costs in two other antitrust cases (not including the cost of the Kentucky complaint which continues to the present). Just how these costs might have affected bidding decisions in the 1992-95 period is not known.

54. The "ambiguity" and "implausibility" arguments are an artifact unique to the circumstances in *Matsushita Elec. Indust. Co. v. Zenith Radio Corp.*, that concerned (a) the plausibility (likelihood) that foreign producers of electronic products would agree to sell their products in the U.S. at low (predatory) prices in order to gain a larger market share, presumably after which prices would be raised in concert to recoup losses incurred; and (b) the ambiguous nature of the data presented in support of that proposition. See *Matsushita Elec. Indust. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 588-97 (1986). It needs to be emphasized that the plausibility of agreements developing among rival sellers to *raise prices, rig bids, or allocate markets or customers* to attain *higher joint profits*, as alleged in most Section 1 cases, involve a markedly different species of agreement from what was alleged

evidently accept implicit defendant contentions that the observed pricing behavior not only is *ambiguous*, but it is *equally plausible* that the observed pricing and sealed-bidding behavior, according to some formulations of modern oligopoly theory ("game" theory), is simply the natural result of brilliant independent business acumen, and not necessarily the result of interfirm agreements.

In order to accept this line of defense argument, in the face of incriminating circumstantial evidence, judges must determine more than whether collusive and non-collusive explanations of observed interfirm pricing behavior are *equally conceivable* or *equally plausible* (per game theoretic models). The crucial issue to be decided is whether there are *equally high probabilities* that the observed behavior could arise from either non-collusive or collusive actions, in complex sealed-bidding, auction situations such as described above.

*Daubert* represents a rather dramatic change of course in the judicial treatment of evidence adduced by plaintiffs to support Section 1 complaints, especially since those very theories of oligopoly which constitute the basis for defendant arguments (Cournot, Bertrand, and more recently Nash) confirm the improbability, if not impossibility of some types of observed pricing-bidding behavior (such as described herein) emerging without a collusive agreement.<sup>55</sup> Moreover, we have observed that, as interpreted by some district courts, *Daubert* not only has raised the requirements of legal proof carried by plaintiffs in trial proceedings proper, it has also opened the door to full-scale, pre-trial defendant challenges to expert testimony, with the express purpose of preventing the trier of fact and jury from ever viewing a presentation of crucial economic and statistical evidence, or hearing expert exposition of the economic foundation for plaintiff's complaint and offers of proof.

---

in *Matsushita*, namely, an agreement to sell at *lower prices and lower profits or at a loss*.

55. As Fisher has stated,

[w]hat, then, does game theory have to say about repeated games? Alas, nothing remarkably helpful to the general analysis of oligopoly. The best known result here is the so-called "folk theorem," which states that, in an infinitely repeated game with low enough discount rates, any outcome that is individually rational can turn out to be a Nash equilibrium.

Franklin M. Fisher, *Games Economists Play: A Noncooperative View*, 20 RAND J. ECON. 113, 116 (1986). And,

[b]ut the crucial question for oligopoly theory is not that of the outcome of one-shot games. Rather it concerns the factors and circumstances leading to cooperative, joint-maximizing outcomes in repeated games. There, as already mentioned, little is known, and the folk theorem strongly suggests that simply analyzing Nash equilibria . . . cannot tell us what we want to know.

*Id.* at 122.

A duopoly model was presented and tested for a specific form of collusion in a sealed-bid, contract auction market, utilizing actual product and market structure conditions and actual price and output data compiled for the 1980s and early 1990s. While the methodology is testable for different types of market structures, it was tested under a duopoly market structure, because a two-firm market (involving sales of a standardized product, with low elasticity of demand, slow market growth rate, and very similar cost structures) *a priori* represents the easiest market condition for coordinating pricing decisions without an overt agreement. Utilizing circumstantial evidence discovered on pricing-output and bidding patterns, a straightforward method was outlined based on standard economic analysis and conforming to the higher evidentiary standards required by *Daubert*, to differentiate (a) explicit collusive pricing and bid-rigging from (b) non-cooperative (tacit) collusion based on sophisticated behavior (as hypothesized in game theoretic models).

Furthermore, economic analysis of the empirical data utilized in the test model revealed that because of the complexity of the data, the sealed-bid constraint, and the large number of bids tendered over the bidding season, it is extremely difficult, if not impossible, for a game theory model to provide the decision strategy necessary to produce the observed pricing-bidding patterns, without some form of direct communication or agreements between the duopolists.<sup>56</sup> In short, courts need to hear expert testimony, based on standard economic analysis, explaining whether there is a high or low probability that the observed pricing and auction-bid behavior could have been effectuated without some form of direct communication or agreement.

In particular, with respect to the proposition tested, the data for the 1984-1988 period disclose that the duopolists satisfied all three of the basic standards identified as indicative of a collusion mode: (a) ending the season with considerable uncommitted (excess) capacity, (b) winning bid prices at levels well above marginal (dock) costs (more than 20% or higher), and (c) a consistent winning pattern by the incumbent firm. By contrast, the bidding patterns examined in the alleged "post-conspiracy" period, 1992-1995, show generally lower winning bid prices, and lower incumbency rates, that are indicative of a move toward more competitive conditions in the market.

Finally, production of data through the discovery process covering prices, bids, capacity, capacity commitments, production costs, and other financial data, such as those displayed in this analysis, provide

---

56. See Drew Fudenberg & Jean Tirole, *Noncooperative Game Theory for Industrial Organization: An Introduction and Overview*, in I HANDBOOK OF INDUSTRIAL ORGANIZATION 259, 285 (Richard Schmalensee & Robert Willig eds., 1989) (noting that "because repetition [in this case, bid opportunities] enlarges the set of equilibria, selecting an equilibrium becomes difficult").

the essential raw material for meeting the requirements of the *Daubert* rule as it has been applied in price-fixing/bid-rigging litigation. An analysis of these kinds of financial data, supplemented by data on market structure characteristics, facilitating devices, and other economic evidence identified by Posner and others as probative of both a disposition toward and actual emergence of collusive arrangements in certain market structures, help document relevant operational details on pricing, bidding, and production commitments, that expert economic testimony can utilize to corroborate (or refute) for the trier of fact whether an illegal collusive arrangement existed among ostensible competitors.

APPENDIX

Figure 1  
Annual Demand Curve of Given School District

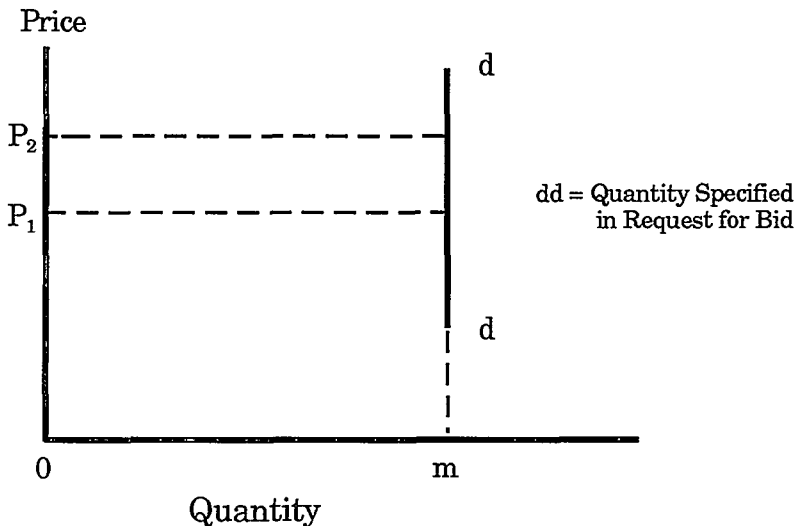


Figure 2  
Cost Structure Half Pint Production

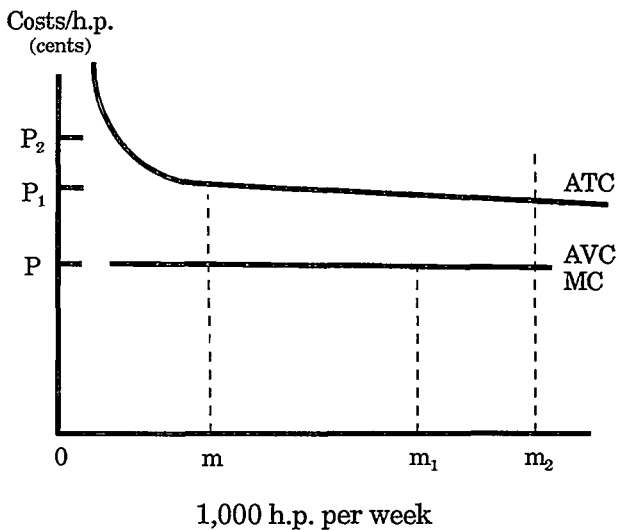


Figure 3A  
Duopoly Bidding Patterns For School Milk Contracts  
In Greater Cincinnati

School Year = 1983

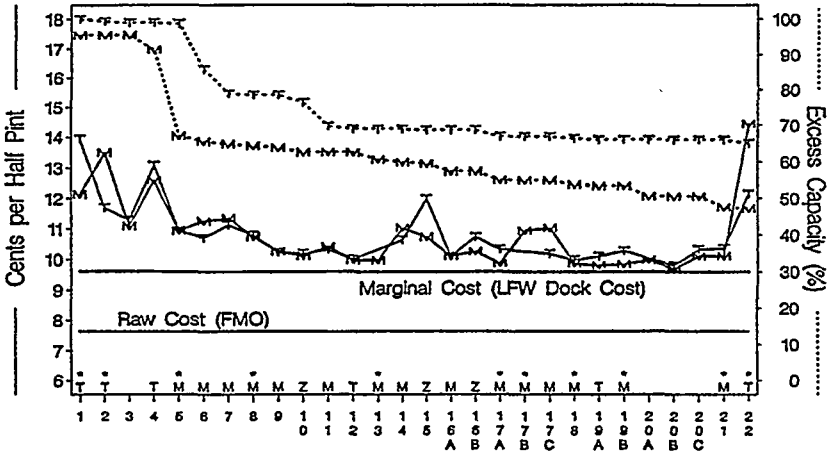
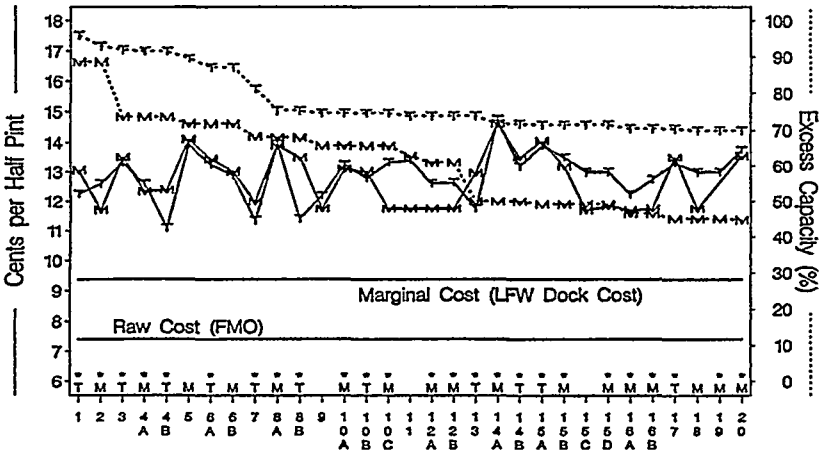


