

October 2018

## Masters of the Universe: Bid Rigging by Private Equity Firms in Multibillion Dollar LBOs

Christopher M. Burke

Stephanie A. Hackett

David W. Mitchell

Simon J. Wilke

Melanie Stallings Williams

*California State University, Northridge*, [stallings.williams@gmail.com](mailto:stallings.williams@gmail.com)

*See next page for additional authors*

Follow this and additional works at: <https://scholarship.law.uc.edu/uclr>

---

### Recommended Citation

Christopher M. Burke, Stephanie A. Hackett, David W. Mitchell, Simon J. Wilke, Melanie Stallings Williams, Michael A. Williams, and Wei Zhao, *Masters of the Universe: Bid Rigging by Private Equity Firms in Multibillion Dollar LBOs*, 87 U. Cin. L. Rev. 29 (2018)

Available at: <https://scholarship.law.uc.edu/uclr/vol87/iss1/2>

This Article is brought to you for free and open access by University of Cincinnati College of Law Scholarship and Publications. It has been accepted for inclusion in University of Cincinnati Law Review by an authorized editor of University of Cincinnati College of Law Scholarship and Publications. For more information, please contact [ronald.jones@uc.edu](mailto:ronald.jones@uc.edu).

---

# Masters of the Universe: Bid Rigging by Private Equity Firms in Multibillion Dollar LBOs

## Authors

Christopher M. Burke, Stephanie A. Hackett, David W. Mitchell, Simon J. Wilke, Melanie Stallings Williams, Michael A. Williams, and Wei Zhao

## MASTERS OF THE UNIVERSE: BID RIGGING BY PRIVATE EQUITY FIRMS IN MULTIBILLION DOLLAR LBOs

*Christopher M. Burke, \* Stephanie A. Hackett, \*\* David W. Mitchell, \*\*\*  
Simon J. Wilke, \*\*\*\* Melanie Stallings Williams, \*\*\*\*\* Michael A.  
Williams, \*\*\*\*\* and Wei Zhao \*\*\*\*\**

*In the first successful case of its kind, a class action alleging widespread collusion in the market for leveraged buyouts, some of the world's largest private equity firms settled *Dahl v. Bain Capital Partners, LLC* for \$590.5 million. The case was unique not only for its size and the fact that it involved complex financial transactions instead of a typical commodity, but also because the claimants used auction theory to demonstrate both the "plus" factors required to prove antitrust injury and the resulting damages. Economic analyses show that the cost to shareholders of collusion in the eight litigated multi-billion dollar leveraged buyout transactions approached \$12 billion.*

*The use of empirical economic analysis in antitrust litigation is now de rigeur. Courts expect it, and litigants have an array of econometricians available who understand both how to work with data and antitrust doctrine. In "ordinary" commodities price fixing cases, plaintiffs and defendants are expected to engage experts who gather transaction data and apply regression theory and other economic analyses to contest whether it is possible to demonstrate injury, impact, and damages. *Dahl* was not an ordinary case in that it involved neither a commodity nor a sellers' cartel. Instead, it involved a buyers' cartel which, Plaintiffs alleged, conspired to drive down the price of a number of unique, large LBOs during the mid-2000s. Additionally, the case was notable because of the Plaintiffs' decision to use the auction theory to demonstrate the existence of antitrust violations and the extent of damages*

---

\*Partner, Scott & Scott (New York & San Diego). M.A., Ph.D., J.D., University of Wisconsin; M.A., William & Mary; B.A., Ohio State University.

\*\*Associate, Scott & Scott (San Diego). B.S., J.D. University of Iowa.

\*\*\*Partner, Robbins, Geller, Rudman & Dowd LLP (San Diego). J.D., University of San Diego School of Law; B.A. University of Richmond.

\*\*\*\*Professor, Economics, University of Southern California. M.A. and Ph.D. (Economics) University of Rochester, B.Comm. (Economics) University of New South Wales.

\*\*\*\*\* Professor & Chair, Department of Business Law, California State University, Northridge. J.D., Boston University; B.A., University of California. The author thanks William Mumford Havens for comments and Professor William E. Ryckman, Jr. for teaching her how to think.

\*\*\*\*\*Director, Competition Economics, LLC. M.A. and Ph.D. (Economics) University of Chicago; B.A. (Economics) University of California, Santa Barbara.

\*\*\*\*\*Principal, Competition Economics, LLC. Ph.D. (Economics) Johns Hopkins University; B.A. (Finance), Renmin University of China.

30	UNIVERSITY OF CINCINNATI LAW REVIEW	[VOL. 87
Introduction.....	31	
Demonstrating Plus Factors to Prove the Existence of and Impact from Collusion in the Private Equity Market .....	33	
The Private Equity Industry.....	33	
Market Allocation and Bid rigging.....	36	
Using Auction Theory to Demonstrate Antitrust Impact .....	38	
Using Auction Theory to Demonstrate Antitrust Damages.....	39	
Conclusions.....	41	
APPENDIX I FACTORS .....	42	
Plus factor 1: Inefficiency in the auctions .....	42	
Plus factor 2: Winning bids below the estimated competitive price.....	44	
Table 2.....	45	
Independent Plus Factor 2: Winning Bid Below the Estimated Competitive Price.....	45	
Plus factor 3: Redistribution of gains and losses .....	46	
Table 3.....	47	
Independent Plus Factor 3: Redistribution of Gains and Losses.....	47	
Table 3 (cont.) .....	48	
Independent Plus Factor 3: Redistribution of Gains and Losses.....	48	
Plus factor 4: Bid reduction below competitive benchmark prices .....	49	
Plus factor 5: Communication and monitoring.....	49	
Table 4.....	51	
Independent Plus Factor 5: Communication And Monitoring ....	51	
Table 4(cont.) .....	52	
Independent Plus Factor 5: Communication And Monitoring ....	52	
Table 4(cont.) .....	53	
Independent Plus Factor 5: Communication And Monitoring ....	53	
Plus factor 6: Large club deals reduce number of bidders.....	54	
Table 5.....	55	
Independent Plus Factor 6: Large Club Deals Reduce Number Of Bidders.....	55	
Table 6.....	57	
Independent Plus Factor 6: Large Club Deals Reduce Number Of Bidders.....	57	
Summary of Plus Factors.....	58	
Appendix II: Damages Analysis .....	59	
IRRs but for the Market Allocation and Bid rigging Agreement.....	59	
Estimating the But-For Competitive IRRs Using CAPM .....	59	

2018]	BID RIGGING BY PRIVATE EQUITY FIRMS	31
	Estimating the But-For Competitive IRRs Using Information Provided in Ewens et al.....	63
	Estimating PE Firms' But-For Equity Valuations Per Share .....	63
	Damages Using the CAPM to Estimate But-For Competitive IRR.....	63
	Table 1 .....	65
	Amc Antitrust Damages Analysis: IRR = 15.59% .....	65
	Table 2 .....	66
	Aramark Antitrust Damages Analysis: IRR= 13.46% .....	66
	Table 3 .....	67
	Freescale Antitrust Damages Analysis: IRR = 19.57% .....	67
	Table 4 .....	68
	Harrah's Antitrust Damages Analysis: IRR = 17.02%.....	68
	Table 5 .....	69
	HCA Antitrust Damages Analysis: IRR = 13.71% .....	69
	Table 6 .....	70
	Kinder Morgan Antitrust Damages Analysis: IRR = 14.38% .....	70
	Table 7 .....	71
	Sungard Antitrust Damages Analysis: IRR = 17.14% .....	71
	Table 8 .....	72
	TXU Antitrust Damages Analysis: IRR = 15.68% .....	72
	Table 9 .....	73
	Antitrust Damages Analysis Summary.....	73
	Appendix III: Equity Valuation Methodology.....	74
	Methodology I: Using PE Firm's Exit EV/EBITDA Multiple....	74
	Step 1: Estimating equity investment ( $E_0$ ) .....	74
	Step 2: Estimating the total purchase price ( $TPP_0$ ).....	75
	Step 3: Estimating the equity valuation per share.....	75
	Methodology II: Using PE Firm's Exit P/E Multiple.....	76
	Methodology III: Using PE Firm's Segment Exit Multiples.....	76

## INTRODUCTION

In 2014, after nearly seven years of litigation, a shareholder class of investors settled their antitrust claims against some of the world's largest private equity ("PE") firms – Bain Capital Partners, Blackstone Group, Carlyle, Goldman Sachs, Kohlberg Kravis Roberts & Co., Silver Lake Technology Management, and TPG Capital – who agreed to pay \$590.5 million.<sup>1</sup> The case arose from an article in the Wall Street Journal

---

1. Andrew Harris, *Buyout Firms' \$590 Million Collusion Settlement Approved*, BLOOMBERG (Sept. 30, 2014, 1:50 PM), <https://www.bloomberg.com/news/articles/2014-09-30/buyout-firms-590-million-collusion-settlement-approved>.

reporting that the Antitrust Division of the U.S. Department of Justice (“DOJ”) sent a letter asking certain PE firms to provide it with information regarding bidding for the acquisition of companies. Ultimately, the DOJ declined to bring action for alleged antitrust violations.<sup>2</sup> In 2007, a proposed class of shareholders alleged that the world’s largest PE firms had violated the Sherman Act, 15 U.S.C. §1, by conspiring to suppress the prices paid to shareholders in several large leveraged buyouts (“LBOs”).<sup>3</sup> The case was unusual in that the shareholder class alleged an overarching conspiracy by a buyers’ cartel that did not involve the purchase of a commodity, but instead involved fairly unique and complex LBOs of large public corporations. The use of club deals (i.e., agreements among PE firms to share capital, valuations, and sector expertise) reduced the number of bidders and provided an environment conducive to collusion.

While the case was notable for both its size and subject matter,<sup>4</sup> it was likewise novel in the way it demonstrated impact and harm: through the use of auction theory. Regression analysis has been a common means of demonstrating antitrust injury<sup>5</sup> and one scholar used the Herfindahl-Hirschman Index (HHI) to demonstrate whether these private equity acquisitions should be viewed as anticompetitive.<sup>6</sup> However, the use of auction theory in the class action permitted the claimants not only to demonstrate injury and damages, but also to develop “plus factors” demonstrating the “concerted action” requirement of a Section 1 claim. The economic analyses, combined with the record of contemporaneous communications and deposition testimony, demonstrate that the seven major private equity firms<sup>7</sup> entered into a market allocation and bid rigging agreement from 2003 to 2007 that reduced the prices paid in eight multibillion-dollar LBOs by \$11.97 billion. In this article, we explain how auction theory was used to show the existence of a market allocation and

---

2. White & Case LLP, *A Recent Court Decision Revives Concern That Some Club Deals Could Violate the Antitrust Laws*, LEXOLOGY (Feb. 5, 2009), <https://www.lexology.com/library/detail.aspx?g=ab238d4b-9ba0-4093-a58b-4ec0df4538f6>.

3. Complaint at 1-2, *Davidson v. Bain Capital Partners, LLC*, No. 1:07-cv-12388-EFH (D. Mass. filed Dec. 28, 2007).

4. For a discussion of the rise of bid rigging cartel behavior worldwide and the effect of fines on deterrence, see Emilie Dargaud, Andrea Mantovani & Carlo Reggiani, *Cartel Punishment and the Distortive Effects of Fines*, 12 J. OF COMPETITION LAW & ECON. 375 (2016).

5. See, e.g., Lawrence Wu, *ECONOMETRICS: LEGAL, PRACTICAL, AND TECHNICAL ISSUES* 341-70 (2d ed. 2014).

6. Jon Fougner, Comment, *Antitrust Enforcement in Private Equity: Target, Bidder, and Club Sizes Should Matter*, 31 YALE J. ON REG. ONLINE 25 (Oct. 6, 2013).

