RECENT ADVANCES IN ECONOMIC METHODOLOGY FOR COORDINATED EFFECTS

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CPI ANTITRUST CHRONICLE JULY 2023

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Coordinated effects have come to play a smaller role in merger enforcement over time. Antitrust agencies now tend to focus on unilateral effects allegations with coordinated effects playing at most a supporting role. This could be due to the popularization of merger simulation and other methodologies to estimate unilateral effects and, until recently, the lack of similar quantitative tools for coordinated effects. This article argues two main points. First, economic theory does not always justify the bundling of coordinated and unilateral effects allegations; in some cases, market or merger characteristics may cut against one theory of harm while supporting the other. Second, by leveraging new methodologies for simulating mergers with coordinated effects, agencies and antitrust practitioners can now evaluate certain classes of mergers where coordinated effects are present using the same quantitative rigor that is commonplace for unilateral effects analyses. We discuss the conceptual framework behind these new methodologies, the settings where these coordinated effects merger simulations are expected to work well, and the types of evidence needed to support them.

I. INTRODUCTION

Firms seeking to collude, whether tacitly or explicitly, face two main economic challenges.[2] The first is determining prices or other strategic variables, such as quantities (the "coordination problem"). The second is that each firm can earn more profit, at least in the short-term, by undercutting collusive prices or otherwise deviating from a collusive scheme (the "incentive problem").[3] These challenges tend to be more difficult to overcome, all else equal, when there are more independent firms in a market competing against one another. Therefore, merger enforcement has long been recognized as one mechanism through which antitrust authorities can prevent or limit collusion in the economy.[4]

Despite this, merger enforcement has trended away from cases that allege a risk of "coordinated effects."[5] The last merger enforcement action litigated to decision based entirely on coordinated effects was the FTC's unsuccessful challenge of the Arch Coal/Triton Coal merger in 2004.[6] Since then, in merger investigations litigated to decision, all coordinated effects allegations have been bundled with unilateral effects allegations.[7]

To our knowledge, there is no basis to think the decline in coordinated effects merger enforcement is due to changes in the economy that make coordinated effects less relevant.[8] Rather, we think the decline is largely due to contributions to the economics literature that have clarified how unilateral effects theories connect to empirical objects, such as markups or diversion.[9] With unilateral effects, useful information can be gleaned from internal documents or head-to-head competition between merging parties. Further, advancements in merger simulation techniques that provide quantitative estimates of consumer harm have largely focused on unilateral effects.[10] In contrast, the study of mergers with coordinated effects has not historically lent itself to a standard quantitative framework.[11] As Steven Salop & Fiona Scott Morton explain:

> [P]art of the reason that coordinated effects concerns have been given less emphasis in recent cases may be that economists have not developed an econometrically intensive measure to predict their prevalence. But if agencies or courts imagine that the lack of an econometric technique is the same thing as the lack of an answer — or a lack of importance — then entire classes of harm will go unenforced.[12]

By deemphasizing coordinated effects, antitrust agencies may be missing an important piece of the puzzle when it comes to merger enforcement. Economic theory shows that the types of markets and mergers that present serious competitive problems due to coordinated effects can differ from those that create concerns about unilateral effects. Furthermore, certain remedies or merger characteristics that may mitigate unilateral effects concerns — such as efficiencies and divestiture — can in some cases be counterproductive when there is a risk of coordinated effects.

In this article, we revisit the economics of coordinated effects, with a particular focus on the recent empirical literature. We explain that advances in econometric analysis allow quantitative merger simulations comparable to those used in unilateral effects investigations in markets

2 The distinction between tacit and explicit collusion is a legal one, and we do not distinguish between the two in this article. See Louis Kaplow, COMPETITION POLICY AND PRICE-FIXING (2013).

3 Michael D. Whinston, LECTURES ON ANTITRUST ECONOMICS 20–21 (2006) ("Modern economic theory tells us that oligopolists who seek to come to an agreement to sustain high prices but who cannot sign binding agreements […] face two principal problems: an incentive problem and a coordination problem.").

4 Andrew R. Dick, *Merger Policy Twenty-Five Years Later: Unilateral Effects Move to the Forefront*, 27 ANTITRUST 1, 25 (2012).

5 Dick, *supra* note 4; D. Daniel Sokol & Sean P. Sullivan, *The Decline of Coordinated Effects Enforcement and How to Reverse It*, FLA. L. REV., (Forthcoming).