Figure 3B

School Year = 1984



\* = Winning Incumbent

Bid Sequence





Figure 5A  
 Duopoly Bidding Patterns For School Milk Contracts  
 In Greater Cincinnati

School Year = 1987

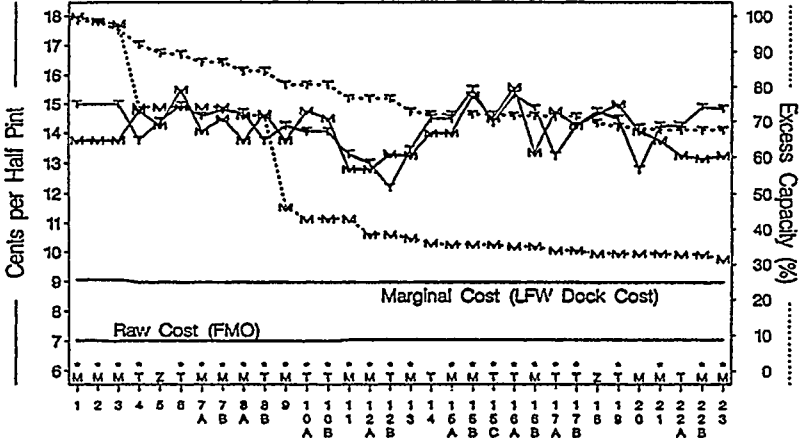
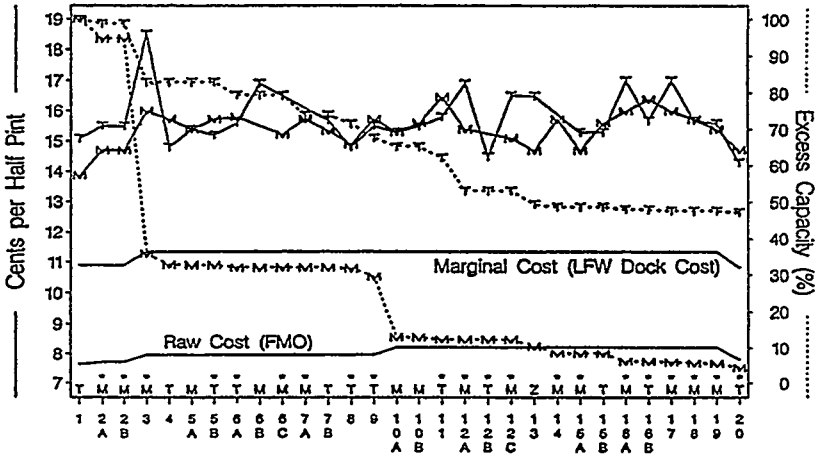


Figure 5B

School Year = 1988



\* = Winning Incumbent

Bid Sequence

Figure 6A  
Duopoly Bidding Patterns For School Milk Contracts  
In Greater Cincinnati

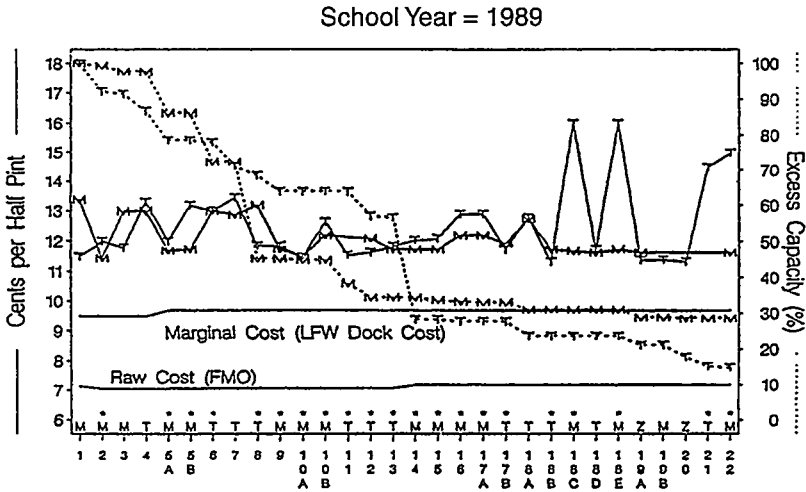


Figure 6B

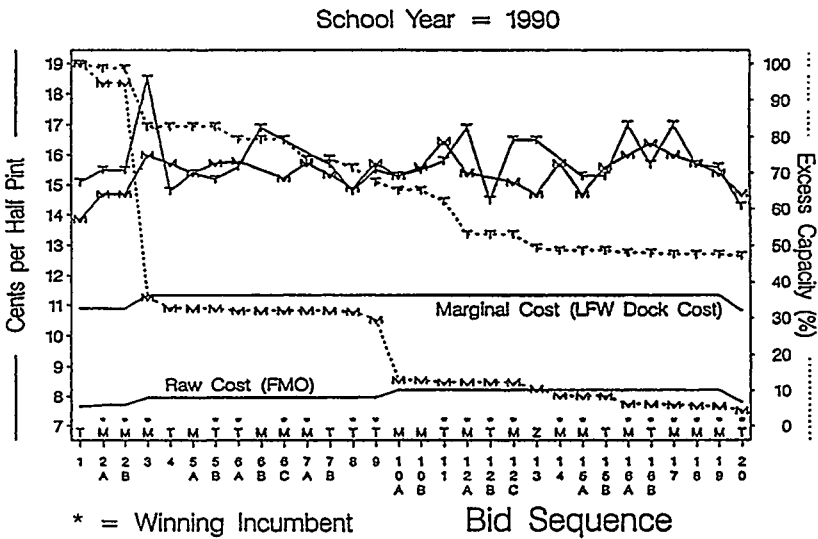
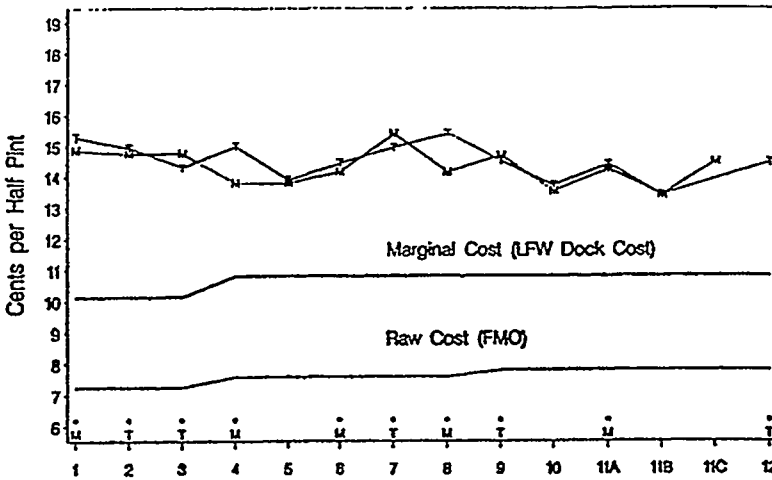


Figure 7A  
Duopoly Bidding Patterns For School Milk Contracts  
In Greater Cincinnati

School Year = 1992



School Year = 1993

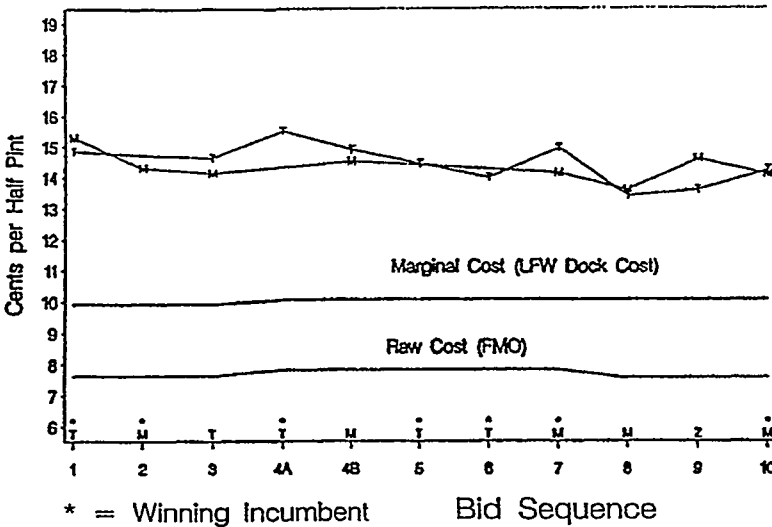
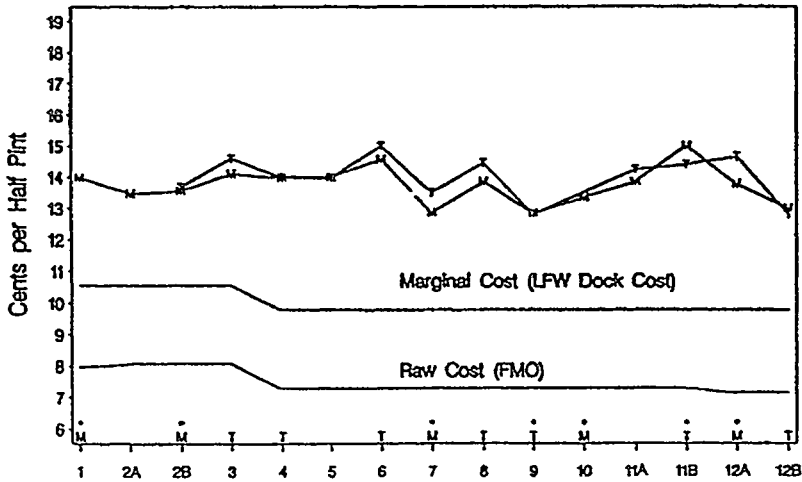
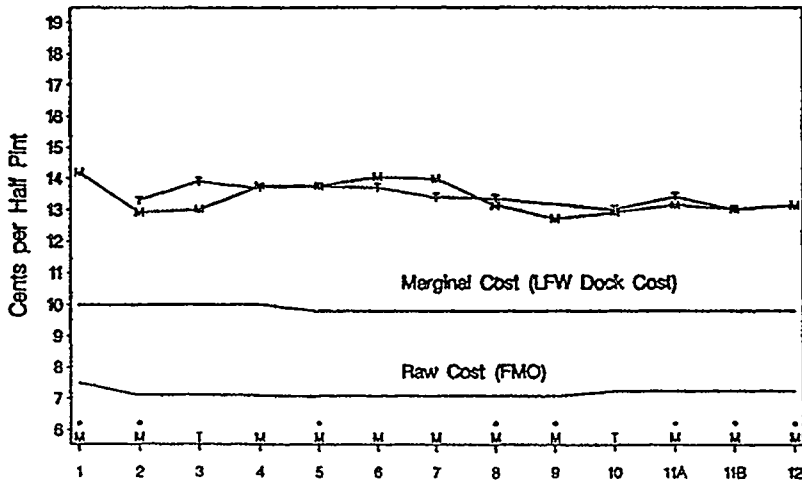