7. Complaint at 4-6, *Dahl v. Bain Capital Partners, LLC*, No. 1:07-cv-12388 (D. Mass. Dec. 28, 2007). (Defendant private equity firms included Bain Capital Partners, Blackstone Group, Carlyle Group, Goldman Sachs Group, Kohlberg Kravis Roberts & Co., Silver Lake Technology Management, and TPG Capital).

bid rigging agreement that resulted in antitrust impact and damages.<sup>8</sup>

DEMONSTRATING PLUS FACTORS TO PROVE THE EXISTENCE OF AND  
IMPACT FROM COLLUSION IN THE PRIVATE EQUITY MARKET

While auction theory has been proposed as a way to obtain optimal results in the market for corporate control,<sup>9</sup> the *Dahl* case was the first prominent instance of the use of auction theory to demonstrate antitrust injury and damages. Game theory, which auction theory is a form of, has been introduced into merger analysis since the 1992 revision of the Merger Guidelines,<sup>10</sup> including its application to coordinated interactions (for example, collusion in the market).<sup>11</sup> Plaintiffs in antitrust actions often rely on regression analysis to demonstrate antitrust injury and damages.<sup>12</sup> *Dahl*, however, was the first reported example of the use of auction theory to demonstrate the existence of plus factors as proof of conspiracy along with demonstrating the degree of harm resulting from the collusion.

We begin with an overview of the private equity industry, followed by a discussion of the dynamics of market allocation and bid rigging. We then apply auction theory to demonstrate the existence of antitrust violations in the *Dahl* case and the degree of harm resulting from the collusion.

*The Private Equity Industry*

A PE firm is a partnership or limited liability corporation that raises equity capital through PE funds.<sup>13</sup> In a typical PE transaction where the PE firm buys a company, the buyout is financed 60% to 90% with debt—hence the term leveraged buyout—and 10% to 40% with funds from investors, including principals at the PE firms.<sup>14</sup> In an LBO, purchasers, often PE firms, acquire most of a company's outstanding shares with a substantial amount of debt financing. Purchasers then take the company

---

8. Authors Christopher M. Burke, Stephanie A. Hackett, and David W. Mitchell served as counsel and authors Simon J. Wilke, Michael A. Williams and Wei Zhao as testifying and consulting experts, respectively, for Plaintiffs in the action.

9. Christina M. Sautter, *Auction Theory and Standstills: Dealing with Friends and Foes in a Sale of Corporate Control*, 64 CASE W. RES. L. REV. 521 (2013).

10. Malcolm B. Coate & Jeffrey H. Fischer, *Daubert, Science, and Modern Game Theory: Implications for Merger Analysis*, 20 S. CT. ECON. REV. 125, 126 (2012).

11. U.S. Dept. of Justice & Fed. Trade Comm'n, *Horizontal Merger Guidelines*, 62 ANTITRUST & TRADE REG. REP. (BNA) No. 1559, Section 2.2 (1992).

12. See, e.g., *supra* note 5.

13. Steven N. Kaplan & Per Strömberg, *Leveraged Buyouts and Private Equity*, 23 J. OF ECON. PERSPECTIVES 121, 122 (2009).

14. *Id.* at 125.

private by withdrawing their shares from the public exchange and operate it for a period of time. Thereafter, the purchasers sell it to a strategic rival or other PE firm or they conduct an initial public offering (“IPO”) and return ownership to the public markets.

LBO activity boomed in the early 1980s, slowed in the 1990s, and thrived again starting in 2001.<sup>15</sup> The value of PE LBO deals in the U.S. surged from \$30 billion in 2001 to over \$450 billion in 2007.<sup>16</sup> In 2006 and 2007, PE funds exceeded 1% of the U.S. stock market’s value.<sup>17</sup> However, LBO activity stagnated in 2008 due to the Great Recession and the resulting freeze in the credit markets upon which PE firms depend.

Since the first LBO boom in the 1980s, PE LBOs have evolved to become less associated with “hostile takeovers.” Instead, PE firms more typically cooperate with incumbent boards of directors and their officers to cultivate relationships to effectuate “friendly takeovers.”<sup>18</sup> As a result, their holdings have expanded to include companies in the financial services, technology, healthcare, manufacturing, and retail industries.<sup>19</sup> Throughout the 2001-2007 boom, PE firms shifted their focus from primarily purchasing noncore business units of large public companies to buying public companies as a whole.<sup>20</sup> PE firms have also increasingly partaken in “club deals,” which are joint agreements between two or more PE firms to pool their resources, expertise, and investment funds’ capital to buy target companies.<sup>21</sup> Of the ten largest completed club deal LBOs of U.S. target companies since 2000, all of the deals included at least one of the named Defendants in *Dahl* and six of the ten LBOs were proprietary club deals that formed part of the overarching conspiracy in *Dahl*.<sup>22</sup> Club deals surged in 2004, peaked in 2007, and accounted for 44% of the \$1.05 trillion total LBO deal value in the 2000 to 2007 period.<sup>23</sup>

Developments in the PE industry sparked debates and criticisms of PE

15. Micah S. Officer, Oguzhan Ozbas & Berk A. Sensoy, *Club Deals in Leveraged Buyouts*, 98 J. OF FIN. ECON. 214, 214 (2010).

16. *Id.*

17. *Supra* note 13, at 125.

18. One example of a “friendly takeover” was in the SunGuard LBO, where Silver Lake cultivated a relationship with the SunGard board of directors and executives. In addition to managements’ participation in the buyout, five-year employment contracts were negotiated with the top seven executives, which offered the executives the opportunity to invest up to \$35 million of their proceeds from the sale of the company into new company stock, and included a 15% incentive equity stake of the new company stock. Redacted Fifth Amended Complaint at 69, *Dahl v. Bain Capital Partners, LLC*, 1:07-cv-12388 (D. Mass. Oct. 10, 2012).

19. U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-08-885, PRIVATE EQUITY: RECENT GROWTH IN LEVERAGED BUYOUTS EXPOSED RISKS THAT WARRANT CONTINUED ATTENTION 10 (2008).

20. Felix Barber & Michael Goold, *The Strategic Secret of Private Equity*, 85 HARV. BUS. REV. 53, 56 (2007).

21. *Supra* note 19, at 5.

22. *Id.* at 27.

23. *Id.* at 24-25.



activities, especially club deals. One criticism is that PE firms can collude through club deals to depress acquisition prices by limiting the number of firms bidding in an auction.<sup>24</sup> Even without collusion, clubbing can decrease competition by reducing the number of bids and, consequently, lower premiums for target companies' shareholders.<sup>25</sup> PE executives argue that club deals form primarily because one firm may not have sufficient capital in funds to buy companies alone or may face constraints on how much capital can be invested in one LBO. Some executives claim that club deals allow bids that would not otherwise be possible, and therefore, increase competition.<sup>26</sup> The financial media began voicing concerns about club deals in 2005, and the Department of Justice's Antitrust Division opened an investigation into this practice in 2006.<sup>27</sup> The United States Government Accountability Office ("GAO") conducted an analysis that looked at public-to-private LBOs completed from 1998 to 2007 and, after controlling for differences in target companies, found that such club deals, in aggregate, were not associated with lower or higher per share price premiums. The GAO found no evidence of an anticompetitive effect on acquisition prices.<sup>28</sup> However, the GAO warned that its conclusions were based on an association, not a causal relationship, between club deals and premiums. The GAO cautioned that its findings may not generalize to the overall population of club deals as it examined a subset of all PE deals.<sup>29</sup>

Officer et al., by contrast, focused on club deals between January 1984 and September 2007 that were worth more than \$100 million.<sup>30</sup> The rationale for examining this set of LBOs was that concerns regarding club deals were mainly associated with large LBOs completed by prominent PE firms.<sup>31</sup> With this targeted sample, Officer et al. found that premiums in club deals were 40% lower than those in sole-sponsored LBOs.<sup>32</sup> In response to such competitive concerns, shareholders of target companies

---

24. TPG's founder David Bonderman observed that formation of "[c]onsortia . . . limits bidding" and ensures that "[there's] less competition for the biggest deals." Redacted Fifth Amended Complaint at 3, *Dahl v. Bain Capital Partners, LLC*, 1:07-cv-12388, (D. Mass. Oct. 10, 2012). A Blackstone executive wrote about Texas Genco that Blackstone's message to TPG and KKR was "better for everyone to join forces and have a much higher chance of winning the deal and not drive the price up." *Id.* at 84-85. KKR compared Texas Genco to SunGard, where "the large PE universe was all working together," and "there was no competition." *Id.* at 68.

25. *Supra* note 15, at 215.

26. *Supra* note 19, at 5.

27. *Supra* note 15, at 237.

28. *Supra* note 19, at 33-34.

29. *Id.* at 33.

30. Micah S. Officer, Oguzhan Ozbas & Berk A. Sensoy, *Club Deals in Leveraged Buyouts*, 98 J. OF FIN. ECON. 214 (2010).

31. This sample includes deals completed by the end of November 2007. *See supra* note 14, at 218.

32. *Id.* at 237.

filed antitrust lawsuits against PE firms.<sup>33</sup>

Antitrust claims against PE firms had been notoriously difficult to make, with at least one court looking at club deals and declining to find that the claim had been stated.<sup>34</sup> *Dahl*<sup>35</sup> advanced a novel theory that posited a conspiracy beyond an agreement to fix the price of a single LBO. In *Dahl*, the Plaintiffs accused the major PE firms of violating Section 1 of the Sherman Act by forming an illegal market allocation and bid rigging to fix the prices of the largest LBOs through the use of, *inter alia*, club deals.<sup>36</sup> In a market allocation agreement, competitors divide markets among themselves. In a bid rigging agreement, by contrast, competitors decide who will be chosen to win a bid on a contract instead of allowing the competitive bidding process to determine the winner.

### *Market Allocation and Bid rigging*

The Sherman Act has, as its premise, the notion that competition “will yield the best allocation of our economic resources, the lowest prices, the highest quality and the greatest material progress, while at the same time providing an environment conducive to the presentation of our democratic political and social institutions.”<sup>37</sup> Collusive agreements, such as price-fixing, bid rigging, and market allocation, unreasonably restrict competitive conditions and harm consumers. Section 1 of the Act prohibits “[e]very contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations.”<sup>38</sup> Proving a violation of Section 1 requires proof of (1) the existence of a contract, combination, or conspiracy among two or more separate entities (2) that unreasonably restrains trade<sup>39</sup> and (3)

---

33. *Supra* note 19, at 6.

34. *See* *Pennsylvania Ave. Funds v. Borey*, 569 F. Supp. 2d 1126, 1134–35 (W.D. Wash. 2008) (court dismissed the antitrust claim for failure to state a claim under the Sherman Act); *see also* *Finnegan v. Campeau Corp.*, 915 F.2d 824, 827–32 (2d Cir. 1990) (the Second Circuit held that the federal securities law precludes application of the antitrust laws to rival bidders that ultimately joined forces to acquire a target company).

35. No. 1:07-cv-12388 (D. Mass.).

36. The Plaintiffs in *Dahl* presented record evidence of an overarching conspiracy to fix prices of large proprietary LBOs. After threatening one another’s proprietary club deals [HCA and Freescale], Tony James of Blackstone reported that “Henry Kravis [KKR] just called to say congratulations and that they were standing down because he had told me before they would not jump a signed deal of ours.” Tony James told George Roberts of KKR, “We would much rather work with you guys than against you. Together we can be unstoppable but in opposition we can cost each other a lot of money.” George Roberts responded, “Agreed.” After hearing the news that KKR agreed to stand down on Freescale, a Goldman Sachs executive observed “club etiquette prevails.” Redacted Fifth Amended Complaint at 142–43, *Dahl v. Bain Capital Partners, LLC*, 1:07-cv-12388 (D. Mass. filed Oct. 10, 2012).