6 *Fed. Trade Comm'n v. Arch Coal, Inc.*, 329 F. Supp. 2d 109 (D.D.C 2004). Although the FTC's challenges to the Evonik/PeroxyChem and Tronox/Cristal mergers occurred after Arch Coal, the FTC alleged unilateral effects in both cases. See Complaint, *In the Matter of RAG-Stiftung, et al.*, Docket No. 9384 (Federal Trade Commission) and Complaint, *In the Matter of Tronox Limited, et al.*, Docket No. 9377, (Federal Trade Commission).

7 Sokol & Sullivan, *supra* note 5.

8 See John Asker & Volker Nocke, *Collusion, Mergers, and Related Antitrust Issues* in HANDBOOK OF INDUSTRIAL ORGANIZATION 5 (Kate Ho et al. eds., 2021).

9 Gregory J. Werden, *A Robust Test for Consumer Welfare Enhancing Mergers Among Sellers of Differentiated Products*, 44 J. INDUS. ORG. 4, 409 (1996); Joseph Farrell & Carl Shapiro, *Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition*, 10 B.E. J. THEOR. ECON. 1 (2010).

10 Nathan H. Miller & Gloria Sheu, *Quantitative Methods for Evaluating the Unilateral Effects of Mergers*, REV. INDUS. ORG. 58, 143 (2021).

11 U.S. Dept. of Justice & Fed. Trade Comm'n, *Horizontal Merger Guidelines*, Section 7.1 (2010). See also Robert H. Porter, *Mergers and Coordinated Effects,* 73 INT'L J. INDUS. ORG., 2 (2020).

12 Steven C. Salop & Fiona Scott Morton, *The 2010 HMGs Ten Years Later: Where Do We Go From Here?*, 58 REV. INDUS. ORG. 81, 93 (2021).

with a history of collusion and a known coordination mechanism. These new coordinated effects tools use data that are similar to — and often identical with — the data that would also be used in unilateral effects analyses. These methodological advances may help restore coordinated effects to a central place in merger enforcement, to the benefit of competition and consumers.

II. MERGERS AND COORDINATED EFFECTS

Viewing mergers through the lens of the coordination and incentive problems shows that coordinated effects can have a distinctly separate set of risk criteria from unilateral effects with respect to post-merger harms. With unilateral effects, the magnitude of adverse price effects tends to be larger, all else equal, when the change in concentration caused by the merger is larger. Indeed, the economics literature confirms that the change in the Herfindahl Hirschman Index ("HHI") correlates with harm in an important class of unilateral effects models.[13] But with coordinated effects, the greatest adverse price effects can arise from mergers that involve firms with more moderate market shares.[14] The reason can be understood through the incentive problem. Economic theory indicates that, again holding all else equal, firms with more moderate shares often are the ones that limit collusive prices, either because they participate in the collusive scheme but would not do so if prices were even higher, or because they undercut the collusive scheme and thereby limit how high the cartel's prices can be while preserving the profitability of the collusion.

In a similar vein, divestitures and cognizable post-merger efficiencies often reduce harms from unilateral effects, but they potentially can increase the harm from coordinated effects. For example, certain divestitures, such as those that create symmetry across firms or otherwise alter the incentive compatibility constraints of participating firms can increase the risk of coordinated effects.[15] Similarly, cost efficiencies resulting from the merger may make coordination easier if they equalize firm cost profiles or make firms more symmetric in other ways. Consequently, when both unilateral and coordinated effects are at risk, enforcement agencies should carefully consider whether efficiencies or proposed divestitures will likely help or hinder the resolution of the coordination and incentive problems in a potential collusive scheme.

Recent merger challenges that have alleged coordinated effects as a primary mechanism for post-merger harm have been successful only when they directly engaged with the question of how the merger would likely impact the coordination and incentive problems. The FTC prevailed in blocking the Tronox/Cristal merger on coordinated effects grounds by showing *inter alia* that the merger would help market participants overcome the coordination problem, for example by making the market more transparent.[16] In contrast, the FTC was denied its preliminary injunction of the Evonik/PeroxyChem merger because the FTC did not provide an "independent basis" to conclude that the merger would alter the ability of firms to coordinate or incentivize participation in a collusive scheme, beyond showing that the merger would increase market concentration.[17]