Figure 7B

School Year = 1994



School Year = 1995



\* = Winning Incumbent Bid Sequence

## LEGEND FOR VARIABLE NAMES

Month	Month of bid letting (bid opening)
Letdate	Date of bid letting (bid opening)
Incumb	Prior school year's winning vendor
Win	Current school year's winning vendor
District Name	Name of school district
County	County of school district
Tbid	Vendor T's lowfat white milk bid
Mbid	Vendor M's lowfat white milk bid
Dock	Lowfat white dock cost
FMO	Federal minimum raw milk cost
Tprior	Vendor T's lowfat white milk bid from prior year
Mprior	Vendor M's lowfat white milk bid from prior year
Tcapwk	Vendor T's weekly half-pint capacity
Texcap	Vendor T's excess capacity (%)
Mcapwk	Vendor M's weekly half-pint capacity
Mexcap	Vendor M's excess capacity (%)

Table A-1  
Duopoly Bidding Patterns For School Milk Contracts In Greater Cincinnati

SCHOOL YEAR=1983															
MONTH	LEDATE	INCUMB	WIN	DISTRICT NAME	COUNTY	TBID	HBID	DOCK	FHO	TPRIOR	WPRIOR	TCAPMK	TEXCAP	HCAPMK	HEKCAP
6	06/02/83	T	T	NEWPORT	CAMPBELL	0.1395	0.1215	0.0960	0.0764	0.1395	0.1425	612,000	100%	1,468,800	96%
6	06/14/83	T	T	LOCKLAND CITY	HAMILTON	0.1170	0.1350	0.0960	0.0764	0.1350	0.1425	612,000	99%	1,468,800	96%
6	06/15/83	T	M	BUTLER COUNTY BO OF ED	BUTLER	0.1309	0.1110	0.0960	0.0764	0.1350	0.1425	612,000	99%	1,468,800	96%
6	06/20/83	H	M	CAMPBELL	CAMPBELL	0.1309	0.1260	0.0960	0.0764	0.1350	0.1425	612,000	99%	1,468,800	91%
7	07/06/83	H	M	COVINGTON	KENTON	0.1094	0.1094	0.0960	0.0764	0.1545	0.1175	612,000	99%	1,468,800	67%
7	07/07/83	M	T	STYCAMORE COMMUNITY CITY	HAMILTON	0.1070	0.1125	0.0960	0.0764	0.1450	0.1405	612,000	99%	1,468,800	60%
7	07/20/83	M	T	BELLEWUE	CAMPBELL	0.1113	0.1135	0.0960	0.0764	0.1449	0.1277	612,000	86%	1,468,800	65%
7	07/22/83	H	T	GREAT OAKS J.V.	HAMILTON	0.1080	0.1074	0.0960	0.0764	0.1377	0.1320	612,000	78%	1,468,800	64%
7	07/25/83	H	T	GREENHILLS-FOREST PARK CITY	HAMILTON	0.1023	0.1026	0.0960	0.0764	0.1240	0.1400	612,000	78%	1,468,800	64%
7	07/27/83	Z	T	HIDDLETON CITY	BUTLER	0.1019	0.1011	0.0960	0.0764	0.1240	0.1400	612,000	78%	1,468,800	63%
7	07/29/83	M	T	ST. BERNARD-ELMHOOD PLACE CITY	HAMILTON	0.1031	0.1041	0.0960	0.0764	0.1475	0.1397	612,000	70%	1,468,800	63%
8	08/01/83	T	M	PRINCETON CITY	HAMILTON	0.1001	0.0998	0.0959	0.0763	0.1565	0.1515	612,000	69%	1,468,800	61%
8	08/02/83	H	M	HILFORD E.V.	CLERMONT	0.1064	0.1103	0.0959	0.0763	0.1565	0.1515	612,000	69%	1,468,800	61%
8	08/03/83	H	M	BEECHWOOD	KENTON	0.1199	0.1074	0.0959	0.0763	0.1555	0.1400	612,000	69%	1,468,800	60%
8	08/05/83	Z	M	BOONE	BOONE	0.1010	0.1011	0.0959	0.0763	0.1450	0.1397	612,000	69%	1,468,800	57%
8	08/08/83	Z	M	FT. THOMAS	CAMPBELL	0.1074	0.1026	0.0959	0.0763	0.1374	0.1498	612,000	69%	1,468,800	57%
8	08/08/83	Z	M	KENTON	KENTON	0.1074	0.1026	0.0959	0.0763	0.1374	0.1498	612,000	69%	1,468,800	57%
8	08/09/83	M	M	FOREST HILLS LOCAL	HAMILTON	0.1033	0.0987	0.0959	0.0763	0.1160	0.1160	612,000	67%	1,468,800	55%
8	08/09/83	M	M	LUDLOW	KENTON	0.1095	0.1095	0.0959	0.0763	0.1429	0.1397	612,000	67%	1,468,800	55%
8	08/09/83	M	M	WYONING CITY	HAMILTON	0.1019	0.1104	0.0959	0.0763	0.1429	0.1397	612,000	67%	1,468,800	55%
8	08/11/83	H	M	ERLANGER/ELSMERE	KENTON	0.0999	0.0987	0.0959	0.0763	0.1425	0.1100	612,000	66%	1,468,800	54%
8	08/15/83	T	M	FAIRFIELD CITY	BUTLER	0.1010	0.0980	0.0959	0.0763	0.1120	0.1610	612,000	66%	1,468,800	53%
8	08/15/83	M	M	MOUNT HEALTHY CITY	BUTLER	0.1027	0.0984	0.0959	0.0763	0.1417	0.1350	612,000	66%	1,468,800	53%
8	08/17/83	M	M	DEER PARK COMMUNITY CITY	HAMILTON	0.0999	0.0999	0.0959	0.0763	0.1417	0.1350	612,000	66%	1,468,800	53%
8	08/17/83	M	M	OAK HILLS LOCAL	HAMILTON	0.0980	0.0969	0.0959	0.0763	0.1435	0.1348	612,000	66%	1,468,800	51%
8	08/17/83	M	M	SOUTHWEST LOCAL	HAMILTON	0.1033	0.1011	0.0959	0.0763	0.1435	0.1348	612,000	66%	1,468,800	51%
8	08/17/83	M	M	LOVELAND CITY	HAMILTON	0.1037	0.1011	0.0959	0.0763	0.1435	0.1348	612,000	66%	1,468,800	48%
8	08/19/83	M	M	LOVELAND CITY	HAMILTON	0.1037	0.1011	0.0959	0.0763	0.1435	0.1348	612,000	66%	1,468,800	48%
9	09/12/83	T	T	NEWPORT	CAMPBELL	0.1215	0.1445	0.0959	0.0763	0.1395	0.1425	612,000	65%	1,468,800	47%

Table A-1 (Continued)