37. *Northern Pacific Railway v. United States*, 356 U.S. 1, 4 (1958).

38. 15 U.S.C. § 1 (2004).

39. *Standard Oil Co. v. United States*, 221 U.S. 1, 58 (1911) (Section 1 prohibits only those restraints that unreasonably restrict competitive conditions).

affects interstate or foreign commerce.<sup>40</sup>

When competitors collude and agree to concerted action, the consumer is harmed while the conspirators are unlawfully rewarded. Collusive agreements typically consist of three components. Conspirators (1) reach an agreement on terms of trade, (2) distribute the collusive gains via a market allocation agreement, and (3) monitor and enforce compliance.<sup>41</sup> Proving collusion is complicated by the fact that firms can act in parallel, consciously, without necessarily violating the Sherman Act.<sup>42</sup> In oligopolies, for example, firms can act in parallel non-collusively because they understand their roles in a repeated game.<sup>43</sup> Therefore, to prove that a Section 1 conspiracy exists, a plaintiff must show more evidence than the defendants' parallel action—a plaintiff must be able to prove that the defendants acted in parallel pursuant to a collusive agreement.<sup>44</sup>

While collusion can be proven with either direct or circumstantial evidence,<sup>45</sup> direct proof is understandably scarce when documenting unlawful conspiracies.<sup>46</sup> Detecting market allocation and bid rigging agreements, like other Section 1 violations, is generally difficult because collusive agreements are typically reached in secret and rarely leave a trail of direct evidence that demonstrates concerted action. Of course, as Judges Posner and Easterbrook observed, “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.”<sup>47</sup>

As a result, claimants “typically must prove other facts and circumstances (often referred to as ‘plus factors’) in combination with conscious parallelism to support an inference of concerted action.”<sup>48</sup> Plus factors are circumstantial evidence of actions or conduct “highly unlikely to occur in the absence of a collusive agreement.”<sup>49</sup> The most important

40. *See, e.g.*, *Realcomp II, Ltd. v. FTC*, 635 F.3d 815, 824 (6th Cir. 2011). For a discussion, *see* 1 ABA SECTION OF ANTITRUST LAW, ANTITRUST LAW DEVELOPMENTS 2 (8th ed. 2017).

41. William E. Kovacic, Robert C. Marshall, Leslie M. Marx & Halbert L. White, *Plus Factors and Agreement in Antitrust Law*, 110 MICH. L. REV. 393, 408 (2011).

42. *See, e.g.*, *Flat Glass Antitrust Litig.*, 385 F.3d 350, 360 (3d Cir. 2004).

43. *Supra* note 41, at 393. *See also* ANDREW I. GAVIL ET AL., ANTITRUST LAW IN PERSPECTIVE: CASES, CONCEPTS AND PROBLEMS IN COMPETITION POLICY 267-68 (2d ed. 2008).

44. *Bell Atlantic Corp. v. Twombly*, 550 U.S. 544, 557 (2007); *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 227 (1993) (“conscious parallelism” is “not in itself unlawful”); *Theatre Enters., Inc. v. Paramount Film Distrib. Corp.*, 346 U.S. 537, 541 (1954) (“[c]ircumstantial evidence of consciously parallel behavior may have made heavy inroads into the traditional judicial attitude toward conspiracy; but ‘conscious parallelism’ has not read conspiracy out of the Sherman Act entirely”).

45. 1 ABA SECTION ANTITRUST LAW, ANTITRUST LAW DEVELOPMENTS 6 (8th ed. 2017).

46. *United Mine Workers of America v. Pennington*, 381 U.S. 676, 720 (1965) (“Only rarely will there be direct evidence of an express agreement” in conspiracy cases).

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

48. *Supra* note 45, at 11.

49. *Supra* note 41, at 405.

plus factors generally show that an action or conduct would be contrary to the conspirators' self-interests had they acted alone.<sup>50</sup>

The Defendant firms in *Dahl* were comprised of highly educated individuals, many with MBAs, PhDs, and law degrees from elite institutions. They worked with lawyers at top defense law firms regularly and accessed capital from the largest money center banks in the world. These were not individuals who were going to simply broadcast their intent to violate a statute that includes criminal penalties. Thus, economic analysis was going to be a critical element for the Plaintiffs to prove the existence of an unlawful agreement.

### *Using Auction Theory to Demonstrate Antitrust Impact*

In *Dahl* there was traditional evidence, such as email communications and internal firm memoranda, to prove an agreement among the PE firms to allocate the LBO market and rig bids. The case was compelling, however, because of the development of plus factors through the use of auction theory.

Auction theory states that if a market is competitive, the price should rise until there remains only one bidder.<sup>51</sup> This has several empirical implications, including: (1) the bidder with the highest valuation should win, i.e., the sale is efficient; (2) the valuation of the second highest bidder should set the winning price; and (3) since the winning price is below the winner's valuation, the winner's expected profit increases as its ownership share of the winning deal increases.

In the presence of collusion, e.g., a bidding ring or buyers' cartel, auction theory has a number of contrasting empirical implications, including: (1) it is impossible to obtain full efficiency, so a bidder with a valuation below the highest valuation will win sometimes; (2) when the cartel operates successfully, the winning bid is below the second-highest valuation; and (3) the cartel needs some arrangement to spread the benefits of the lower winning bid among the non-winning bidders. These contrasting characteristics describe the present case and indicate the presence of collusion.

In *Dahl*, auction theory was used to demonstrate the existence of six plus factors: (1) inefficiency in the auctions; (2) winning bids below the estimated competitive price; (3) redistribution of gains and losses; (4) bid reduction below competitive benchmark prices; (5) communication and monitoring; and (6) large club deals reduced the number of bidders.<sup>52</sup> The

---

50. *Id.*

51. See, e.g., R. Preston McAfee & John McMillan, *Auctions and Bidding*, 25 J. OF ECON. LITERATURE 699 (1987).

52. No. 1:07-cv-12388 (D. Mass), Document 1020-2, pp. 25-27, 31.

ability to demonstrate multiple plus factors allows the determination of whether firms' actions are more likely than not the result of an agreement to be made more precisely.<sup>53</sup> The six plus factors, in combination with parallel conduct among PE firms, supported an inference of concerted action in *Dahl*. When considering the plus factors jointly across the totality of the deals, along with the nature of the repeated interactions of the market participants, the economic analyses show that the PE firms' conduct was (1) consistent with coordinated behavior and inconsistent with competition and (2) more likely than not the result of a market allocation and bid rigging agreement. That is, the economic evidence tended to exclude the possibility that the PE firms acted independently. Further descriptions along with the underlying analyses of these plus factors are contained in Appendix I.

#### *Using Auction Theory to Demonstrate Antitrust Damages*

In addition to using auction theory to develop plus factors (and therefore evidence of collusion), *Dahl* is notable for its use of auction theory to demonstrate antitrust injury and to quantify damages. The analysis was premised on the proposition that the PE firms' conduct in a given LBO transaction resulted in antitrust impact and damage to class members if the actual price was less than the but-for competitive price. The issues of impact and damages were circular; if the auction prices hadn't been suppressed, there would be no impact and consequently no damages. Calculating damages was simply a matter of measuring the delta of what should have been paid per share (had there been no collusion) multiplied by the number of affected shares.

The damages methodology determined the competitive price of each LBO transaction by estimating the PE firms' equity valuations per share *but for* the alleged market allocation and bid rigging agreement. A PE firm's but-for equity valuation per share for a transaction equaled the maximum price per share it was willing to pay given the but-for competitive internal rate of return ("IRR"), i.e., the IRR that would have prevailed but for the alleged market allocation and bid rigging agreement.

According to economic theory, if a market is competitive, the price should rise to the point where supply equals demand. In the case where a single unit is for sale, such as a firm, price rises because of competition to the point where only a single bidder remains.<sup>54</sup> This has several

---

53. See, e.g., *supra* note 41, at 393.

54. See, e.g., Jeremy Bulow & Paul Klemperer, *Auctions Versus Negotiations*, 86 AM. ECON. REV. 180, 180 (1996) ("In an absolute English auction, in which the price rises continuously until only one bidder remains and the seller is required to accept the final bid, the sale price equals the lowest competitive price at which supply equals demand.").

empirical implications, including (1) the bidder with the highest valuation should win and (2) the valuation of the second-highest bidder should set the winning price. For example, suppose there were three potential buyers of a given item. Each buyer has a maximum willingness to pay for the item, so one of the buyers has the highest willingness to pay. The seller's goal is to obtain the highest price. To induce the seller to sell the item, the buyer with the highest willingness to pay has to offer slightly more than the buyer with the second-highest willingness to pay. Applied to this case, this means the competitive price equals the second highest equity valuation per share.

In a seminal article for which he won the Nobel Prize in Economics, William Vickrey<sup>55</sup> showed that under standard economic assumptions, many auction formats are equivalent in the sense that (1) the formats end up with the same rule regarding who wins the object and (2) the expected pricing rule is the same. In particular, for all the auction formats considered by Professor Vickrey, the sale mechanism is *efficient*, i.e., the entity with the highest value for the object gets it and so rule (1) is determined. Moreover, the expected price paid is exactly equal to the second-highest valuation and so the pricing rule (2) is uniquely determined. This cornerstone result is known as the "Revenue Equivalence Theorem."<sup>56</sup> A well-known and highly successful application of auction theory is the Federal Communications Commission's ("FCC") sale of radio spectrum.<sup>57</sup>

Based on the above economic analyses, the damages methodology proceeds as follows. Economic theory establishes that, for each transaction, the competitive price equals the second highest equity valuation per share. Using the PE firms' own valuation models for each

---

55. William Vickrey, *Counterspeculation, Auctions, and Competitive Sealed Tenders*, 16 J. OF FIN. 8 (1961).

56. See, e.g., PAUL KLEMPERER, *AUCTIONS: THEORY AND PRACTICE* 16-19 (2004); VIJAY KRISHNA, *AUCTION THEORY* 27-34 (2d ed. 2010).

57. See, *About Auctions*, FED. COMM'N COMM'N, [http://wireless.fcc.gov/auctions/default.htm?job=about\\_auctions](http://wireless.fcc.gov/auctions/default.htm?job=about_auctions) ("Since 1994, the Federal Communications Commission (FCC) has conducted auctions of licenses for electromagnetic spectrum. . . . The Commission has found that spectrum auctions more effectively assign licenses than either comparative hearings or lotteries. The auction approach is intended to award the licenses to those who will use them most effectively. Additionally, by using auctions, the Commission has reduced the average time from initial application to license grant to less than one year, and the public is now receiving the direct financial benefit from the award of licenses. . . . In the Balanced Budget Act of 1997, Congress extended and expanded the FCC's auction authority."). See also R. Preston McAfee, John McMillan & Simon Wilkie, *The Greatest Auction in History*, in *BETTER LIVING THROUGH ECONOMICS*, 168, 181-82 (John J. Siegfried, ed., 2009) ("Academic economists, working with FCC staff and especially FCC economist Evan Kwerel, created an auction form that has been used to sell over \$100 billion dollars of spectrum in dozens of countries. The design reflected trade-offs that were understood only because of the development of auction theory in the 1980s and thus implemented recent innovations in economic analysis. The FCC auction performed well by a variety of measures and seems to have balanced revenue and efficiency.").