III. METHODOLOGICAL FRAMEWORK FOR EVALUATING COORDINATED EFFECTS

Recent methodological advances in economics have identified a class of mergers for which modeling can be used as a basis for merger simulations: those mergers that occur in markets where tacit or explicit collusion is already present. By focusing on markets where firms have already resolved the coordination problem, the literature combines data with economic theory to model the incentive problems that limit collusive pricing. The key insight of these new approaches is that modeling can inform the profitability of coordination, defection, and punishment, both pre-merger and post-merger. These objects determine each firm's "incentive compatibility constraint," the short-term versus long-term profit tradeoff that must be satisfied for firms to participate in a given collusive scheme in equilibrium. These models can then show how a merger would affect each firm's incentive compatibility constraint, and use that understanding to quantitatively predict harms post-merger.

This methodology builds on an older, established theoretical literature that rigorously models coordination between firms, including Rotemberg & Saloner (1986) and Green & Porter (1984).[18] Fundamentally, it yields a similar toolkit to that used in unilateral effects merger sim-

13 Volker Nocke & Michael D. Whinston, *Concentration Thresholds for Horizontal Mergers*, 112 AMER. ECON. REV. 6, 1915 (2022).

14 Iwan Bos & Joseph E. Harrington Jr., *Endogenous Cartel Formation with Heterogeneous Firms*, 41 RAND J. ECON. 92 (2010); Ryan Mansley, Nathan H. Miller, Gloria Sheu & Matthew C. Weinberg, *A Price Leadership Model for Merger Analysis*, INT'L J. INDUS. ORG (forthcoming).

15 See Helder Vasconcelos, *Tacit Collusion, Cost Asymmetries, and Mergers*, 36 RAND J. ECON. 1, 39–62 (2005).

16 *Fed. Trade Comm'n v. Tronox Ltd.*, 332 F. Supp. 3d 187 (D.D.C. 2018).

17 *Fed. Trade Comm'n v. RAG-Stiftung*, 436 F. Supp. 3d 278 (D.D.C. 2020).

18 Julio J. Rotemberg & Garth Saloner, *A Supergame-Theoretic Model of Price Wars during Booms*, 76 AMER. ECON. REV. 3, 390 (1986); Edward J. Green & Robert H. Porter, *Noncooperative Collusion under Imperfect Price Information*, 52 ECONOMETRICA 1, 87 (1984).

ulation. An economist first models the dynamics of competition in the market pre-merger, considering consumer demand, firm production costs, and other relevant economic characteristics. The model then generates predictions of post-merger behavior. As with unilateral effects simulation models, the better the model reflects the salient market and firm characteristics, the more useful the results.

Two sets of recent papers show how practitioners can exploit knowledge of the collusive mechanism to quantify harms from coordinated effects. Miller, Sheu & Weinberg (2021) and Miller & Weinberg (2017) (collectively, "Miller et al.") simulate the impact of mergers in the domestic beer industry.[19] These papers provide a framework for estimating the impact of mergers involving industries with a history of oligopolistic price leadership involving firms with differentiated products. Similarly, Igami & Sugaya (2021) simulate mergers in the international vitamin industry, which has historically been vulnerable to coordination on quotas.

The domestic beer industry saw increasing concentration during the period studied in Miller et al. Between 2001 and 2011, three companies Anheuser-Busch-InBev ("ABI"), SABMiller, and Molson-Coors accounted for 61-69 percent of all U.S. revenue, and the major importers Grupo Modelo and Heineken accounted for another 12-16 percent of revenue. In June 2008, SABMiller and Molson Coors merged their U.S. operations. A subsequent merger investigation by the DOJ into a proposed ABI-Modelo merger found a history of price leadership behavior in the beer industry between domestic firms. Specifically, the DOJ found that ABI announced annual price increases each summer to be implemented in early fall. Following their merger, MillerCoors "typically joined ABI price increases."[20]

Miller et al. begin their investigation of the impact of the MillerCoors and proposed ABI-Modelo merger by estimating consumer demand for beer using a typical workhorse econometric model for differentiated products price competition, known as a "nested logit random coefficients" model. This type of demand model is commonly used in the literature, and variants of the model will be familiar to many antitrust practitioners from their use in unilateral effects investigations.[21]

Miller et al. develop an empirical model of oligopolistic price leadership for the supply side based on documentary evidence on coordination mechanisms used in the domestic beer industry uncovered in a DOJ investigation. In the model, a price leader first makes a non-binding price announcement, and then firms set prices simultaneously. The price announcement serves as a "focal point" that firms in the market can use to align their beliefs and resolve the coordination problem. Colluding firms decide whether to set their prices in line with the leader's announcement or undercut the announced prices. The tradeoff is that firms recognize that deviating from the price announcement will lead to retaliation and a return to a non-collusive equilibrium with lower prices. Thus, for the price leadership collusive scheme to be sustainable, the colluding firms must view maintaining the collusive scheme over the long term to be more profitable than undercutting and reaping short term profits.