MONTH	LETDATE	INCUMB	MIN	DISTRICT NAME	COUNTY	TBID	MBID	DOCK	FHO	TPRIOR	RPRIOR	TCAPAK	TEXCAP	MCAPAK	MECAP
6	06/20/84	T	Y	NEWPORT	CAMPBELL	0.1225	0.1305	0.0936	0.0740	0.1215	0.1445	612,000	96%	1,468,800	89%
6	06/22/84	M	Y	BUTLER COUNTY BD OF ED	BUTLER	0.1260	0.1170	0.0936	0.0740	0.1130	0.1110	612,000	92%	1,468,800	87%
7	07/03/84	T	M	LOCKLAND CITY	HAMILTON	0.1330	0.1350	0.0937	0.0741	0.1170	0.1350	612,000	92%	1,468,800	74%
7	07/05/84	M	M	GREAT OAKS J.V.	HAMILTON	0.1260	0.1235	0.0937	0.0741	0.1080	0.1074	612,000	92%	1,468,800	74%
7	07/05/84	T	M	SYCAMORE COMMUNITY CITY	HAMILTON	0.1110	0.1240	0.0937	0.0741	0.1070	0.1125	612,000	92%	1,468,800	74%
7	07/16/84	M	Y	CAMPBELL	CAMPBELL	0.1395	0.1410	0.0937	0.0741	0.1309	0.1260	612,000	90%	1,468,800	72%
7	07/17/84	M	Y	BELLEVE	CAMPBELL	0.1325	0.1345	0.0937	0.0741	0.1134	0.1135	612,000	87%	1,468,800	72%
7	07/17/84	M	Y	MIDDLETON CITY	KENTON	0.1289	0.1302	0.0937	0.0741	0.1074	0.1026	612,000	81%	1,468,800	72%
7	07/26/84	M	Y	MIDDLETON CITY	BUTLER	0.1395	0.1200	0.0937	0.0741	0.1019	0.1011	612,000	75%	1,468,800	68%
7	07/27/84	M	M	BOONE	BOONE	0.1395	0.1390	0.0937	0.0741	0.1099	0.1074	612,000	75%	1,468,800	68%
7	07/27/84	T	Y	ST. BERNARD-ELKHOD PLAGE CITY	HAMILTON	0.1140	0.1350	0.0937	0.0741	0.1031	0.1041	612,000	75%	1,468,800	68%
7	07/31/84	H	Z	NORWOOD CITY	HAMILTON	0.1220	0.1175	0.0937	0.0741	0.1094	0.1094	612,000	75%	1,468,800	68%
8	08/01/84	H	Y	COVINGTON	KENTON	0.1325	0.1310	0.0937	0.0741	0.1010	0.1011	612,000	75%	1,468,800	68%
8	08/01/84	Y	Y	FT. THOMAS	CAMPBELL	0.1280	0.1302	0.0937	0.0741	0.1010	0.1011	612,000	75%	1,468,800	68%
8	08/01/84	M	M	PRINCETON CITY	CAMPBELL	0.1333	0.1175	0.0937	0.0741	0.1001	0.0998	612,000	75%	1,468,800	68%
8	08/02/84	M	M	NORTHWEST LOCAL	HAMILTON	0.1340	0.1175	0.0937	0.0741	0.1033	0.0987	612,000	74%	1,468,800	63%
8	08/06/84	M	M	FOREST HILLS LOCAL	HAMILTON	0.1262	0.1175	0.0937	0.0741	0.1033	0.0987	612,000	74%	1,468,800	61%
8	08/06/84	M	H	MILEEND, E.V.	CLEARMONT	0.1265	0.1175	0.0937	0.0741	0.1023	0.1026	612,000	74%	1,468,800	50%
8	08/09/84	T	Y	GREENHILLS-FOREST PARK CITY	HAMILTON	0.1175	0.1297	0.0937	0.0741	0.1023	0.1026	612,000	72%	1,468,800	50%
8	08/10/84	M	M	LADLOH /VERONIA	KENTON	0.1475	0.1462	0.0937	0.0741	0.1064	0.1103	612,000	72%	1,468,800	50%
8	08/10/84	T	Y	MALTON/VERONIA	BOONE	0.1320	0.1350	0.0937	0.0741	0.1064	0.1103	612,000	71%	1,468,800	49%
8	08/13/84	M	T	BEECHWOOD	KENTON	0.1350	0.1405	0.0937	0.0741	0.1064	0.1103	612,000	71%	1,468,800	49%
8	08/13/84	M	M	ERLANGER/ELSNERE	KENTON	0.1350	0.1320	0.0937	0.0741	0.1064	0.1103	612,000	71%	1,468,800	49%
8	08/13/84	M	M	LAKOTA LOCAL	BUTLER	0.1300	0.1170	0.0937	0.0741	0.1064	0.1103	612,000	71%	1,468,800	49%
8	08/13/84	M	M	FOUNT HEALTHY CITY	HAMILTON	0.1300	0.1185	0.0937	0.0741	0.1027	0.0984	612,000	71%	1,468,800	48%
8	08/13/84	M	M	FAIRFIELD CITY	BUTLER	0.1225	0.1170	0.0937	0.0741	0.1027	0.0984	612,000	70%	1,468,800	46%
8	08/15/84	M	M	LOWLAND CITY	HAMILTON	0.1275	0.1175	0.0937	0.0741	0.1037	0.1011	612,000	70%	1,468,800	45%
8	08/16/84	M	M	WORKING CITY	HAMILTON	0.1330	0.1350	0.0937	0.0741	0.1037	0.1011	612,000	70%	1,468,800	45%
8	08/17/84	T	Z	SOUTHWEST LOCAL	HAMILTON	0.1300	0.1175	0.0937	0.0741	0.1033	0.1011	612,000	70%	1,468,800	45%
8	08/20/84	M	M	DEER PARK COMMUNITY CITY	HAMILTON	0.1300	0.1175	0.0937	0.0741	0.1033	0.1011	612,000	70%	1,468,800	45%
8	08/21/84	M	M	SILVER GROVE	CAMPBELL	0.1375	0.1355	0.0937	0.0741	0.1033	0.1011	612,000	70%	1,468,800	45%

SCHOOL YEAR=1984



Table A-1 (Continued)

SCHOOL YEAR=1985

MONTH	LETDATE	INCURB	MIN	DISTRICT NAME	COUNTY	TBD	MSD	DOCK	FHO	TPRIOR	HPRIOR	TCAPK	TECAP	HCAPK	MECAP
6	06/04/85	T	T	NEWPORT	CAMPBELL	0.1290	0.1305	0.0908	0.0716	0.1225	0.1305	979,200	100%	1,468,800	100%
6	06/17/85	Z	M	KORWOOD CITY	HAMILTON	0.1295	0.1275	0.0908	0.0716	0.1220	0.1175	979,200	97%	1,468,800	100%
6	06/28/85	M	M	GREAT OAKS J.J.V.	HAMILTON	0.1310	0.1285	0.0908	0.0716	0.1260	0.1235	979,200	97%	1,468,800	88%
7	07/01/85	T	T	LYCKLAND CITY	HAMILTON	0.1340	0.1360	0.0908	0.0716	0.1350	0.1350	979,200	97%	1,468,800	88%
7	07/05/85	T	T	SCYMORE COMMUNITY CITY	HAMILTON	0.1275	0.1295	0.0876	0.0707	0.1110	0.1240	979,200	96%	1,468,800	86%
7	07/15/85	T	T	CAMPBELL	CAMPBELL	0.1372	0.1450	0.0876	0.0707	0.1320	0.1410	979,200	95%	1,468,800	88%
7	07/16/85	T	T	WALTON/VERONA	BOONE	0.1332	0.1345	0.0876	0.0707	0.1320	0.1345	979,200	95%	1,468,800	88%
7	07/17/85	T	T	BELLEVEUE	CAMPBELL	0.1350	0.1370	0.0876	0.0707	0.1325	0.1345	979,200	95%	1,468,800	83%
7	07/25/85	M	M	DATON	CAMPBELL	0.1375	0.1345	0.0876	0.0707	0.1289	0.1302	979,200	89%	1,468,800	83%
7	07/26/85	T	T	KENTON	CAMPBELL	0.1299	0.1315	0.0876	0.0707	0.1135	0.1200	979,200	89%	1,468,800	81%
7	07/29/85	T	T	MIDDLETON CITY	HAMILTON	0.1190	0.1195	0.0876	0.0707	0.1140	0.1150	979,200	82%	1,468,800	80%
7	07/30/85	M	M	ST. BERNARD-ELMWOOD PLACE CITY	HAMILTON	0.1350	0.1375	0.0876	0.0707	0.1350	0.1350	979,200	81%	1,468,800	80%
7	07/31/85	M	M	BOONE	HAMILTON	0.1430	0.1410	0.0876	0.0707	0.1330	0.1350	979,200	81%	1,468,800	80%
7	07/31/85	M	M	WYOMING CITY	HAMILTON	0.1390	0.1390	0.0876	0.0707	0.1330	0.1350	979,200	81%	1,468,800	80%
8	08/01/85	M	M	NORTHWEST LOCAL	HAMILTON	0.1245	0.1225	0.0876	0.0707	0.1340	0.1175	979,200	81%	1,468,800	78%
8	08/01/85	M	M	MILFORD E.V.	CLEMONT	0.1315	0.1295	0.0862	0.0693	0.1265	0.1175	979,200	80%	1,468,800	76%
8	08/01/85	M	M	PRINCETON CITY	HAMILTON	0.1345	0.1225	0.0862	0.0693	0.1333	0.1175	979,200	80%	1,468,800	76%
8	08/02/85	T	T	FT. THOMAS	CAMPBELL	0.1349	0.1355	0.0862	0.0693	0.1280	0.1302	979,200	80%	1,468,800	74%
8	08/02/85	M	M	BUTLER COUNTY BD OF ED	BUTLER	0.1245	0.1220	0.0862	0.0693	0.1260	0.1170	979,200	80%	1,468,800	74%
8	08/05/85	M	M	COVINGTON	KENTON	0.1370	0.1340	0.0862	0.0693	0.1325	0.1310	979,200	80%	1,468,800	74%
8	08/05/85	M	M	FOREST HILLS LOCAL	HAMILTON	0.1250	0.1237	0.0862	0.0693	0.1262	0.1175	979,200	80%	1,468,800	74%
8	08/05/85	M	M	CINCINNATI CITY	HAMILTON	0.1197	0.1197	0.0862	0.0693			979,200	79%	1,468,800	59%
8	08/08/85	M	M	CINCINNATI CITY	HAMILTON	0.1197	0.1197	0.0862	0.0693			979,200	79%	1,468,800	59%
8	08/08/85	M	M	CINCINNATI CITY	HAMILTON	0.1295	0.1295	0.0862	0.0693	0.1275	0.1175	979,200	79%	1,468,800	47%
8	08/08/85	M	M	LUDLOW	HAMILTON	0.1480	0.1480	0.0862	0.0693	0.1475	0.1462	979,200	79%	1,468,800	47%
8	08/09/85	M	M	SILVER GROVE	CAMPBELL	0.1500	0.1500	0.0862	0.0693	0.1355	0.1355	979,200	79%	1,468,800	47%
8	08/09/85	M	M	BEECHWOOD	CAMPBELL	0.1380	0.1380	0.0862	0.0693	0.1300	0.1405	979,200	79%	1,468,800	46%
8	08/12/85	M	T	FAIRFIELD CITY	KENTON	0.1440	0.1455	0.0862	0.0693	0.1275	0.1405	979,200	79%	1,468,800	46%
8	08/13/85	M	T	GREENHILLS-FOREST PARK CITY	BUTLER	0.1400	0.1220	0.0862	0.0693	0.1225	0.1170	979,200	79%	1,468,800	46%
8	08/16/85	Z	Z	SOUTHWEST LOCAL	HAMILTON	0.1225	0.1297	0.0862	0.0693	0.1175	0.1297	979,200	79%	1,468,800	46%
8	08/15/85	Z	M	ERLANGER/ELSKERE	HAMILTON	0.1400	0.1325	0.0862	0.0693	0.1300	0.1175	979,200	77%	1,468,800	45%
8	08/15/85	Z	M	MOUNT HEALTHY CITY	KENTON	0.1360	0.1345	0.0862	0.0693	0.1350	0.1320	979,200	77%	1,468,800	45%
8	08/19/85	M	M	FINNEYTON LOCAL	HAMILTON	0.1249	0.1225	0.0862	0.0693	0.1300	0.1185	979,200	77%	1,468,800	44%
8	08/20/85	M	M	FINNEYTON LOCAL	HAMILTON	0.1240	0.1225	0.0862	0.0693	0.1300	0.1185	979,200	77%	1,468,800	43%