LBO, the PE firms' equity valuations per share were calculated but for the alleged market allocation and bid rigging agreement. This analysis reveals the competitive price of each transaction since that price equals the second-highest valuation. These damages calculations, reported in detail in Appendix II, show what the IRRs would have been if not for the alleged market allocation and bid rigging agreement. The total classwide damages across the disputed LBO transactions equal approximately \$11.97 billion.

#### CONCLUSIONS

The *Dahl* case extends the use of economic analysis, and specifically auction theory, in antitrust matters, including class action cases. In particular, the *Dahl* case extends the use of economic analysis in antitrust by using auction theory to (1) specify and empirically test plus factors used to evaluate the likelihood of collusion; (2) provide a methodology utilizing evidence common to class members to demonstrate that members of a proposed class incurred a common impact as a result of the alleged collusive conduct; and (3) provide a methodology based on generally accepted economics that can be used reliably to quantify classwide damages.

## APPENDIX I FACTORS

*Plus factor 1: Inefficiency in the auctions*

The LBO auctions were inefficient: the bidder with the highest valuation did not win the sale. This fact is inconsistent with models of competitive behavior since under competition, competing bidders bid up to their individual valuations. In contrast, auction theory predicts that auctions will be inefficient when a cartel exists. In particular, if the values of the two highest bidders are very close, the cartel will select a lower valuation bidder to win the auction.

The Plaintiffs in *Dahl* calculated a bidders' gross value of winning the transaction from that bidder's data (when available). For the purpose of the calculations, we assume a standard LBO plan of purchasing the target firm with a given leverage ratio and holding the target firm for five years before exiting. This is a common time horizon in the analyses undertaken by PE firms. The PE firm with the highest enterprise exit valuation of the target firm after five years should have been able to offer the highest initial equity premium. Therefore, we identify the PE firm with the highest enterprise exit value as the high-value bidder.

Freescale, HCA, Kinder Morgan, and TXU were "strongly" inefficient, i.e., the bidder with the highest valuation is not in the winning club (see Table 1). AMC, Aramark, Harrah's, and SunGard, were "partially" inefficient, i.e., even though the highest-valuation bidder was a member of the winning club, at least one bidder that did not have the highest valuation was also a member of the winning club. This economic evidence is contrary to what is expected in a competitive setting, suggesting that competition in these auctions was suppressed. These actions constitute a plus factor—that is, actions or conduct (in this case a significant number of the auctions being inefficient) unlikely to occur in the absence of a collusive agreement. These findings provide evidence of bidder collusion in the transactions.



*Table 1*  
*Independent Plus Factor 1: Inefficiency in the LBOs*

Transaction	PE Firm with the Highest Equity Valuation		Winning PE Firm(s)		Does the winning PE firm have the highest value?
	PE Firm	Equity Valuation (\$ mil)	PE Firm	Equity Valuation (\$ mil)	
AMC	Apollo	834.8	Apollo J.P. Morgan	834.8 778.5	Yes No
Aramark	J.P. Morgan	6,506.4	Goldman Sachs J.P. Morgan T. H. Lee Warburg Pincus	6,497.4 6,506.4 6,464.3 6,495.1	No Yes No No
Freescale	KKR/Silver Lake	19,047.3	Blackstone Carlyle Permira TPG	16,534.9 15,724.7 XXX 15,666.6	No No XXX No
Harrah's	TPG	17,745.8	Apollo TPG	XXX 17,745.8	XXX Yes
HCA	Goldman Sachs	27,525.7	Bain KKR Merrill Lynch	21,300.6 20,762.0 23,304.4	No No No
Kinder Morgan	J.P. Morgan	21,056.7	AIG Carlyle Goldman Sachs	XXX 18,463.9 20,038.3	XXX No No
SunGard	Silver Lake	11,259.4	Bain Blackstone Goldman Sachs KKR Providence Silver Lake TPG	11,038.7 10,301.7 XXX 10,227.2 XXX 11,259.4 10,990.7	No No XXX No XXX Yes No
TXU	Apollo	34,589.7	Goldman Sachs J.P. Morgan KKR TPG	31,361.4 32,366.8 30,993.1 32,244.3	No No No No

Notes:

"XXX" indicates that there was no sufficient information to estimate an equity valuation for the PE firm. All valuation estimates are based on the CAPM methodology described in Section VI.B.

Source:

Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1020-2 (D. Mass. filed Aug. 12, 2014), at 28.

*Plus factor 2: Winning bids below the estimated competitive price*

The second type of conduct against a firm's unilateral self-interest related to the existence of winning bids below the estimated competitive price. Competition in an ascending auction determines a winning bid that is greater than the second-highest valuation. Consider an auction in which the winning bid  $b$  is less than the second-highest valuation  $v$ . By bidding  $b + \epsilon$ , where  $\epsilon$  is a negligibly small number, the bidder with valuation  $v$  can win the auction. Therefore, by not submitting a competing bid, the bidder with valuation  $v$  forgoes a surplus equal to  $v - b - \epsilon$ . Thus, a winning bid less than the second-highest valuation shows that the firms engaged in actions against their unilateral economic self-interests, absent the existence of an agreement.

If the market for large LBOs were competitive, the acquisition price would be forced up to the point where the bidder with the second-highest valuation would just earn a competitive rate of return. Since the target firms were large publicly traded firms, the opportunity cost for an investor is purchasing a portfolio of stocks. So, for example, one might take the long-run rate of return on the S&P 500 index as a benchmark competitive rate of return. In the following analysis, the Plaintiffs used 10% as the competitive rate of return. Note that at this price, the winner of the transaction expects to exceed a 10% rate of return.

We conclude that in all eight of LBOs, the winning bid was less than the estimated competitive price (see Table 2). The weighted-average of the winning bids was more than 9% below the estimated competitive price.

*Table 2*  
*Independent Plus Factor 2: Winning Bid Below the Estimated Competitive Price*

Transaction	PE Firm with the Second-Highest Equity Valuation			Winning PE Firm(s)		Is the winning bid below the estimated competitive price?
	PE Firm	Equity Valuation (\$ mil)	Estimated Competitive Price	PE Firm	Bid (\$ mil)	
AMC	J.P. Morgan	778.5	778.5	Apollo J.P. Morgan	722.9	Yes
Aramark	Goldman Sachs	6,497.4	6,497.4	Goldman Sachs J.P. Morgan T. H. Lee Warburg Pincus	6,091.9	Yes
Freescal	Blackstone	16,534.9	16,948.2	Blackstone Carlyle Permira TPG	16,534.9	Yes
Harrah's	Goldman Sachs	17,400.7	17,400.7	Apollo TPG	16,699.3	Yes
HCA	Blackstone	24,630.2	24,630.2	Bain KKR Merrill Lynch	20,886.9	Yes
Kinder Morgan	Goldman Sachs	20,038.3	20,038.3	AIG Carlyle Goldman Sachs	14,404.0	Yes
SunGard	Bain	11,038.7	11,038.7	Bain Blackstone Goldman Sachs KKR Providenc e Silver Lake TPG	10,452.2	Yes
TXU	J.P. Morgan	32,366.8	32,366.8	Goldman Sachs J.P. Morgan KKR TPG	31,937.9	Yes

Source: Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1020-2 (D. Mass. filed Aug. 12, 2014), at 29.

*Plus factor 3: Redistribution of gains and losses*

In any cartel, a redistribution mechanism to share the profits among members is required. This is especially true in the case of a bid rigging agreement where the items being purchased are relatively costly individual units purchased infrequently. In particular, if a bidder in an individual auction “stands down,” and drops out when the price is significantly below their valuation, then they are leaving money on the table and granting the profit to another bidder, i.e., the winner.

This action is against their unilateral self-interest absent some compensation mechanism. For example, the bidder who stood down could be rewarded with a quid pro quo in future auctions or receive a side payment in the current auction. Such a side payment could involve being brought into the winning club in the current deal or receiving some other financial benefit from the current deal.

In an ascending auction with private bidder values, competing bidders bid up to their individual valuations. Therefore, no losing bidder would want to join the “winning club” bid because that would imply that such a bidder obtains a negative surplus. Many auctions resulted in deals in which non-winning PE firms were brought into the deal. Thus, the PE firms appeared to be acting against their unilateral self-interests in that the winning bidder invited the losing bidders into the club to share the benefits.

In the case of ascending auctions with a common value component, auction theory shows that lower-value bidders may want to join the winning bid, since in this case the high-value bidder has a strategy that ensures a positive profit when winning the auction. However, in this case, the winning bidder would act against its unilateral self-interest (in the absence of an agreement) by sharing its profits with other, lower-valuation bidders.

In six of the eight LBOs (AMC, Aramark, Freescale, Harrah’s, Kinder Morgan, SunGard), non-winning PE firms were invited into the transaction (i.e., asked to join and either did or did not join). In three of the eight LBOs (Aramark, Freescale, Harrah’s), non-winning PE firms were brought into the transaction (i.e., asked to join and accepted). These actions constitute a plus factor—that is, actions or conduct (in this case winners inviting non-winning Defendant PE firms into a transaction) unlikely to occur in the absence of a collusive agreement. These findings provide evidence of bidder collusion in the transactions.

*Table 3  
Independent Plus Factor 3: Redistribution of Gains and Losses*

Transaction	Winning PE Firm(s)	Non-Winning PE Firm(s) <i>Invited Into Deal</i>	Non-Winning PE Firm(s) <i>Brought Into Deal</i>	Was a non-winning PE firm <i>invited</i> into the deal?	Was a non-winning PE firm <i>brought</i> into the deal?
AMC	Apollo, J.P. Morgan	Blackstone, Goldman, T.H. Lee, TPG		Yes	No
Aramark	Goldman Sachs, J.P. Morgan, T. H. Lee, Warburg Pincus	Bain (Sankaty)	Bain (Sankaty)	Yes	Yes
Freescale	Blackstone*, Permira, Carlyle, TPG	KKR Financial Corp.**	KKR Financial Corp.**	Yes	Yes
Harrath's	Apollo, TPG	Blackstone, Goldman, KKR	Blackstone, Goldman	Yes	Yes

Notes: \* Includes BCIP, a limited partner of Blackstone, controlled by Bain's senior managing directors. \*\*The debt arm of KKR.

Source:  
Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1020-2 (D. Mass. filed Aug. 12, 2014), at 30.

*Table 3 (cont.)  
Independent Plus Factor 3: Redistribution of Gains and Losses*

Transaction	Winning PE Firm(s)	Non-Winning PE Firm(s)	Invited Into Deal	Non-Winning PE Firm(s) Brought Into Deal	Was a non-winning PE firm invited into the deal?	Was a non-winning PE firm brought into the deal?
HCA	Bain, KKR, Merrill Lynch				No	No
Kinder Morgan	AIG, Carlyle, Goldman Sachs	Apollo, Blackstone, KKR, TPG	Carlyle, T.H. Lee		Yes	No
SunGard	Bain, Blackstone, Goldman Sachs, KKR, Providence, Silver Lake, TPG				Yes	No
TXU	Goldman Sachs, J.P. Morgan, KKR, TPG				No	No

Notes: \* Includes BCIP, a limited partner of Blackstone, controlled by Bain's senior managing directors. \*\*The debt arm of KKR.

Source: Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1020-2 (D. Mass. filed Aug. 12, 2014), at 30.