Miller et al. estimate key parameters governing the firms' marginal costs (which are often not directly observed by econometricians in merger investigations) and the incentive compatibility constraints using scanner data on prices and quantities.[22] These estimates allow Miller et al. to then simulate the competitive effects of mergers, taking into account coordinated effects. Miller et al. consider both the Miller/Coors merger and a hypothetical merger of ABI and Grupo Modelo. The results are consistent with these mergers relaxing incentive compatibility constraints and allowing firms to set higher collusive prices. Furthermore, incorporating cost efficiencies for MillerCoors *amplifies* this coordinated effect because it strengthens the firm that most constrains collusion in the model.[23]

Another recent paper by Igami & Sugaya uses a similar framework to Miller et al., but apply it to very different setting: one where firms that produce commodity goods compete on quantity rather than price.[24] During the 1990s, Roche, a major Swiss drug company, colluded with vitamin makers around the world to cartelize the production of vitamins. Although some of these vitamin cartels collapsed on their own, several survived until the cartel was prosecuted by the DOJ in 1999. Evidence uncovered through the investigations of antitrust authorities found that the vitamin cartels operated by setting production quotas for each member during quarterly meetings. The colluding firms then monitored each other's compliance with the scheme by monitoring publicly available trade statistics. Documentary evidence also shows that the colluding firms threatened retaliation against one another for real or perceived defections from the quota agreements.

19 Nathan H. Miller & Matthew C. Weinberg, *Understanding the Price Effects of the MillerCoors Joint Venture*, 85 ECONOMETRICA 6, 1763 (2017); Nathan H. Miller, Gloria Sheu & Matthew C. Weinberg, *Oligopolistic Price Leadership and Mergers: The United States Beer Industry*, 111 AMER. ECON. REV. 10, 3123 (2021).

20 See Dept. of Justice, "Justice Department Files Antitrust Lawsuit Challenging Anheuser-Busch Inbev's Proposed Acquisition of Grupo Modelo," January 31, 2013, https://www.justice.gov/opa/pr/justice-department-files-antitrust-lawsuit-challenging-anheuser-busch-inbev-s-proposed.

21 See e.g. Oliver Budzinski & Isabel Ruhmer, *Merger Simulation in Competition Policy: A Survey*, 6 J. COMP. L. & ECON. 2, 227 (2010).

22 Antitrust agencies often rely on accounting data from the merging firms, which do not reveal the marginal costs of the merging firms without additional assumptions.

23 Mansley et al., *supra* note 14, expands on this result and shows that some divestitures can amplify coordination.

24 Mitsuru Igami & Takuo Sugaya, *Measuring the Incentive to Collude: The Vitamin Cartels, 1990–99*, 89 REV. ECON. STUD. 3, 1460 (2022).

Igami & Sugaya model the demand side of the vitamin market using a linear demand equation. They model the supply side of the market as consisting of a set of firms setting quantities cooperatively while competing against a fringe. Firm incentives to maintain the collusive scheme post-merger are modeled using incentive compatibility constraints, as in Miller et al. An important distinction is that Igami & Sugaya assume that firms either engage in near-perfect collusion or otherwise deviate to competitive prices, whereas Miller et al incorporate that collusion can be partial, coordinating on prices below monopoly levels in order to reduce the incentives of firms to deviate. With the model estimated, Igami & Sugaya use simulations to examine the coordinated effects of mergers. They find that the mergers that create concerns for coordinated effects are those that yield more symmetric cost profiles. These effects are potentially significant: a hypothetical merger between two parties to the vitamin C cartel that would have eliminated the highest-cost vitamin C manufacturer, BASF, would have increased the profit gain from coordination for the highest-cost of the remaining manufacturers, E. Merck, by 47 percent.[25]

IV. LITIGATING COORDINATED EFFECTS MOVING FORWARD

The advances discussed above suggest a set of steps plaintiffs could use to quantify harms from coordinated effects: 1) identify the collusive mechanism used within the industry using industry knowledge and observed patterns of competition, 2) estimate pre-merger demand and a supply-side model that incorporates the collusive mechanism, and 3) use the estimated model to simulate the effects of the merger on prices and quantities, possibly taking merger-specific efficiencies and other aspects of the merger into account.