Table A-1 (Continued)

SCHOOL YEAR=1986

MONTH	LEI DATE	INCDRB	MIN	DISTRICT NAME	COUNTY	T81D	HB1D	DOCK	FHO	TRPRIOR	HPRIOR	TCAPKX	TEXCAP	HCAPKX	HXCAP
6	06/09/86	H	H	HILFORD E.V.	CLEMONT	0.1400	0.1340	0.0874	0.0700	0.1315	0.1295	979,200	98X	1,468,800	99X
6	06/16/86	H	H	HORWOOD CITY	HAMILTON	0.1250	0.1275	0.0874	0.0700	0.1275	0.1275	979,200	97X	1,468,800	99X
6	06/17/86	T	T	STANMORE COMMUNITY CITY	HAMILTON	0.1250	0.1400	0.0874	0.0700	0.1275	0.1295	979,200	97X	1,468,800	87X
6	06/30/86	T	T	LOCKLAND CITY	CAMPBELL	0.1340	0.1370	0.0874	0.0700	0.1340	0.1360	979,200	94X	1,468,800	87X
6	06/30/86	T	T	NEWPORT	CAMPBELL	0.1320	0.1355	0.0874	0.0700	0.1290	0.1305	979,200	94X	1,468,800	87X
7	07/03/86	T	H	CLEMONT COUNTY BOARD OF EDUCATION	CLEMONT	0.1400	0.1340	0.0874	0.0700	0.1393	0.1450	979,200	92X	1,468,800	87X
7	07/03/86	T	H	CAMPBELL	CAMPBELL	0.1420	0.1490	0.0874	0.0700	0.1400	0.1295	979,200	91X	1,468,800	70X
7	07/08/86	H	H	LOVELAND CITY	HAMILTON	0.1400	0.1320	0.0874	0.0700	0.1400	0.1380	979,200	89X	1,468,800	70X
7	07/11/86	H	H	SILVER GROVE	CAMPBELL	0.1440	0.1430	0.0874	0.0700	0.1380	0.1380	979,200	89X	1,468,800	69X
7	07/23/86	H	H	MIDDLETON CITY	CAMPBELL	0.1091	0.1225	0.0874	0.0700	0.1190	0.1195	979,200	84X	1,468,800	66X
7	07/24/86	T	T	KENTON	BUTLER	0.1349	0.1405	0.0874	0.0700	0.1299	0.1315	979,200	80X	1,468,800	66X
7	07/25/86	T	T	ST. BERNARD-ELMWOOD PLACE CITY	HAMILTON	0.1360	0.1375	0.0874	0.0700	0.1350	0.1375	979,200	76X	1,468,800	66X
7	07/29/86	T	T	FT. THOMAS	CAMPBELL	0.1374	0.1399	0.0874	0.0700	0.1349	0.1355	979,200	75X	1,468,800	66X
7	07/31/86	H	H	COVINGTON	CAMPBELL	0.1425	0.1390	0.0874	0.0700	0.1370	0.1340	979,200	75X	1,468,800	66X
8	08/01/86	H	H	OAK HILLS LOCAL	HAMILTON	0.1250	0.1225	0.0875	0.0701	0.1310	0.1285	979,200	75X	1,468,800	65X
8	08/04/86	H	H	GREAT OAKS J.V.	HAMILTON	0.1345	0.1320	0.0875	0.0701	0.1310	0.1285	979,200	75X	1,468,800	63X
8	08/04/86	H	Z	NORTHWEST LOCAL	HAMILTON	0.1285	0.1258	0.0875	0.0701	0.1245	0.1225	979,200	75X	1,468,800	63X
8	08/04/86	H	H	WALTON/VERONA	BOONE	0.1360	0.1395	0.0875	0.0701	0.1335	0.1335	979,200	75X	1,468,800	63X
8	08/05/86	H	H	DEER PARK COMMUNITY CITY	HAMILTON	0.1370	0.1340	0.0875	0.0701	0.1250	0.1237	979,200	74X	1,468,800	63X
8	08/05/86	H	H	FOREST HILLS LOCAL	HAMILTON	0.1310	0.1285	0.0875	0.0701	0.1250	0.1237	979,200	74X	1,468,800	62X
8	08/06/86	H	H	BOONE	BOONE	0.1360	0.1340	0.0875	0.0701	0.1430	0.1410	979,200	74X	1,468,800	59X
8	08/07/86	H	H	BUTLER COUNTY SD OF ED	BUTLER	0.1425	0.1380	0.0875	0.0701	0.1360	0.1220	979,200	74X	1,468,800	59X
8	08/07/86	H	H	ERLANGER/ELSKERE	KENTON	0.1300	0.1275	0.0875	0.0701	0.1365	0.1365	979,200	74X	1,468,800	59X
8	08/07/86	H	H	PRINCETON CITY	KENTON	0.1540	0.1505	0.0875	0.0701	0.1365	0.1225	979,200	74X	1,468,800	59X
8	08/08/86	H	H	LUDLO	KENTON	0.1275	0.1499	0.0875	0.0701	0.1500	0.1480	979,200	74X	1,468,800	52X
8	08/11/86	T	H	BEECHWOOD	CAMPBELL	0.1420	0.1370	0.0875	0.0701	0.1440	0.1455	979,200	74X	1,468,800	52X
8	08/11/86	T	H	DAYTON	CAMPBELL	0.1270	0.1240	0.0875	0.0701	0.1375	0.1365	979,200	74X	1,468,800	52X
8	08/12/86	H	H	FAIRFIELD CITY	BUTLER	0.1275	0.1285	0.0875	0.0701	0.1400	0.1220	979,200	73X	1,468,800	52X
8	08/12/86	T	T	GREENHILLS-FOREST PARK CITY	HAMILTON	0.1400	0.1390	0.0875	0.0701	0.1225	0.1297	979,200	73X	1,468,800	52X
8	08/12/86	T	T	WORKING CITY	HAMILTON	0.1285	0.1237	0.0875	0.0701	0.1380	0.1390	979,200	72X	1,468,800	51X
8	08/18/86	H	T	HOOR HEALTHY CITY	HAMILTON	0.1369	0.1630	0.0875	0.0701	0.1449	0.1225	979,200	72X	1,468,800	50X
8	08/19/86	H	T	BELLEUE	CAMPBELL	0.1369	0.1630	0.0875	0.0701	0.1350	0.1370	979,200	72X	1,468,800	50X
8	08/21/86	H	H	FINNETTOWN LOCAL	HAMILTON	0.1400	0.1225	0.0875	0.0701	0.1240	0.1225	979,200	72X	1,468,800	49X

Table A-1 (Continued)