*Plus factor 4: Bid reduction below competitive benchmark prices*

As Kovacic et al. discuss:

The primary way to determine whether any bids at a procurement, or a set of procurements, came from an explicit cartel requires a benchmark that is considered noncollusive. A benchmark could be a time period, a geographic region, or a related but separate product. The analytic requirements are substantial when evaluating bid data relative to a benchmark. If that analysis is done well, the results can constitute a super plus factor—that is, actions or conduct (in this case, pricing) that are highly unlikely to occur in the absence of a collusive agreement. One way to do this analysis well requires that a reliable predictive econometric model be estimated for a benchmark, usually a time period, where conduct is thought to be noncollusive.<sup>58</sup>

The findings of Officer et al. (2010) provide economic evidence on this plus factor.<sup>59</sup> In particular, they show that, on average, the premium paid in club deals by large PE firms (which include Defendants in *Dahl*) in transactions over \$100 million is statistically significantly lower by approximately 40% than premiums in non-club deals. In contrast, Boone and Mulherin,<sup>60</sup> and Comment<sup>61</sup> consider the effect of club deals in transactions above and below \$100 million (which includes bids from many relatively small PE firms who were not defendants in *Dahl*) and find that club deals do not result in lower premiums than non-club deals. Thus, the economics literature suggests that club deals do not lower premiums, all else equal, when the sample includes relatively small transactions. In contrast, club deals lead to lower premiums, all else equal, when the transactions are restricted to larger dollar values. The 40% lower premiums, all else equal, found by Officer et al. constitute a plus factor—that is, pricing behavior unlikely to occur in the absence of a collusive agreement.<sup>62</sup>

*Plus factor 5: Communication and monitoring*

Communication among bidders is integral to the successful operation

---

58. See, e.g., *supra* note 41, at 420.

59. *Supra* note 15.

60. Audra L. Boone & J. Harold Mulherin, *Do Private Equity Consortiums Facilitate Collusion in Takeover Bidding?*, 17 J. OF CORP. FIN. 1475 (2011).

61. Robert Comment, *Team Bidding by Private Equity Sponsors: Are the Antitrust Allegations Plausible?* 23 J. OF APPLIED FIN. 111 (2013).

62. See, e.g., *supra* note 41, at 393.

of a cartel. As Kovacic et al. discuss:

Communication is a central part of the operation of a cartel. We are concerned with communication that reflects the ongoing nature of the conspiracy. In general, if a seller (receiver) knows something about another seller (sender) an immediate question arises: Was there no legitimate unilateral function for the sender in communicating such information to the receiver? Overall, information is a valuable commodity. For one seller to know information about a rival is to give that seller a competitive advantage. A competitor has no unilateral interest in disadvantaging itself relative to its rivals.<sup>63</sup>

The economic evidence shows that each of the Defendant PE firms exchanged types of information that would not be in their unilateral self-interest to exchange absent the existence of an agreement. For example, the firms exchanged information at times in the bidding for a given LBO that would not be in their unilateral self-interests absent the existence of an agreement on bid levels and bid strategy with ostensible horizontal competitors. A compendium of examples of such communications is presented in Table 4.

---

63. *Id.* at 423.



*Table 4  
Independent Plus Factor 5: Communication And Monitoring*

Transaction	Winning PE Firm(s)	Non-Winning PE Firm(s)	Evidence of communication/monitoring between PE firms
AMC	Apollo, J.P. Morgan	Bain, Blackstone, Carlyle, Goldman, T. H. Lee, TPG	1. Apollo spoke to TPG, Blackstone and THL regarding a co-investment. J.P. Morgan was offered exclusivity on AMC.
Aramark	Goldman Sachs, J.P. Morgan, T. H. Lee, Warburg Pincus	Apollo, Bain, Blackstone, Carlyle, KKR, TPG	1. Apollo approached GS PIA regarding a co-invest as a quid pro quo for Nalco and Cablecom. GS PIA did not cut Apollo in on Aramark, but offered the Kinder Morgan deal or another "special opportunity." Despite being shut out, Apollo did not mount a competing bid. 1. BX had discussions with TPG after submitting a solo bid. 1A. BX invited TPG to "mitigate the risk of competition..." 1B. KKR offered BX an "olive branch" on Vivendi if "they don't do something stupid on HCA and we prevail on Freescale." 1C. KKR congratulated BX and BX stated "we would much rather work with you guys than against you. Together we can be unstoppable but in opposition we can cost each other a lot of money." 1D. As reciprocation, BX invited KKR into Clear Channel. 2. KKR/SLP/Bain/Apax club considered letting BX acquire Freescale then approaching them with an NXP merger later, "why bid up unnecessarily?" 2A. Eventually the club pulled out of bidding to "facilitate bringing things together down the road."
Freescale	Blackstone, Carlyle, Permira, TPG	Bain, KKR, Silver Lake	

*Table 4(cont.)*  
*Independent Plus Factor 5: Communication And Monitoring*

Transaction	Winning PE Firm(s)	Non-Winning PE Firm(s)	Evidence of communication/monitoring between PE firms
Harrath's	Apollo, TPG	Bain, Blackstone, Goldman, T. H. Lee	1. Apollo notified TPG of the deal, TPG believed they needed to reciprocate.
HCA	Bain, KKR, Merrill Lynch	Apollo, Blackstone, Carlyle, Goldman, T. H. Lee, TPG	<p>1. TPG, GS PIA, BX and TCG stood down based on request from KKR. HCA's advisors were in a "frenzy" to create a competing consortium.</p> <p>1A. TPG approached KKR, Bain and JPM about getting a piece of HCA—Each firm expressed an interest in letting TPG in but the HCA board opposed (as TPG was the most likely to make a competing offer).</p> <p>1B. After telling KKR and Bain they passed, TPG stated "All we can do is do onto others as we want them to do unto us... it will pay off in the long run even though it feels bad in the short run."</p> <p>2. Apollo wanted to form a competing consortium after Merrill's "snub" on HCA, but quickly stood down for fear of topping a KKR deal.</p> <p>3. When KKR submitted a bid on Freescale, BX's Freescale consortium threatened to go after HCA as retaliation and signed a confidentiality agreement</p> <p>3A. BUT once KKR stood down on Freescale, BX dropped HCA. BX also stated that they didn't want to jump a deal even though "it is a shame we let KKR get away with highway robbery."</p>
Kinder Morgan	AIG, Carlyle, Goldman Sachs	Apollo, Bain, Blackstone, KKR, TPG	<p>1. The Kinder Morgan deal was a <i>quid pro quo</i> for TCG and GS PIA.</p> <p>1A. Carlyle thought that KM was its paycheck for EDMC.</p> <p>2. GS PIA confidentiality agreement created exclusivity with potential co-investors.</p> <p>3. Apollo felt that GS PIA owed them a "special deal" and didn't view Kinder in the same category as Aramark.</p>

*Table 4(cont.)  
Independent Plus Factor 5: Communication And Monitoring*

Transaction	Winning PE Firm(s)	Non-Winning PE Firm(s)	Evidence of communication/monitoring between PE firms
SunGard	Bain, Blackstone, Goldman Sachs, KKR, Providence, Silver Lake, TPG	Carlyle, T. H. Lee	<ol style="list-style-type: none"> <li>1. TPG and BX were offered a co-invest after they considered forming a rival consortium.</li> <li>2. TPG told its team that being overly aggressive would only benefit shareholders and cost SLP.</li> <li>3. PEP agreed that they owed KKR for SunGard.</li> <li>4. SLP and KKR discussed future partnering and reciprocation.</li> <li>5. SLP contacted BX to discuss lack of reciprocity after SunGard. BX wondered what the Quid Pro Quo was for SunGard, thought about offering Freescale.</li> </ol>
TXU	Goldman Sachs, J.P. Morgan, KKR, TPG	Apollo	<ol style="list-style-type: none"> <li>1. Apollo approached TPG about getting in on TXU; also considered cashing in KKR "favor" for access to the deal.</li> <li>2. TCG tried to get in the deal; GS referred them to TPG or KKR.</li> </ol>

Source:  
Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1020-2 (D. Mass. filed Aug. 12, 2014), at 32-34.

*Plus factor 6: Large club deals reduce number of bidders*

Plaintiffs' alleged that Defendant PE firms formed clubs to reduce the already limited number of PE firms that could participate in a given LBO transaction.<sup>64</sup> As discussed above, auction theory shows that a reduction in the number of bidders will, on average, lead to a reduction in the winning bid. To examine this claim, Plaintiffs' expert economists conducted an empirical study of 3,080 LBOs in the United States completed in the period 1981 through July 2012. The sample consisted of all completed LBOs during this period for which data on the value of the transaction was publicly available.<sup>65</sup> For each transaction, Plaintiffs' expert economists identified the value of the transaction, the number of bidders, and the presence or absence of a club. A club is defined as present if more than one investor in the transaction is a financial sponsor or has a financial sponsor parent. The dependent variable (i.e., the variable to be explained) was a binary variable that equaled one if the number of bidders was two or more and zero if the number of bidders was one. The regression analysis allowed Plaintiffs' expert economists to test empirically whether the presence of a club (on average) had a statistically significant effect on the dependent variable (i.e., whether the transaction had more than one bidder) controlling for the value of the transaction. The results of the regression analysis showed that the presence of a club led to a statistically significant reduction in the likelihood of having more than one bidder in a transaction, holding constant the value of the transaction (see Table 5, Model 1). We also find that this likelihood is reduced even further for larger transactions (see Table 5, Model 2). These findings show that the likelihood of a competing bid is significantly reduced in large club deals.

---

64. Redacted Fifth Amended Complaint at 2-3, *Dahl v. Bain Capital Partners LLC*, No. 1:07-cv-12388-EFH (D. Mass. Oct. 10, 2012).

65. B. ESPEN ECKBO, 2 CORPORATE TAKEOVERS: MODERN EMPIRICAL DEVELOPMENTS, BIDDING STRATEGIES, FINANCING AND CORPORATE CONTROL 905, note 5 (2010) ("The dollar value of the transaction is the total value of consideration paid by the acquirer, excluding fees and expenses. It includes the amount paid for all common stock, common stock equivalents, preferred stock, debt, options, assets, warrants, and stake purchases made within 6 months of the announcement date of the transaction. Assumed liabilities are included in the value if they are publicly disclosed. Preferred stock is included only if it is being acquired as part of a 100% acquisition. If a portion of the consideration paid by the acquirer is common stock, the stock is valued by using the closing price on the last full trading day before the announcement of the terms of the stock swap. If the exchange ratio of shares offered changes, the stock is valued based on its closing price on the last full trading date before the date of the exchange ratio change.").

*Table 5*  
*Independent Plus Factor 6: Large Club Deals Reduce Number Of Bidders*

Variable	Model 1	Model 2
Value of Transaction	1.27e-5*** (1.80e-6)	2.05e-5*** (2.50e-6)
Club	-0.05*** (0.01)	-0.03* (0.01)
Value of Transaction × Club		-1.60e-5*** (3.58e-6)
Constant	0.03*** (0.004)	0.03*** (0.004)
Number of Observations	3,080	3,080
F Statistic	26.6	24.5
Prob > F	0.000	0.000
Adjusted R-Squared	0.02	0.02

Source: Thomson One.

Note: Standard errors are enclosed in parentheses. Symbols \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively.

To further evaluate these results, we also split the 3,080 transactions into different groups based on their values. In particular, we split the transactions into two groups depending on whether the transaction value is less than \$1 billion. The first row, second column of Table 5 shows that if the transaction value is less than \$1 billion, then the fact that the winning bidder is a club has no statistically significant effect on whether there are two or more bidders. In contrast, the first row, third column of Table 5 shows that if the transaction value is greater than or equal to \$1 billion, the fact that the winning bidder is a club has a statistically significant and negative effect on whether there are two or more bidders. Table 6 shows similar results when the 3,080 transactions are split into two groups depending on whether the transaction value is less than \$1.5 billion, \$2.0 billion, \$2.5 billion, and \$3.0 billion. In each case, the results show that if the transaction value is greater than or equal to a given dollar

amount, the fact that the winning bidder is a club has a statistically significant and negative effect on whether there are two or more bidders. In addition, these negative effects are larger in column 3 than in column 2. That is, the negative effects are larger for the larger transaction values. These findings show that the likelihood of a competing bid is significantly reduced in large club deals, in fact the coefficient more than quadruples in size. As discussed above, economic theory shows that a reduction in the number of bidders will, on average, lead to a reduction in the winning bid. These findings provide evidence that the formation of clubs in large transactions reduced competition.