Although the methods to quantify harms from coordinated effects are new, they do not place a significantly larger investigatory burden on plaintiffs beyond what is normally required in litigating a merger on unilateral effects. Much of the data required to conduct the types of analyses in Miller et al. and Igami & Sugaya are often already produced in the course of a merger investigation or litigation. Data used in Miller et al. include retail scanner data providing weekly revenue and unit sales for beers from a sample of supermarkets in the pre-merger period, household demographic information from the Census Bureau, and information on transportation costs (an important component of beer production costs) using Google Maps.[26] Similarly, Igami & Sugaya use information on prices, aggregate output and market shares, plant capacity, and unit production costs using documents produced in the course of subsequent antitrust investigations.

In supporting the model, it can be helpful to lay the evidentiary-groundwork to demonstrate that the merger simulation reflects the salient economic realities of the alleged markets. This can go beyond the "checklist" of factors suggested by the Horizontal Merger Guidelines by establishing not only a history of coordinated conduct, but by identifying the likely mechanism of collusion for the industry. For example, Miller et al. rely on evidence uncovered from the DOJ's investigation of the proposed ABI-Modelo merger to identify the beer industry's historical pattern of oligopolistic price leadership, while Igami & Sugaya use evidence uncovered from investigations of the vitamin cartels to identify that industry's production quota scheme. This sort of evidence shows first, that market participants may have solved the coordinated problem; and second, that a mechanism exists for the merger to exacerbate harm from coordination.

While the merger simulation itself quantifies the extent to which the merger changes the incentive problem within the model, qualitative evidence remains helpful and can serve as a useful complement to the model. Economic theory shows that a cartel's ability to charge supra-competitive prices is constrained by the member of the cartel with the greatest incentive to defect. In practice, this could be a follower within the price leadership context (e.g. Miller or Coors prior to their merger) or a firm that has historically been the first to defect in response to changing macroeconomic conditions. Evidence showing that this constraint is provided pre-merger by one of the merging parties can be consistent with harm from coordinated effects in much the same way that evidence of head-to-head competition between merging parties is suggestive of harm via unilateral effects. Alternatively, the merger might involve a competitively significant firm that has resisted coordination or undercut an existing coordination by other firms (a "maverick" in the parlance of the Horizontal Merger Guidelines), thereby tightening the incentive compatibility constraints that limit collusion. Again, evidence consistent with that possibility can complement the model.

It should be noted that not all mergers involving markets where collusion is present pose a risk of coordinated effects. For example, a merger that does not involve the cartel member with the greatest incentive to defect or a maverick firm may not increase prices further, absent efficiencies or divestitures. Efficiencies that reduce symmetry among cartel members may reduce the incentive for some members to continue to collude as Igami & Sugaya show in the case of their hypothetical vitamin C merger.[27] Merging parties who believe their merger to be procompetitive could present evidence along these lines in defending their merger to antitrust authorities or courts.

25 Igami & Sugaya 1488–1499, *supra* note 24.

26 Mansley et al., *supra* note 14, show how the model can be calibrated with data on market shares and margins.

27 Efficiencies may also exacerbate coordinated effects as Miller et al. show for the MillerCoors merger.

V. CONCLUSION

Economic theory indicates that unilateral and coordinated effects present conceptually distinct threats to competition from mergers. However, litigation around coordinated effects, when not paired with unilateral effects, has been relatively rare in recent history. Advances in the economics literature have worn away at the gap between the ability to quantitatively assess unilateral and coordinated effects. Coordinated effects have a real and vital role to play in antitrust, and to ignore them in favor of unilateral effects ignores an important part of the competition landscape.

Given that data are likely available to conduct rigorous coordinated effects analysis in a relevant class of mergers, a natural next step would be for the antitrust agencies and private plaintiffs to challenge a merger with this sort of analysis at the forefront. While the previous lack of quantitative methods to address coordinated effects may have hampered the antitrust community from coalescing around a standardized approach to the problem of coordinated effects, this is no longer the obstacle it once was. Practitioners now have an updated toolkit with which to consider coordinated effects and the real, and distinct, effects they may have on competition.