MONTH	LEDATE	INCURB	WIN	DISTRICT NAME	COUNTY	YBID	HBID	DOCK	FRO	FPRIOR	HPRIOR	TCAPK	TEXCAP	HCAPK	HEXCAP
5	05/21/87	H	M	COVINGTON	KEITHON	0.1500	0.1375	0.0905	0.0703	0.1425	0.1390	979,200	99%	1,468,800	100%
5	05/29/87	M	M	NORWOOD CITY	HAMILTON	0.1500	0.1375	0.0905	0.0703	0.1425	0.1275	979,200	98%	1,468,800	98%
6	06/09/87	M	M	MILFORD E.V.	CAMPBELL	0.1500	0.1375	0.0903	0.0701	0.1400	0.1340	979,200	96%	1,468,800	96%
7	07/01/87	M	T	NEPORT	CAMPBELL	0.1375	0.1475	0.0893	0.0701	0.1320	0.1355	979,200	92%	1,468,800	74%
7	07/06/87	Z	Z	NORTHWEST LOCAL	HAMILTON	0.1440	0.1425	0.0893	0.0701	0.1285	0.1258	979,200	89%	1,468,800	74%
7	07/08/87	T	M	CAMPBELL	CAMPBELL	0.1495	0.1550	0.0893	0.0701	0.1420	0.1380	979,200	89%	1,468,800	74%
7	07/09/87	M	M	ERLANGER/ELSHIRE	KEITHON	0.1479	0.1405	0.0893	0.0701	0.1425	0.1360	979,200	87%	1,468,800	74%
7	07/09/87	M	M	SILVER GROVE	CAMPBELL	0.1479	0.1450	0.0893	0.0701	0.1440	0.1450	979,200	87%	1,468,800	74%
7	07/15/87	M	M	LOWLAND CITY	HAMILTON	0.1469	0.1375	0.0893	0.0701	0.1400	0.1320	979,200	84%	1,468,800	72%
7	07/15/87	T	T	SYCAMORE COMMUNITY CITY	HAMILTON	0.1375	0.1465	0.0893	0.0701	0.1220	0.1400	979,200	84%	1,468,800	72%
7	07/27/87	M	M	BOONE	CAMPBELL	0.1405	0.1375	0.0893	0.0701	0.1350	0.1340	979,200	81%	1,468,800	46%
7	07/31/87	M	M	FT. THOMAS	CAMPBELL	0.1405	0.1475	0.0893	0.0701	0.1374	0.1399	979,200	81%	1,468,800	43%
7	07/31/87	T	T	KEITHON	KEITHON	0.1405	0.1450	0.0893	0.0701	0.1349	0.1405	979,200	81%	1,468,800	43%
8	08/03/87	M	M	BUTLER COUNTY BD OF ED	BUTLER	0.1300	0.1280	0.0897	0.0705	0.1240	0.1240	979,200	77%	1,468,800	43%
8	08/04/87	M	M	FAIRFIELD CITY	BUTLER	0.1220	0.1330	0.0897	0.0705	0.1270	0.1240	979,200	77%	1,468,800	38%
8	08/04/87	T	T	HIDDLETON CITY	BUTLER	0.1220	0.1330	0.0897	0.0705	0.1091	0.1225	979,200	77%	1,468,800	38%
8	08/05/87	M	M	PRINCETON CITY	HAMILTON	0.1345	0.1325	0.0897	0.0705	0.1300	0.1275	979,200	73%	1,468,800	37%
8	08/06/87	M	M	WYOMING CITY	HAMILTON	0.1450	0.1400	0.0897	0.0705	0.1400	0.1380	979,200	72%	1,468,800	36%
8	08/07/87	M	M	DEER PARK COMMUNITY CITY	HAMILTON	0.1450	0.1450	0.0897	0.0705	0.1370	0.1340	979,200	72%	1,468,800	36%
8	08/07/87	M	M	LUDLOW	KEITHON	0.1552	0.1530	0.0897	0.0705	0.1560	0.1505	979,200	72%	1,468,800	36%
8	08/07/87	T	T	WALTON/VERONA	BOONE	0.1435	0.1450	0.0897	0.0705	0.1360	0.1395	979,200	72%	1,468,800	36%
8	08/10/87	T	T	BEECHWOOD	KENTON	0.1535	0.1560	0.0897	0.0705	0.1475	0.1499	979,200	72%	1,468,800	35%
8	08/10/87	M	M	FOREST HILLS LOCAL	HAMILTON	0.1485	0.1335	0.0897	0.0705	0.1310	0.1285	979,200	72%	1,468,800	35%
8	08/11/87	M	M	GREENHILLS-FOREST PARK CITY	HAMILTON	0.1325	0.1475	0.0897	0.0705	0.1275	0.1285	979,200	71%	1,468,800	34%
8	08/11/87	T	T	ST. BERNARD-ELMWOOD PLACE CITY	HAMILTON	0.1425	0.1425	0.0897	0.0705	0.1360	0.1375	979,200	71%	1,468,800	34%
8	08/12/87	Z	Z	NORTHWEST LOCAL	HAMILTON	0.1475	0.1425	0.0897	0.0705	0.1360	0.1375	979,200	70%	1,468,800	33%
8	08/17/87	M	M	BELLEUE	CAMPBELL	0.1450	0.1500	0.0897	0.0705	0.1369	0.1430	979,200	68%	1,468,800	33%
8	08/19/87	M	M	DARTON	CAMPBELL	0.1280	0.1405	0.0897	0.0705	0.1420	0.1370	979,200	68%	1,468,800	33%
8	08/20/87	M	M	FINNEYTON LOCAL	HAMILTON	0.1425	0.1375	0.0897	0.0705	0.1400	0.1225	979,200	67%	1,468,800	33%
8	08/24/87	T	M	LOCKLAND CITY	HAMILTON	0.1425	0.1325	0.0897	0.0705	0.1340	0.1370	979,200	67%	1,468,800	33%
8	08/24/87	M	M	HOUST REALTY CITY	HAMILTON	0.1490	0.1515	0.0897	0.0705	0.1285	0.1237	979,200	67%	1,468,800	33%
8	08/31/87	M	M	ORR HILLS LOCAL	HAMILTON	0.1485	0.1325	0.0897	0.0705	0.1250	0.1225	979,200	67%	1,468,800	31%

SCHOOL YEAR=1987

Table A-1 (Continued)

MONTH	LETDATE	INCUMB	WIN	DISTRICT NAME	COUNTY	TBID	NRID	DOCK	FHO	TPRIOR	MPRIOR	TCAPK	TEXCAP	KCAPK	KECAP
4	06/12/88		H	CLERMONT COUNTY BOARD OF EDUCATION	CLERMONT	0.1402	0.1375	0.0889	0.0679	0.1500	0.1375	979,200	100%	1,468,800	100%
6	06/13/88	H	H	MILFORD E.V.	CLERMONT	0.1379	0.1375	0.0880	0.0665	0.1425	0.1375	979,200	97%	1,468,800	95%
6	06/21/88	H	H	NORWOOD CITY	HAMILTON	0.1418	0.1375	0.0880	0.0665	0.1479	0.1375	979,200	91%	1,468,800	91%
7	07/01/88	H	H	SILVER GROVE	CAMPBELL	0.1503	0.1450	0.0880	0.0665	0.1479	0.1450	979,200	95%	1,468,800	95%
7	07/08/88	H	T	CAMPBELL	CAMPBELL	0.1523	0.1500	0.0880	0.0665	0.1375	0.1475	979,200	93%	1,468,800	93%
7	07/08/88	T	T	NEWPORT	CAMPBELL	0.1405	0.1500	0.0880	0.0665	0.1375	0.1475	979,200	93%	1,468,800	93%
7	07/08/88	T	T	BOONE	BOONE	0.1476	0.1400	0.0880	0.0665	0.1425	0.1375	979,200	83%	1,468,800	83%
7	07/11/88	H	H	ERLANGER/VELSHERE	KENTON	0.1488	0.1430	0.0880	0.0665	0.1459	0.1405	979,200	82%	1,468,800	82%
7	07/14/88	H	H	SYCAMORE COMMUNITY CITY	HAMILTON	0.1455	0.1500	0.0880	0.0665	0.1375	0.1465	979,200	82%	1,468,800	82%
7	07/20/88	T	T	WALTON/VERONA	BOONE	0.1450	0.1500	0.0880	0.0665	0.1435	0.1435	979,200	73%	1,468,800	73%
7	07/28/88	T	T	COVINGTON	KENTON	0.1535	0.1458	0.0880	0.0665	0.1500	0.1375	979,200	69%	1,468,800	69%
7	07/28/88	Z	Z	NORTWEST LOCAL	HAMILTON	0.1502	0.1475	0.0880	0.0665	0.1440	0.1425	979,200	69%	1,468,800	69%
7	07/29/88	T	T	KENTON	KENTON	0.1445	0.1475	0.0880	0.0665	0.1420	0.1330	979,200	65%	1,468,800	65%
8	08/01/88	T	T	HIDDLETON CITY	BUTLER	0.1325	0.1375	0.0916	0.0665	0.1220	0.1330	979,200	61%	1,468,800	61%
8	08/02/88	H	H	WYOMING CITY	HAMILTON	0.1500	0.1425	0.0916	0.0665	0.1450	0.1400	979,200	61%	1,468,800	61%
8	08/04/88	H	H	FAIRFIELD CITY	BUTLER	0.1425	0.1375	0.0916	0.0665	0.1300	0.1280	979,200	61%	1,468,800	61%
8	08/04/88	H	T	FT. THOMAS	CAMPBELL	0.1450	0.1525	0.0916	0.0665	0.1405	0.1475	979,200	60%	1,468,800	60%
8	08/05/88	H	H	CINCINNATI CITY	HAMILTON	0.1372	0.1294	0.0916	0.0665	0.1405	0.1475	979,200	60%	1,468,800	60%
8	08/05/88	H	H	CINCINNATI CITY	HAMILTON	0.1372	0.1294	0.0916	0.0665	0.1405	0.1475	979,200	60%	1,468,800	60%
8	08/05/88	T	T	DAYTON	HAMILTON	0.1300	0.1430	0.0916	0.0665	0.1280	0.1405	979,200	60%	1,468,800	60%
8	08/05/88	H	H	LUDLOW	CAMPBELL	0.1525	0.1483	0.0916	0.0665	0.1552	0.1530	979,200	60%	1,468,800	60%
8	08/05/88	H	H	BEECHWOOD	KENTON	0.1525	0.1483	0.0916	0.0665	0.1552	0.1530	979,200	60%	1,468,800	60%
8	08/08/88	H	H	DEER PARK COMMUNITY CITY	KENTON	0.1525	0.1483	0.0916	0.0665	0.1552	0.1530	979,200	60%	1,468,800	60%
8	08/08/88	H	H	FOREST HILLS LOCAL	KENTON	0.1525	0.1483	0.0916	0.0665	0.1552	0.1530	979,200	60%	1,468,800	60%
8	08/08/88	H	H	PRINCETON LOCAL	KENTON	0.1525	0.1483	0.0916	0.0665	0.1552	0.1530	979,200	60%	1,468,800	60%
8	08/08/88	Z	Z	SOUTHWEST LOCAL	HAMILTON	0.1450	0.1375	0.0916	0.0665	0.1425	0.1400	979,200	59%	1,468,800	59%
8	08/08/88	Z	Z	BUTLER COUNTY BD OF ED	HAMILTON	0.1525	0.1483	0.0916	0.0665	0.1425	0.1400	979,200	59%	1,468,800	59%
8	08/09/88	H	H	GREENHILLS-FOREST PARK CITY	BUTLER	0.1430	0.1370	0.0916	0.0665	0.1350	0.1280	979,200	59%	1,468,800	59%
8	08/11/88	H	T	OK HILLS LOCAL	HAMILTON	0.1375	0.1375	0.0916	0.0665	0.1325	0.1325	979,200	59%	1,468,800	59%
8	08/12/88	H	H	FINNEYTOWN LOCAL	HAMILTON	0.1506	0.1425	0.0916	0.0665	0.1425	0.1375	979,200	58%	1,468,800	58%
8	08/15/88	H	H	BELLEVUE	CAMPBELL	0.1475	0.1500	0.0916	0.0665	0.1450	0.1500	979,200	58%	1,468,800	58%
8	08/16/88	H	M	LOVELAND CITY	HAMILTON	0.1478	0.1400	0.0916	0.0665	0.1469	0.1375	979,200	56%	1,468,800	56%
8	08/16/88	H	M	ST. BERNARD-ELMWOOD PLACE CITY	HAMILTON	0.1475	0.1500	0.0916	0.0665	0.1425	0.1425	979,200	56%	1,468,800	56%
8	08/17/88	T	T	MOUNT HEALTHY CITY	HAMILTON	0.1431	0.1355	0.0916	0.0665	0.1490	0.1315	979,200	56%	1,468,800	56%

SCHOOL YEAR=1988

Table A-1 (Continued)