*Table 6*  
*Independent Plus Factor 6: Large Club Deals Reduce Number Of Bidders*

Sample Split (S) (\$ billion)	Coefficient of Club Dummy	
	Transaction Value < S	Transaction Value ≥ S
1.0	-0.02 (0.02)	-0.14*** (0.04)
1.5	-0.03* (0.01)	-0.18*** (0.05)
2.0	-0.04** (0.01)	-0.17*** (0.06)
2.5	-0.04*** (0.01)	-0.18*** (0.06)
3.0	-0.04*** (0.01)	-0.19*** (0.07)

Source: Thomson One.

Notes:

The regression equation is  $\text{Indicator (Number of Bidders > 1)} = \alpha + \beta X + \varepsilon$ , where  $X = [\text{Value of the transaction, Club Dummy}]$ .

Standard errors are enclosed in parentheses. Symbols \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively.

*Summary of Plus Factors*

To perform a thorough economic analysis to ascertain the likelihood of collusion, one cannot simply isolate a single plus factor. Rather, one must look at the economic evidence and plus factors as a whole to understand whether the possibility of independent (and therefore lawful) action tends to be excluded. When considering the plus factors jointly across the totality of the deals and the nature of the repeated interactions of the market participants, Plaintiffs' expert economists found that their economic analyses showed that Defendants' actions in the transactions at issue were consistent with coordinated behavior but inconsistent with competition. They also concluded the Defendants' actions in the transactions at issue were more likely than not the result of a market allocation and bid rigging agreement.



## APPENDIX II: DAMAGES ANALYSIS

*IRRs but for the Market Allocation and Bid rigging Agreement*

We next analyze the values PE firms would be willing to pay for the eight LBO transactions. A number of different inputs were employed in the PE firms' analyses, e.g., debt structure, dividend schedule, exit multiple, interest rate, management options, and required cash. The IRRs of the PE firms would have been inflated during the conspiracy period because they were artificially lowering the sales prices of the eight transactions through their alleged market allocation and bid rigging agreement. Therefore, from a damages perspective, it was important to determine what the IRRs in the eight transactions would have been but for the alleged market allocation and bid rigging agreement.

Within our auction-theoretic methodology, we present two approaches to estimate the but-for competitive IRRs. First, we employ the well-accepted Capital Asset Pricing Model ("CAPM"). Second, we use calculations of PE firms' IRRs provided by Ewen et al.<sup>66</sup> The advantage of the CAPM approach is that it allows one to address the specific risks of each LBO separately using a well-accepted, common methodology. Using the average IRR earned by PE firms in their buyout funds to estimate the but-for competitive IRRs is consistent with investors having a common target return for PE funds.

For these reasons, the CAPM approach provided a well-accepted, reliable, and common methodology for measuring damages on a classwide basis using information common to the proposed class that is more tailored to the specific characteristics of each LBO transaction. Using the average IRR earned by PE firms in their buyout funds provided a cross check on the CAPM approach on a classwide basis using information common to the proposed class.

*Estimating the But-For Competitive IRRs Using CAPM*

The CAPM is "the first, most famous, and (so far) most widely used model in asset pricing."<sup>67</sup> The CAPM was developed by William Sharpe and John Lintner,<sup>68</sup> in work that was awarded a Nobel Prize. The CAPM

---

66. Michael Ewens, Charles Jones & Matthew Rhodes-Kropf, *The Price of Diversifiable Risk in Venture Capital and Private Equity*, 26 REV. OF FIN. STUD. 1854 (2013).

67. See JOHN H. COCHRANE, ASSET PRICING 152 (2005).

68. William F. Sharpe, *Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk*, 19 J. OF FIN. 425 (1964); John Lintner, *The Valuation of Risky Assets and the Selection of Risky Investment in Stock Portfolios and Capital Budgets*, 47 REV. OF ECON. & STAT. 13 (1965); and John Lintner, *Security Prices, Risky and Maximal Gains from Diversification*, 20 J. OF FIN. 587 (1965). Professor Lintner passed away before the Nobel Prize was awarded to Professor Sharpe in 1990.

relates the expected return of an asset to the market rate of return, the risk-free rate of return, and the asset's risk.<sup>69</sup> According to the CAPM the return on an asset equals:

$$\alpha + r_f + \beta(r_m - r_f),$$

where  $\alpha$  measures the "excess return,"  $r_f$  denotes the risk-free rate of return,  $r_m$  denotes the expected market rate of return, and  $\beta$  is a measure of the systematic risk of the asset's return relative to the return on the market portfolio.<sup>70</sup> A fundamental implication of the CAPM is that if the market is efficient in its use of information, then the predicted value of  $\alpha$ , the excess return, equals zero. Thus, the variance in returns to a given asset is solely due to its riskiness.

However, if the excess return  $\alpha$  for a PE firm equals zero, that implies that the PE firm delivers zero value to its investors over the market return. Thus, for each transaction, the Plaintiffs needed to estimate the competitive market return (i.e., the CAPM return) as well as the  $\alpha$  that a PE firm expects to earn in a competitive environment that would cover the sum of management fees, expenses, and any other additional returns.

In this case, there was only one transaction, Freescale, for which a jump bid occurred when a group of Defendant PE firms allegedly attempted to "cheat" on the collusive agreement. We use this natural experiment to calibrate the expected excess return,  $\alpha$ , required to generate a competitive IRR. Since Freescale had highest riskiness, i.e.,  $\beta$ , among the LBO transactions, calculating the but-for competitive IRRs for the other seven transactions using the  $\alpha$  derived from the Freescale transaction was conservative.

To estimate the but-for competitive IRR for each transaction using the CAPM methodology, we estimate the competitive excess return,  $\alpha$ , as follows. The evidence on record demonstrated that by September 10, 2006 the Freescale board of directors accepted a buyout offer share price of \$38 submitted by Blackstone and its group.<sup>71</sup> Later the same day, the group consisting of KKR, Silver Lake, Bain, and Apax Partners Worldwide, LLP ("KKR Group") submitted a written indication of interest to the Freescale board for a price of \$40.00-\$42.00. It stated that "should the board elect to move forward and enter into a definitive agreement with the other consortium . . . we will immediately withdraw

---

69. See, e.g., *supra* note 67, at 3-33.

70. See, e.g., *supra* note 66, at 1870.

71. Freescale Semiconductor, Inc., Schedule 14A (U.S. Securities and Exchange Commission, October 19, 2006 at 28), <https://www.sec.gov/Archives/edgar/data/1272547/000119312506210856/ddefm14a.htm> (last visited Jan. 30, 2018); 1:07-cv-12388 (D. Mass), Document 1031, at n. 491.

our offer, and we have decided we would not participate in any subsequent market check or other exploratory process.”<sup>72</sup> The letter also indicated that “[u]pon receiving access to due diligence information and meetings with management, we would consider increasing our valuation . . . .”<sup>73</sup> The indication of interest “stressed the KKR/SLP Group’s view that it could pay more for the Company than any other buyer due to the synergies that they could generate by combining Freescale with the semiconductor business that it was under contract to acquire . . . .”<sup>74</sup> The letter further acknowledged the KKR Group could generate over \$500 million in synergies through a combination of Philips and Freescale.<sup>75</sup>

On September 14, 2006, the Blackstone group submitted a formal offer of \$40 per share.<sup>76</sup> Freescale’s board accepted the offer and entered into a definitive agreement with the Blackstone group on September 15, 2006.<sup>77</sup> Consistent with the KKR Group’s written indication of interest cited above, our analysis of the Defendant PE firms’ valuation models confirmed that the KKR Group was indeed the high value bidder but stood down and stopped bidding. Using the midpoint of the KKR Group’s stated opening range of offered share prices, we conclude that the but-for competitive price of the Freescale transaction equaled \$41 per share. Hence, the but-for competitive IRR for the Freescale transaction was the IRR at which the equity valuation per share equals \$41.<sup>78</sup> If competition had continued, the price may have been even higher.<sup>79</sup>

Next, the parameters of the CAPM using evidence common to the proposed class members. We estimate the risk-free rate of return,  $r_f$ , using data obtained from the Federal Reserve Board of Governors.<sup>80</sup> A

---

72. 1:07-cv-12388 (D. Mass.), Document 1031, ¶219.

73. *Id.*

74. *Supra* note 71.

75. 1:07-cv-12388 (D. Mass.), Document 1031, ¶219.

76. *Supra* note 71, at 30.

77. *Id.* at 31-32.

78. With regard to the Freescale transaction, the Plaintiffs noted that the effort by the KKR Group to “cheat” on the collusive agreement affected the process by which the ultimate price of the transaction was determined. Cheating by members of a cartel or bidding ring was common and detecting cheating and enforcing the collusive agreement was an important part of a successful cartel or bidding ring. *See, e.g.,* ROBERT C. MARSHALL & LESLIE M. MARX, *THE ECONOMICS OF COLLUSION: CARTELS AND BIDDING RINGS*, ch. 1, 2, 6 & 10 and especially pp. 103-104 (2012). Thus, the effect of the collusive agreement in lowering the actual price below the competitive price in the Freescale transaction was less than that in the other seven deals.

79. Alternatively, the Plaintiffs could have used the Blackstone valuation model with a share price of \$41, which yields a competitive IRR of 18.12%. This would imply that, but for the market allocation and bid rigging agreement, Blackstone would have continued to bid until dropping out at \$41 following the September 10, 2006 written indication of interest to the Freescale board from the KKR Group. In this case, the competitive price would equal the second highest valuation, i.e., \$41 since KKR Group’s valuation is the highest. This approach would yield a lower competitive  $\alpha$  for Freescale equal to 4.74%. As a result, total damages would increase.

80. BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM, *FRED ECONOMIC DATA, 10-Year*

commonly used risk-free rate of return is the 10-year U.S. Treasury constant maturity rate. We use the latest date, on or before the LBO announcement date, for which the 10-year constant maturity rate was reported. We estimate the expected market rate of return,  $r_m$ , using S&P 500 index data obtained from the data repository maintained by economist Professor Robert Shiller, winner of the 2013 Nobel Prize in Economics.<sup>81</sup> We use the dividend-reinvested compound annual growth rate of the S&P 500 index for the period March 1957 (i.e., the month the S&P 500 index was introduced) to the month before the deal announcement date for the expected market rate of return. Each transaction's risk measure,  $\beta$ , was estimated using data obtained from the Center for Research in Security Prices ("CRSP"), a research center at the University of Chicago Booth School of Business that provides historical data on security prices and returns.<sup>82</sup> We estimate  $\beta$  using CRSP data for the five-year period up to six months prior to the announcement of the transaction. Having estimated the risk-free rate of return, the market rate of return, the risk measure  $\beta$ , and the competitive price for the Freescale transaction, we solve for  $\alpha$  and thus obtain the competitive but-for IRR for each transaction.

Using the \$40 valuation per share of the second highest bidder, i.e., Blackstone, yielded a but-for competitive IRR equal to 19.57% for Freescale. This IRR significantly exceeded the market rate of return<sup>83</sup> as well as academic estimates of the average IRRs of PE firms, e.g., Ewens et al. and Ang and Sorenson.<sup>84</sup> Since the CAPM predicted return for Freescale equaled 13.38%, i.e., when  $\alpha$  equals zero, we determine that the competitive  $\alpha$  for Freescale equals 6.19%.<sup>85</sup> We then used Freescale's competitive  $\alpha$  to calculate the competitive IRR of the other seven transactions.