		SCHOOL YEAR=1989														
MONTH	LEDATE	INCUMB	WIN	DISTRICT NAME	BOARD OF EDUCATION	COUNTY	TBID	HBID	DOCK	FNO	TPRIOR	MPRIOR	TCAPWK	TEKCAP	MCAPWK	MEKCAP
4	04/11/89	H	T	K	CLERMONT	CLERMONT	0.1150	0.1338	0.0966	0.0715	0.1402	0.1375	979,200	100%	1,468,800	100%
6	06/08/89	H	T	M	KILGORE	KILGORE	0.1200	0.1145	0.0945	0.0706	0.1379	0.1375	979,200	92%	1,468,800	92%
6	06/15/89	H	T	H	BOONE	BOONE	0.1380	0.1300	0.0945	0.0706	0.1276	0.1400	979,200	91%	1,468,800	98%
7	06/20/89	H	H	H	BELLEVIEW	CAMPBELL	0.1300	0.1300	0.0945	0.0706	0.1475	0.1500	979,200	87%	1,468,800	98%
7		H	H	H	KIRKWOOD	HAMILTON	0.1300	0.1170	0.0946	0.0707	0.1418	0.1375	979,200	78%	1,468,800	86%
7	07/03/89	H	T	H	PRINCETON CITY	HAMILTON	0.1319	0.1175	0.0946	0.0707	0.1405	0.1500	979,200	78%	1,468,800	86%
7	07/08/89	T	T	H	NEWPORT	CAMPBELL	0.1300	0.1500	0.0946	0.0707	0.1405	0.1500	979,200	71%	1,468,800	72%
7	07/12/89	T	T	H	CAMPBELL	CAMPBELL	0.1345	0.1288	0.0946	0.0707	0.1445	0.1475	979,200	68%	1,468,800	45%
7	07/15/89	H	H	H	KENTON	KENTON	0.1185	0.1519	0.0946	0.0707	0.1445	0.1475	979,200	64%	1,468,800	45%
7	07/17/89	H	H	H	ERLANGER/ELSHERE	KENTON	0.1150	0.1150	0.0946	0.0707	0.1488	0.1430	979,200	64%	1,468,800	45%
7	07/14/89	H	H	H	BUTLER COUNTY BD OF ED	BUTLER	0.1150	0.1150	0.0946	0.0707	0.1430	0.1370	979,200	64%	1,468,800	45%
7	07/14/89	H	H	H	SILVER GROVE	CAMPBELL	0.1265	0.1220	0.0946	0.0707	0.1503	0.1450	979,200	64%	1,468,800	45%
7	07/18/89	H	T	H	SYCAMORE COMMUNITY CITY	HAMILTON	0.1156	0.0946	0.0707	0.1455			979,200	64%	1,468,800	45%
7	07/28/89	T	T	H	ST. BERNARD-ELMWOOD PLACE CITY	HAMILTON	0.1165	0.1210	0.0946	0.0707	0.1475	0.1500	979,200	57%	1,468,800	34%
7	07/31/89	T	T	H	MIDDLETON CITY	BUTLER	0.1184	0.1175	0.0946	0.0707	0.1325	0.1375	979,200	57%	1,468,800	34%
8	08/01/89	H	H	H	FOREST HILLS LOCAL	HAMILTON	0.1204	0.1175	0.0962	0.0719	0.1439	0.1375	979,200	28%	1,468,800	34%
8	08/03/89	H	H	H	LOVELAND CITY	HAMILTON	0.1210	0.1175	0.0962	0.0719	0.1478	0.1400	979,200	28%	1,468,800	34%
8	08/04/89	H	H	H	LUDLOW	KENTON	0.1290	0.1220	0.0962	0.0719	0.1575	0.1483	979,200	28%	1,468,800	33%
8	08/07/89	H	H	H	COVINGTON	KENTON	0.1200	0.1200	0.0962	0.0719	0.1535	0.1458	979,200	28%	1,468,800	33%
8	08/07/89	T	T	H	FT. THOMAS	CAMPBELL	0.1175	0.1195	0.0962	0.0719	0.1450	0.1525	979,200	28%	1,468,800	33%
8	08/10/89	T	T	H	BEECHWOOD	CAMPBELL	0.1280	0.1275	0.0962	0.0719	0.1555	0.1400	979,200	24%	1,468,800	31%
8	08/10/89	T	T	H	DAYTON	CAMPBELL	0.1134	0.1170	0.0962	0.0719	0.1300	0.1430	979,200	24%	1,468,800	31%
8	08/10/89	T	T	H	FAIRFIELD CITY	BUTLER	0.1300	0.1170	0.0962	0.0719	0.1225	0.1375	979,200	24%	1,468,800	31%
8	08/10/89	T	T	H	GREENHILLS-FOREST PARK CITY	HAMILTON	0.1375	0.1165	0.0962	0.0719	0.1375	0.1425	979,200	24%	1,468,800	31%
8	08/10/89	T	T	H	WYOMING CITY	HAMILTON	0.1400	0.1175	0.0962	0.0719	0.1500	0.1475	979,200	24%	1,468,800	31%
8	08/11/89	H	Z	H	NORTHWEST LOCAL	HAMILTON	0.1339	0.1165	0.0962	0.0719	0.1502	0.1475	979,200	21%	1,468,800	29%
8	08/11/89	H	Z	H	OAK HILLS LOCAL	HAMILTON	0.1140	0.0962	0.0719	0.1463			979,200	21%	1,468,800	29%
8	08/14/89	H	Z	H	SOUTHWEST LOCAL	HAMILTON	0.1134	0.0962	0.0719	0.1525			979,200	18%	1,468,800	29%
8	08/17/89	Z	T	H	WALTON/VERONA	BOONE	0.1450	0.0962	0.0719	0.1450			979,200	15%	1,468,800	29%
8	08/21/89	H	H	H	MOUNT HEALTHY CITY	HAMILTON	0.1500	0.1165	0.0962	0.0719	0.1431	0.1355	979,200	15%	1,468,800	29%

Table A-1 (Continued)

MONTH	LEI DATE	INCLMB	WIN	DISTRICT NAME	BOARD OF EDUCATION	COUNTY	TBID	HBID	DOCK	FHO	YPRDR	HPRIOR	TDAPMK	TEXCAP	HCAPMK	HEXCAP
4	06/03/90	T	H	CLERMONT COUNTY	CLERMONT	CLERMONT	0.1509	0.1386	0.1083	0.0766	0.1150	0.1338	979,200	100%	1,468,800	100%
6	06/07/90	H	H	HILFORD E.V.	HILFORD E.V.	CLERMONT	0.1550	0.1470	0.1093	0.1145	0.1200	0.1145	979,200	99%	1,468,800	95%
6	06/07/90	H	H	HORWOOD CITY	HORWOOD CITY	HAMILTON	0.1550	0.1470	0.1093	0.0772	0.1200	0.1170	979,200	99%	1,468,800	95%
4	06/03/90	T	H	CLERMONT COUNTY	CLERMONT	CLERMONT	0.1509	0.1386	0.1083	0.0766	0.1150	0.1338	979,200	100%	1,468,800	100%
6	06/07/90	H	H	HILFORD E.V.	HILFORD E.V.	CLERMONT	0.1550	0.1470	0.1093	0.0772	0.1200	0.1145	979,200	99%	1,468,800	95%
6	06/07/90	H	H	HORWOOD CITY	HORWOOD CITY	HAMILTON	0.1550	0.1470	0.1093	0.0772	0.1200	0.1170	979,200	99%	1,468,800	95%
7	07/09/90	H	H	DAYTON	DAYTON	KENTON	0.1850	0.1600	0.1114	0.0797	0.1290	0.1220	979,200	83%	1,468,800	36%
7	07/11/90	T	H	ERLANGER/ELSHERE	ERLANGER/ELSHERE	CAMPBELL	0.1480	0.1573	0.1114	0.0797	0.1134	0.1175	979,200	83%	1,468,800	33%
7	07/12/90	H	T	WALTON/VERONA	WALTON/VERONA	KENTON	0.1540	0.1540	0.1114	0.0797	0.1185	0.1175	979,200	83%	1,468,800	33%
7	07/16/90	T	T	BOONE	BOONE	KENTON	0.1520	0.1573	0.1114	0.0797	0.1450	0.1300	979,200	79%	1,468,800	32%
7	07/16/90	H	T	CAMPBELL	CAMPBELL	CAMPBELL	0.1690	0.1580	0.1114	0.0797	0.1180	0.1300	979,200	79%	1,468,800	32%
7	07/16/90	H	M	SILVER GROVE	SILVER GROVE	CAMPBELL	0.1650	0.1523	0.1114	0.0797	0.1265	0.1220	979,200	79%	1,468,800	32%
7	07/18/90	H	M	BELLEWUE	BELLEWUE	CAMPBELL	0.1570	0.1535	0.1114	0.0797	0.1265	0.1220	979,200	74%	1,468,800	32%
7	07/18/90	H	M	SYCAMORE COMMUNITY CITY	SYCAMORE COMMUNITY CITY	CAMPBELL	0.1570	0.1535	0.1114	0.0797	0.1156	0.1300	979,200	74%	1,468,800	32%
7	07/19/90	T	Z	HEMPST	HEMPST	CAMPBELL	0.1480	0.1490	0.1114	0.0797	0.1300	0.1300	979,200	72%	1,468,800	32%
7	07/27/90	T	T	ST. BERNARD-ELKWOOD PLACE CITY	ST. BERNARD-ELKWOOD PLACE CITY	CAMPBELL	0.1550	0.1573	0.1114	0.0797	0.1165	0.1210	979,200	69%	1,468,800	30%
7	07/27/90	H	T	FAIRFIELD CITY	FAIRFIELD CITY	BUTLER	0.1530	0.1530	0.1141	0.0823	0.1600	0.1170	979,200	65%	1,468,800	33%
8	08/01/90	H	T	FOREST MILLS LOCAL	FOREST MILLS LOCAL	HAMILTON	0.1550	0.1646	0.1141	0.0823	0.1264	0.1175	979,200	65%	1,468,800	33%
8	08/03/90	H	T	KENTON	KENTON	HAMILTON	0.1580	0.1540	0.1141	0.0823	0.1185	0.1319	979,200	62%	1,468,800	32%
8	08/05/90	H	M	LOVELAND CITY	LOVELAND CITY	HAMILTON	0.1690	0.1540	0.1141	0.0823	0.1210	0.1175	979,200	53%	1,468,800	12%
8	08/05/90	H	T	HIDDELOAK CITY	HIDDELOAK CITY	BUTLER	0.1450	0.1450	0.1141	0.0823	0.1184	0.1175	979,200	53%	1,468,800	12%
8	08/06/90	H	M	PRINCETON CITY	PRINCETON CITY	HAMILTON	0.1650	0.1510	0.1141	0.0823	0.1319	0.1165	979,200	53%	1,468,800	12%
8	08/08/90	Z	H	WORTHWEST LOCAL	WORTHWEST LOCAL	HAMILTON	0.1650	0.1470	0.1141	0.0823	0.1339	0.1165	979,200	49%	1,468,800	11%
8	08/09/90	H	H	MYOMING CITY	MYOMING CITY	HAMILTON	0.1570	0.1573	0.1141	0.0823	0.1175	0.1165	979,200	49%	1,468,800	9%
8	08/09/90	H	H	GREENHILLS-FOREST PARK CITY	GREENHILLS-FOREST PARK CITY	HAMILTON	0.1530	0.1470	0.1141	0.0823	0.1140	0.1165	979,200	49%	1,468,800	8%
8	08/10/90	H	H	OAK HILLS LOCAL	OAK HILLS LOCAL	HAMILTON	0.1700	0.1600	0.1141	0.0823	0.1280	0.1275	979,200	48%	1,468,800	6%
8	08/10/90	H	H	BEECHWOOD	BEECHWOOD	KENTON	0.1570	0.1640	0.1141	0.0823	0.1175	0.1195	979,200	48%	1,468,800	6%
8	08/13/90	H	T	FT. THOMAS	FT. THOMAS	CAMPBELL	0.1700	0.1600	0.1141	0.0823	0.1290	0.1220	979,200	48%	1,468,800	6%
8	08/13/90	H	M	LUDLOW	LUDLOW	KENTON	0.1570	0.1600	0.1141	0.0823	0.1290	0.1220	979,200	48%	1,468,800	6%
8	08/14/90	H	M	HAWEIRA CITY	HAWEIRA CITY	HAMILTON	0.1570	0.1573	0.1141	0.0823	0.1500	0.1165	979,200	48%	1,468,800	6%
8	08/15/90	H	M	MOUNT HEALTHY CITY	MOUNT HEALTHY CITY	HAMILTON	0.1560	0.1540	0.1141	0.0823	0.1500	0.1165	979,200	48%	1,468,800	6%
8	08/20/90	H	M	DAYTON	DAYTON	CAMPBELL	0.1430	0.1473	0.1109	0.0782	0.1134	0.1175	979,200	47%	1,468,800	4%

SCHOOL YEAR=1990  
(cont'ned)

Table A-2  
Duopoly Bidding Patterns For School Milk Contracts In Greater Cincinnati

SCHOOL YEAR=1992												
MONTH	LEDATE	INCLXB	MIN	DISTRICT NAME	COUNTY	TBID	HBID	FNO	TPRIOR	MPRIOR		
6	06/02/92	H	H	BELLEVUE	CAMPBELL	0.1530	0.1486	0.072562				
6	06/08/92	T	T	WALTON/VERONA	BOONE	0.1495	0.1475	0.072562				
6	06/24/92	T	T	NEWPORT	CAMPBELL	0.1430	0.1475	0.072562				
7	07/07/92	H	H	SILVER GROVE	CAMPBELL	0.1498	0.1380	0.075787				
7	07/10/92	H	H	TALAMANDA/HAR CITY	BUTLER	0.1370	0.1379	0.075787				
7	07/13/92	H	H	COVINGTON	KENTON	0.1445	0.1415	0.075787				
7	07/24/92	T	T	KENTON	KENTON	0.1495	0.1539	0.075787				
7	07/31/92	M	H	LUDLOW	KENTON	0.1540	0.1415	0.075787				
8	08/03/92	T	T	FT. THOMAS	CAMPBELL	0.1450	0.1469	0.077937				
8	08/04/92	T	T	NORTHEAST LOCAL	HAMILTON	0.1373	0.1354	0.077937				
8	08/06/92	M	M	BEECHWOOD	KENTON	0.1440	0.1425	0.077937				
8	08/06/92	M	M	FAIRFIELD CITY	BUTLER	0.1360	0.1340	0.077937				
8	08/06/92	Z	Z	MIDDLETON CITY	BUTLER	0.1360	0.1340	0.077937				
8	08/14/92	T	T	DAYTON	CAMPBELL	0.1445	0.1448	0.077937				

Table A-2 (Continued)

----- SCHOOL YEAR=1993 -----

MONTH	LEDATE	INCLMB	WIN	DISTRICT NAME	COUNTY	TBID	HBID	FHO	TPRIOR	MPRIOR
6	06/08/93	T	T	WALTON/VERONA	BOONE	0.1485	0.1530	0.076271	0.1495	0.1475
6	06/10/93	M	M	BELLEVUE	CAMPBELL	0.1432	0.1432	0.076271	0.1430	0.1486
6	06/25/93	T	M	HEMPHAT	CAMPBELL	0.1465	0.1414	0.076271	0.1430	0.1475
7	07/06/93	T	T	CAMPBELL	CAMPBELL	0.1550	0.1452	0.078260	0.1498	0.1380
7	07/06/93	M	T	SILVER GROVE	CAMPBELL	0.1490	0.1452	0.078260	0.1445	0.1380
7	07/22/93	T	T	DAYTON	CAMPBELL	0.1445	0.1452	0.078260	0.1445	0.1380
7	07/24/93	T	T	KENTON	CAMPBELL	0.1400	0.1415	0.078260	0.1495	0.1415
7	07/30/93	M	M	LOGAN	KENTON	0.1495	0.1415	0.078260	0.1495	0.1415
8	08/04/93	M	M	FAIRFIELD CITY	BUTLER	0.1340	0.1360	0.075426	0.1340	0.1340
8	08/05/93	Z	T	MIDDLEBORO CITY	BUTLER	0.1360	0.1460	0.075426	0.1340	0.1448
8	08/06/93	M	M	BEECHWOOD	KENTON	0.1425	0.1410	0.075826	0.1440	0.1425



Table A-2 (Continued)

MONTH	LEDATE	HOURS	LN	DISTRICT NAME	COUNTY	IBID	MBID	FNO	TPRIOR	RPRIOR
5	05/16/94	R	M	BELLEVUE	CAMPBELL		0.1399	0.079604		0.1432
6	06/27/94	M	M	CINCINNATI CITY	HAMILTON		0.1348	0.080786		
6	06/27/94	M	M	NEPORT	CAMPBELL	0.1369	0.1357	0.080786	0.1465	0.1414
6	06/29/94	Y	M	MALTON/VERONA	BOONE	0.1460	0.1412	0.080786	0.1485	0.1510
7	07/03/94	Y	M	SILVER GROVE	CAMPBELL	0.1398	0.1399	0.072851	0.1490	0.1452
7	07/06/94	Y	M	SOJTRGATE	CAMPBELL	0.1499	0.1457	0.072851		
7	07/12/94	R	M	CAMPBELL	CAMPBELL	0.1350	0.1285	0.072851	0.1550	
7	07/14/94	R	M	ERLANGER/ELSHERE	BENTON	0.1445	0.1385	0.072851	0.1445	
7	07/19/94	Y	M	DAYTON	CAMPBELL	0.1280	0.1284	0.072851	0.1360	0.1460
7	07/25/94	Y	T	MIDDLEFOWN CITY	BUTLER		0.1335	0.072851		
7	07/26/94	R	M	COALITION	BENTON	0.1425	0.1385	0.072851		
7	07/29/94	Y	M	FT. THOMAS	CAMPBELL	0.1440	0.1500	0.072851	0.1400	
7	07/29/94	Y	T	KENTON	KENTON	0.1460	0.1500	0.072851	0.1425	0.1610
8	08/03/94	R	M	BEECHWOOD	BENTON	0.1465	0.1577	0.071454	0.1430	0.1610
8	08/03/94	Y	M	FAIRFIELD CITY	BUTLER	0.1280	0.1500	0.071454	0.1340	0.1360

SCHOOL YEAR=1994

Table A-2 (Continued)

SCHOOL YEAR=1995												
MONTH	LEDATE	INCRMB	MIN	DISTRICT NAME	COUNTY	TBID	MBID	FMO	TPRIOR	MPRIOR		
5	05/08/95	M	H	BELLEUE	CAMPBELL	0.1330	0.1419	0.074874	0.1369	0.1399		
6	06/26/95	M	H	NEWPORT	CAMPBELL	0.1350	0.1291	0.070950	0.1440	0.1357		
6	06/27/95	T	H	KENTON	KENTON	0.1370	0.1375	0.070950	0.1400	0.1500		
6	06/30/95	M	T	SILVER GROVE	CAMPBELL	0.1373	0.1375	0.070950	0.1398	0.1399		
7	07/06/95	M	H	SOUTHGATE	CAMPBELL	0.1370	0.1404	0.070735	0.1499	0.1457		
7	07/12/95	M	T	CAMPBELL	CAMPBELL	0.1340	0.1399	0.070735	0.1460	0.1412		
7	07/18/95	M	T	WALTON/VERONA	BOONE	0.1335	0.1314	0.070735	0.1445	0.1395		
7	07/21/95	M	H	DAYTON	CAMPBELL	0.1335	0.1269	0.070735	0.1280	0.1284		
7	07/25/95	M	H	BOONE	BOONE	0.1300	0.1290	0.072347	0.1465	0.1377		
8	08/01/95	T	H	MIDDLETON CITY	BUTLER	0.1340	0.1314	0.072347	0.1280	0.1300		
8	08/03/95	M	H	BEECHWOOD	KENTON	0.1300	0.1300	0.072347	0.1280	0.1300		
8	08/03/95	M	H	FAIRFIELD CITY	BUTLER	0.1300	0.1300	0.072347	0.1280	0.1300		
8	08/04/95	M	H	FT. THOMAS	CAMPBELL	0.1300	0.1314	0.072347	0.1280	0.1385		