---

*Treasury Constant Maturity Rate* (DGS10), <http://research.stlouisfed.org/fred2/series/DGS10>.

81. ROBERT SHILLER, ONLINE DATA ROBERT SHILLER, *Stock Market Data*, <http://www.econ.yale.edu/~shiller/data.htm>.

82. *About CRSP*, THE UNIVERSITY OF CHICAGO BOOTH SCHOOL OF BUSINESS, CENTER FOR RESEARCH IN SECURITY PRICES, <http://www.crsp.com/about-crsp>. ("As one of the 12 Research and Learning Centers at Chicago Booth, CRSP bridges theory and practice with trusted data solutions. . . . Since 1960, CRSP has provided research-quality data to scholarly researchers and advanced the body of knowledge in finance, economics and related disciplines. Today, nearly 500 leading academic institutions in 35 countries rely on CRSP data for academic research and to support classroom instructions.")

83. *Supra* note 81.

84. Andrew Ang & Morten Sorenson, *Risks, Returns, and Optimal Holdings of Private Equity: A Survey of Existing Approaches*, 2 Q. J. OF FIN. 1250011-1 (2012).

85. The Plaintiffs' estimate of Freescale's  $\alpha$  was consistent with other estimates of excess return in the academic literature. *See, e.g.*, Michael Ewens, Charles Jones & Matthew Rhodes-Kropf, *The Price of Diversifiable Risk in Venture Capital and Private Equity*, 26 REV. OF FIN. STUD. 1854 (2013).

*Estimating the But-For Competitive IRRs Using Information Provided in Ewens et al.*

We determine the PE firms' but-for competitive IRRs using information provided by Ewens, Jones, and Rhodes-Kropf.<sup>86</sup> They reported that the annualized equal-weighted IRR of buyout funds for the period 1980 to 2007 was 13.24%.<sup>87</sup> Based on the Defendant PE firms' offering of limited partnership interests, we add the fund's costs, e.g., management fees and carried interest, by requiring that a limited partner pay 20% annually to the fund's general partners.<sup>88</sup> Thus, To earn 13.24% after paying these fees, the limited partners in a fund must have earned 16.55%, i.e.,  $(1 - 0.20) \times 16.55\% = 13.24\%$ . Therefore, the but-for competitive IRR equaled 16.55%.

*Estimating PE Firms' But-For Equity Valuations Per Share*

We next estimate what the PE firms' equity valuations per share for each LBO transaction would have been but for the alleged market allocation and bid rigging agreement. A PE firm's but-for equity valuation per share for a transaction is the maximum price per share it is willing to pay, given the competitive but-for IRR. Appendix III provides a detailed description of the methodology used to estimate PE firms' equity valuations per share for the eight transactions.

Using the methodology described above, we estimate what the competitive prices in the eight transactions would have been but for the alleged market allocation and bid rigging agreement. For each LBO transaction, damages were the difference between the competitive price and the actual share price, multiplied by the transaction-specific number of common shares. Importantly, our methodology used the PE firms' own valuation documents, LBO models, and inputs. The actual price was the LBO's offer share price. Based on this analysis, we conclude that there is a reliable and common methodology using common evidence that could be applied to ascertain whether the PE firms' conduct resulted in antitrust impact and damages to proposed class members.

*Damages Using the CAPM to Estimate But-For Competitive IRRs*

Tables 1 to 8 show the results of the Plaintiffs' antitrust damages for the eight transactions, using the transaction-specific but-for competitive

---

86. *Supra* note 66.

87. *See supra* note 66, at 1869, table 1.

88. *See, e.g.*, Andrew Metrick & Ayako Yasuda, *The Economics of Private Equity Funds*, 23 REV. OF FIN. STUD. 2303 (2010).

IRRs estimated using the CAPM methodology. For example, Table 1 shows PE firms' equity valuations per share for AMC, as well as the PE firms' equity valuations per share multiplied by  $N^{Common}$ , the transaction-specific number of common shares. As shown in Table 1, the competitive price, i.e., the second highest equity value per share, exceeds the actual price and therefore, we conclude that the proposed class members incurred damages in the AMC transaction.

Tables 1 to 8 show that for all eight transactions, the competitive price exceeds the actual price. The results show that proposed class members incurred damages in each of the eight transactions. Since damages for the eight transactions are positive, we conclude that there was an antitrust impact from the alleged market allocation and bid rigging agreement. As shown in Table 9, total damages across all eight transactions equal approximately \$11.97 billion.

*Table 1*  
*Amc Antitrust Damages Analysis: IRR = 15.59%*

PE Firm	Equity Valuation per Share (\$) <sup>1</sup>	Equity Valuation per Share Multiplied by $N^{\text{Common}}$ (\$mil)
Apollo	22.52	834.8
Blackstone	20.56	762.2
Goldman Sachs	19.14	709.6
J.P. Morgan	21.00	778.5
Competitive Price <sup>2</sup>	21.00	778.5
Actual Price	19.50	722.9
Antitrust Damages <sup>3</sup>	55.6	

Notes:

<sup>1</sup> PE firms' equity valuations per share were estimated using an IRR of 15.59%. The IRR was estimated using the CAPM methodology explained in Section II and Appendix IV. The market rate of return equals the dividend-reinvested compound annual growth rate of the S&P 500 index for the period March 1957 (i.e., the month the S&P 500 index was introduced) to June 2004 (i.e., the month before the deal announcement date). The risk-free rate is the 10-year treasury constant maturity rate on the latest date, on or before the announcement date, for which the 10-year treasury constant maturity rate was reported. The risk measure,  $\beta$ , was estimated using CRSP data for the five-year period up to six months prior to the announcement of the transaction.

<sup>2</sup> For the reasons explained in Section II and Appendix III, the competitive price equals the second highest equity valuation.

<sup>3</sup> Antitrust damages equal the difference between the competitive price per share and actual price per share, multiplied by  $N^{\text{Common}}$ .

Source:

Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1014-1 (D. Mass. filed Aug. 1, 2014), at 6.

*Table 2*  
*Aramark Antitrust Damages Analysis: IRR= 13.46%*

PE Firm	Equity Valuation per Share (\$) <sup>1</sup>	Equity Valuation per Share Multiplied by N <sup>Common</sup> (\$mil)
Blackstone	34.66	6,246.9
Goldman Sachs	36.05	6,497.4
J.P. Morgan	36.10	6,506.4
KKR	35.45	6,388.4
T.H. Lee	35.87	6,464.3
Warburg Pincus	36.04	6,495.1
Competitive Price <sup>2</sup>	36.05	6,497.4
Actual Price	33.80	6,091.9
Antitrust Damages <sup>3</sup>	405.5	

Notes:

<sup>1</sup> PE firms' equity valuations per share were estimated using an IRR of 15.59%. The IRR was estimated using the CAPM methodology explained in Section II and Appendix IV. The market rate of return equals the dividend-reinvested compound annual growth rate of the S&P 500 index for the period March 1957 (i.e., the month the S&P 500 index was introduced) to June 2004 (i.e., the month before the deal announcement date). The risk-free rate is the 10-year treasury constant maturity rate on the latest date, on or before the announcement date, for which the 10-year treasury constant maturity rate was reported. The risk measure,  $\beta$ , was estimated using CRSP data for the five-year period up to six months prior to the announcement of the transaction.

<sup>2</sup> For the reasons explained in Section II and Appendix III, the competitive price equals the second highest equity valuation.

<sup>3</sup> Antitrust damages equal the difference between the competitive price per share and actual price per share, multiplied by  $N^{\text{Common}}$ .

Source:

Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1014-1 (D. Mass. filed Aug. 1, 2014), at 7.



*Table 3*  
*Freescale Antitrust Damages Analysis: IRR = 19.57%*

PE Firm	Equity Valuation per Share (\$) <sup>1</sup>	Equity Valuation per Share Multiplied by $N^{Common}$ (\$mil)
AIG	37.10	15,336.8
Blackstone	40.00	16,534.9
Carlyle	38.04	15,724.7
KKR/Silver Lake	46.08	19,047.3
TPG	37.90	15,666.6
Competitive Price <sup>2</sup>	41.00	16,948.2
Actual Price	40.00	16,534.9
Antitrust Damages <sup>3</sup>	413.4	

Notes:

<sup>1</sup> PE firms' equity valuations per share were estimated using an IRR of 15.59%. The IRR was estimated using the CAPM methodology explained in Section II and Appendix IV. The market rate of return equals the dividend-reinvested compound annual growth rate of the S&P 500 index for the period March 1957 (i.e., the month the S&P 500 index was introduced) to June 2004 (i.e., the month before the deal announcement date). The risk-free rate is the 10-year treasury constant maturity rate on the latest date, on or before the announcement date, for which the 10-year treasury constant maturity rate was reported. The risk measure,  $\beta$ , was estimated using CRSP data for the five-year period up to six months prior to the announcement of the transaction.

<sup>2</sup> For the reasons explained in Section II and Appendix III, the competitive price equals the second highest equity valuation.

<sup>3</sup> Antitrust damages equal the difference between the competitive price per share and actual price per share, multiplied by  $N^{Common}$ .

Source:

Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1014-1 (D. Mass. filed Aug. 1, 2014), at 8.

*Table 4*  
*Harrah's Antitrust Damages Analysis: IRR = 17.02%*

PE Firm	Equity Valuation per Share (\$) <sup>1</sup>	Equity Valuation per Share Multiplied by $N^{Common}$ (\$mil)
Blackstone	91.17	16,915.6
Goldman Sachs	93.78	17,400.7
TPG	95.64	17,745.8
Competitive Price <sup>2</sup>	93.78	17,400.7
Actual Price	90.00	16,699.3
Antitrust Damages <sup>3</sup>	701.4	

Notes:

<sup>1</sup> PE firms' equity valuations per share were estimated using an IRR of 15.59%. The IRR was estimated using the CAPM methodology explained in Section II and Appendix IV. The market rate of return equals the dividend-reinvested compound annual growth rate of the S&P 500 index for the period March 1957 (i.e., the month the S&P 500 index was introduced) to June 2004 (i.e., the month before the deal announcement date). The risk-free rate is the 10-year treasury constant maturity rate on the latest date, on or before the announcement date, for which the 10-year treasury constant maturity rate was reported. The risk measure,  $\beta$ , was estimated using CRSP data for the five-year period up to six months prior to the announcement of the transaction.

<sup>2</sup> For the reasons explained in Section II and Appendix III, the competitive price equals the second highest equity valuation.

<sup>3</sup> Antitrust damages equal the difference between the competitive price per share and actual price per share, multiplied by  $N^{Common}$ .

Source:

Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1014-1 (D. Mass. filed Aug. 1, 2014), at 9.

*Table 5*  
*HCA Antitrust Damages Analysis: IRR = 13.71%*

PE Firm	Equity Valuation per Share (\$) <sup>1</sup>	Equity Valuation per Share Multiplied by $N^{\text{Common}}$ (\$mil)
Bain	52.01	21,300.6
Blackstone	60.14	24,630.2
Carlyle	56.01	22,938.8
Goldman Sachs	67.21	27,525.7
KKR	50.70	20,762.0
Merrill Lynch	56.90	23,304.4
Competitive Price <sup>2</sup>	60.14	24,630.2
Actual Price	51.00	20,886.9
Antitrust Damages <sup>3</sup>		3,743.3

Notes:

<sup>1</sup> PE firms' equity valuations per share were estimated using an IRR of 15.59%. The IRR was estimated using the CAPM methodology explained in Section II and Appendix IV. The market rate of return equals the dividend-reinvested compound annual growth rate of the S&P 500 index for the period March 1957 (i.e., the month the S&P 500 index was introduced) to June 2004 (i.e., the month before the deal announcement date). The risk-free rate is the 10-year treasury constant maturity rate on the latest date, on or before the announcement date, for which the 10-year treasury constant maturity rate was reported. The risk measure,  $\beta$ , was estimated using CRSP data for the five-year period up to six months prior to the announcement of the transaction.

<sup>2</sup> For the reasons explained in Section II and Appendix III, the competitive price equals the second highest equity valuation.

<sup>3</sup> Antitrust damages equal the difference between the competitive price per share and actual price per share, multiplied by  $N^{\text{Common}}$ .

Source:

Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1014-1 (D. Mass. filed Aug. 2, 2014), at 10.

*Table 6*  
*Kinder Morgan Antitrust Damages Analysis: IRR = 14.38%*

PE Firm	Equity Valuation per Share (\$) <sup>1</sup>	Equity Valuation per Share Multiplied by $N^{\text{Common}}$ (\$mil)
Apollo	100.92	13,522.3
Blackstone	100.35	13,446.0
Carlyle	137.80	18,463.9
Goldman Sachs	149.55	20,038.3
KKR	138.30	18,530.9
J.P. Morgan	157.15	21,056.7
TPG	102.32	13,709.9
Competitive Price <sup>2</sup>	149.55	20,038.3
Actual Price	107.50	14,404.0
Antitrust Damages <sup>3</sup>		5,634.3

## Notes:

<sup>1</sup> PE firms' equity valuations per share were estimated using an IRR of 15.59%. The IRR was estimated using the CAPM methodology explained in Section II and Appendix IV. The market rate of return equals the dividend-reinvested compound annual growth rate of the S&P 500 index for the period March 1957 (i.e., the month the S&P 500 index was introduced) to June 2004 (i.e., the month before the deal announcement date). The risk-free rate is the 10-year treasury constant maturity rate on the latest date, on or before the announcement date, for which the 10-year treasury constant maturity rate was reported. The risk measure,  $\beta$ , was estimated using CRSP data for the five-year period up to six months prior to the announcement of the transaction.

<sup>2</sup> For the reasons explained in Section II and Appendix III, the competitive price equals the second highest equity valuation.

<sup>3</sup> Antitrust damages equal the difference between the competitive price per share and actual price per share, multiplied by  $N^{\text{Common}}$ .

## Source:

Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1014-1 (D. Mass. filed Aug. 1, 2014), at 11.

*Table 7*  
*Sungard Antitrust Damages Analysis: IRR = 17.14%*

PE Firm	Equity Valuation per Share (\$) <sup>1</sup>	Equity Valuation per Share Multiplied by $N^{Common}$ (\$mil)
Bain	38.02	11,038.7
Blackstone	35.48	10,301.7
Carlyle	36.35	10,553.6
KKR	35.23	10,227.2
Silver Lake	38.78	11,259.4
T.H. Lee	33.59	9,751.6
TPG	37.85	10,990.7
Competitive Price <sup>2</sup>	38.02	11,038.7
Actual Price	36.00	10,452.2
Antitrust Damages <sup>3</sup>		586.5

Notes:

<sup>1</sup> PE firms' equity valuations per share were estimated using an IRR of 15.59%. The IRR was estimated using the CAPM methodology explained in Section II and Appendix IV. The market rate of return equals the dividend-reinvested compound annual growth rate of the S&P 500 index for the period March 1957 (i.e., the month the S&P 500 index was introduced) to June 2004 (i.e., the month before the deal announcement date). The risk-free rate is the 10-year treasury constant maturity rate on the latest date, on or before the announcement date, for which the 10-year treasury constant maturity rate was reported. The risk measure,  $\beta$ , was estimated using CRSP data for the five-year period up to six months prior to the announcement of the transaction.

<sup>2</sup> For the reasons explained in Section II and Appendix III, the competitive price equals the second highest equity valuation.

<sup>3</sup> Antitrust damages equal the difference between the competitive price per share and actual price per share, multiplied by  $N^{Common}$ .

Source:

Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1014-1 (D. Mass. filed Aug. 1, 2014), at 12.

*Table 8*  
*TXU Antitrust Damages Analysis: IRR = 15.68%*

PE Firm	Equity Valuation per Share (\$) <sup>1</sup>	Equity Valuation per Share Multiplied by $N^{\text{Common}}$ (\$mil)
Apollo/2	75.00	34,589.7
Blackstone	66.12	30,494.3
Goldman Sachs	68.00	31,361.4
J.P. Morgan	70.18	32,366.8
KKR	67.20	30,993.1
TPG	69.91	32,244.3
Competitive Price <sup>3</sup>	70.18	32,366.8
Actual Price	69.25	31,937.9
Antitrust Damages <sup>4</sup>		428.9

## Notes:

<sup>1</sup> PE firms' equity valuations per share were estimated using an IRR of 15.68%. The IRR was estimated using the CAPM methodology explained in Section II and Appendix IV. The market rate of return equals the dividend-reinvested compound annual growth rate of the S&P 500 index for the period March 1957 (i.e., the month the S&P 500 index was introduced) to January 2007 (i.e., the month before the deal announcement date). The risk-free rate is the 10-year treasury constant maturity rate on the latest date, on or before the announcement date, for which the 10-year treasury constant maturity rate was reported. The risk measure,  $\beta$ , was estimated using CRSP data for the five-year period up to six months prior to the announcement of the transaction.

<sup>2</sup> For Apollo, the equity valuation per share was obtained from APOLLO106617.pdf, which reports an offer price per share of \$75.00 for an IRR of 17.6%, but does not report offer prices per share for IRRs lower than 17.6%. Since the offer price per share increases as the IRR decreases, using the offer price per share at the higher IRR of 17.6% is conservative.

<sup>3</sup> For the reasons explained in Section II and Appendix III, the competitive price equals the second highest equity valuation.

<sup>4</sup> Antitrust damages equal the difference between the competitive price per share and actual price per share, multiplied by  $N^{\text{Common}}$ .

## Sources:

Dahl v. Bain Capital Partners, LLC, No. 1:07-cv-12388-WGY Document 1014-1 (D. Mass. filed Aug. 1, 2014), at 13.

*Table 9*  
*Antitrust Damages Analysis Summary*

Deal	Competitive Price (\$mil)	Actual Price (\$mil)	Damages (\$mil)
AMC	778.5	722.9	55.6
Aramark	6,497.4	6,091.9	405.5
Freescale	16,948.2	16,534.9	413.4
Harrah's	17,400.7	16,699.3	701.4
HCA	24,630.2	20,886.9	3,743.3
Kinder Morgan	20,038.3	14,404.0	5,634.3
SunGard	11,038.7	10,452.2	586.5
TXU	32,366.8	31,937.9	428.9
Total			11,968.9

## APPENDIX III: EQUITY VALUATION METHODOLOGY

A PE firm's equity valuation per share for a transaction is the maximum price per share the firm is willing to pay, given its target IRR. For each transaction, we first select each PE firm's most recent internal LBO analysis document that contains sufficient data and information to estimate the equity valuation per share using the methodology described in this appendix. Furthermore, in the case of winning PE firms, we only consider documents reporting LBO analysis conducted prior to the LBO announcement date. PE firms' internal LBO analysis documents report predicted IRRs for given share prices and assumptions on future target firm cash flows and exit values. In all other instances, we obtain data from the PE firms' LBO analysis documents to estimate equity valuations per share. Thus, for each transaction, our methodology to estimate a PE firm's equity valuation per share uses the PE firms' own LBO analysis methodology.

The selected document is either an Excel spreadsheet or is in PDF format. When the selected document is an Excel spreadsheet, we estimate the PE firm's equity valuation per share by determining the share price at which the PE firm's predicted IRR equals the competitive IRR.

When the selected document is in PDF format, we use one of the following three methodologies depending on transaction-specific factors and the particular plans of the PE firm:

*Methodology I: Using PE Firm's Exit EV/EBITDA Multiple*

Under this methodology, no dividends are paid before the exit year and the exit year total enterprise value ( $TEV_T$ ) is calculated as the product of  $EBITDA_T$  and exit EV/EBITDA multiple ( $\chi$ ). For a given target IRR level ( $r$ ), we estimate the equity valuation per share using the following steps:

Step 1: Estimating equity investment ( $E_0$ )

The terminal equity value,  $E_T$ , is given by

$$E_T = TEV_T + C_T - D_T \quad (1)$$

where  $C_T$  and  $D_T$  denote cash on hand and total debt at the exit year. Cash payment to new sponsors,  $I_T$ , is:

$$I_T = \omega_T E_T + OP_T = \omega_T E_T + \gamma E_0 \quad (2)$$



where  $\omega_T$ ,  $OP_T$ ,  $\alpha$ , and  $E_0$  denote the sponsor's ownership percentage at the exit time, management option proceeds at the exit time, percent of equity that are management options, and total equity investment at the LBO time.<sup>89</sup>

New sponsor's equity investment,  $I_0$ , can be calculated using the definition of IRR as follows:<sup>90</sup>

$$I_0 = \omega_0 E_0 = I_T (1 + r)^{-T} \quad (3)$$

where  $\omega_0$  denotes the sponsor's ownership percentage at the LBO time.

From equations (2) and (3), we derive the following expression for  $E_0$ :

$$E_0 = \frac{\omega_T E_T}{\omega_0 (1 + r)^T - \gamma} \quad (4)$$

Step 2: Estimating the total purchase price ( $TPP_0$ )

$$TPP_0 = E_0 + D_0 - Fees \quad (5)$$

where  $D_0$  denotes the debt financing level, and  $Fees$  denotes total LBO financing and transaction fees.

Step 3: Estimating the equity valuation per share

Using the fact that total sources equal total uses in an LBO, we have

$$E_{pre} = TPP_0 + C_{pre} - D_{pre} - C_0 \quad (6)$$

where  $E_{pre}$  denotes total equity value paid to the shareholders,  $D_{pre}$  denotes the debt level before the LBO,  $C_{pre}$  denotes the cash level before the LBO, and  $C_0$  denotes cash on hand after the LBO.

The equity value per share,  $P$ , is calculated as follows:

---

89. Option proceeds are fixed at the reported value if there is insufficient information to determine the formula used to calculate it. Note that  $\alpha$  equals  $1 - \omega_T$  when  $\omega_0$  equals 1.

90. One PE firm's LBO analysis of Aramark suggests that the formula  $I_0 - SDF = I_T (1 + r)^{-T}$  is used to estimate the IRR, where  $SDF$  denotes Sponsor Deal Fees.

$$P = \frac{E_{pre}}{N^{total}} \quad (7)$$

where  $N^{total}$  is the number of total diluted shares outstanding.

*Methodology II: Using PE Firm's Exit P/E Multiple*

Under this methodology, no dividends are paid before the exit year and the exit year total equity value ( $E_T$ ) is calculated as the product of net income ( $NI_T$ ) and exit P/E multiple ( $\phi$ ):

$$E_T = \phi \times NI_T \quad (8)$$

Once  $E_T$  is calculated using equation (8), the PE firm's equity valuation per share is estimated using equations (2) to (7).

*Methodology III: Using PE Firm's Segment Exit Multiples*

Some documents do not report a company-wide exit multiple. Instead, each segment of the company has its own EBITDA and exit multiple. In this case, we first use the exit multiple to calculate the total enterprise value for each segment. Then, we sum the total enterprise values across the segments to obtain the company-wide total enterprise value,  $TEV_T$ . The exit equity valuation is then calculated as follows:

$$E_T = TEV_T + C_T - D_T \quad (9)$$

Once  $E_T$  is calculated using equation (9), the PE firm's equity valuation per share is estimated using equations (2) to (7).