

“WELCOME TO THE HOTEL CALIFORNIA”: THE BEAST OF ALGORITHMIC PRICING



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Mirrors on the ceiling,
The pink champagne on ice
And she said, 'we are all just prisoners here, of our own device'
And in the master's chambers,
They gathered for the feast
They stab it with their steely knives,
But they just can't kill the beast

Last thing I remember, I was
Running for the door
I had to find the passage back to the place I was before
'Relax' said the night man,
'We are programmed to receive.
You can check out any time you like,
But you can never leave!'²

I. INTRODUCTION

With the emergence of the internet, firms today are able to collect and analyze massive amounts of data and, as the "Internet of Things" develops, these opportunities will increase exponentially. Technological innovation has also nurtured the development of dynamic pricing algorithms, capable of monitoring market activity and setting product prices accordingly. The optimist sees the price efficiency that can result. The pessimist is afraid she's right.

Efficiency in pricing, eventually reaching equilibrium where supply meets demand, is the holy grail of economics. But what if the implementation practicalities of efficient pricing include upward bias, and informational and organizational asymmetries favor suppliers over customers? Rather than achieving equilibrium prices — the best of all possible worlds — monopoly prices that squeeze surplus from consumers may result. Algorithmic pricing challenges us to develop legal doctrine that recognizes and addresses this dilemma.

Algorithms facilitating coordinated prices by competitors implicate a core antitrust law concern. Where this condition exists because competitors agree on the pricing algorithm to use — or because they have adopted a common pricing agent — antitrust is spot on: case law establishes that this is express collusion covered by Section 1 of the Sherman Act. The hard part, therefore, is adapting antitrust law to algorithmic pricing when its effect is akin to what economists often call "tacit" collusion — the sort of pricing seen in oligarchical markets where sellers are able to watch and follow each other's pricing and supply adjustments. Under prevailing law, tacit collusion, also referred to as "conscious parallelism," does not violate Section 1.³ Yet, algorithmic pricing can mimic this very state of

² Don Felder, Don Henley & Glenn Frey, "Hotel California," (1976) (Hotel California lyrics © Universal Music Publishing Group).

³ See generally William E. Kovacic et al., *Plus Factors and Agreement in Antitrust Law*, 110 MICH. L. REV. 393, 395, 405 (2011) ("Kovacic et al., Price Factors").

affairs. That, after all, is the algorithm's intent: (1) monitor and capture the necessary real-time input data; (2) weigh and balance it against the accumulated historical data, including past supply and demand responses; and (3) spew out a profit-maximizing output price.

When public officials in Australia, Chile, and Germany attempted to provide motorists with more online price transparency for fuel, prices increased, rather than decreased.⁴ Supra-competitive market prices achieved through algorithms is market harm that we should be concerned about. We discuss here the limits of prevailing antitrust law in dealing with these circumstances, and the need to look beyond when antitrust, as currently understood, does not provide an obvious answer.

II. WHAT'S IT ALL ABOUT, ALGIE?

Algorithms are tools for calculation, data processing, and automated reasoning. An algorithm is any well-defined computational procedure that takes some value, or set of values, as input and produces some value, or set of values as output.⁵ Pricing algorithms can look to factors such as competing firms' present or past prices, costs of production, consumer preferences and price sensitivities, market information such as suppliers' and competitors' stocks, and external information such as weather patterns.⁶ Pricing algorithms are dynamic, responding quickly to market changes. Therefore, firms using algorithmic pricing can adjust prices exponentially faster than can firms relying on traditional analytic methods. In December 2013 Amazon reportedly implemented more than 2.5 million price changes *every day* — compared to Walmart's 54,633 changes during the entire month of November.⁷ Pricing algorithms thus offer firms an alert and adaptable profit-maximizing tool for making pricing decisions and other operating adjustments.

As the U.S. enforcers have recognized, a core principle of free market competition is the ability of firms to adjust pricing in response to competitive conditions.⁸ Accordingly, pricing algorithms may be procompetitive — “not as something that raises alarm bells.”⁹ However, algorithmic pricing can also have anticompetitive effects where it enables or facilitates collusion by competitors. In May 2017, the OECD Secretariat detailed concerns that algorithms offer opportunities to firms to achieve collusive outcomes that do not necessarily require a traditional agreement.¹⁰ European Commissioner Margrethe Vestager echoed these concerns: “the challenges that automated systems create are very real. If they help companies to fix prices, they really could make our economy work less well for everyone else” and “as competition enforcers, I think we need to make it very clear that companies can't escape responsibility for collusion by hiding behind a computer program.”¹¹ Where algorithms enable not collusion, but coordinated pricing by competitors, the market harm may be comparable, but addressing it more elusive. At recent FTC hearings, “panelists agreed the use of such algorithms is difficult to analyze under traditional antitrust principles, other than in cases in which competing firms consciously decide to jointly employ an algorithm to fix prices.”¹²

4 Václav Šmejkal, *Cartels by Robots—Current Antitrust Law in Search of an Answer*, at 3, <https://doi.org/10.22598/iele.2017.4.2.1> (“Šmejkal, Cartels by Robots”).

5 CORMEN ET AL., *INTRODUCTION TO ALGORITHMS* (MIT Press 2d ed. 2001).

6 *Pricing Algorithms: Economic Working Paper on the Use of Algorithms to Facilitate Collusion and Personalised Pricing* (Competition & Markets Authority, Working Paper Oct. 8, 2018), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746353/Algorithms_econ_report.pdf.

7 Profitero Blog, *Profitero Price Intelligence: Amazon Makes More Than 2.5 Million Daily Price Changes*, Profitero, (Dec. 10, 2013), <https://www.profitero.com/2013/12/profitero-reveals-that-amazon-com-makes-more-than-2-5-million-price-changes-every-day/>.

8 OECD, *Algorithms and Collusion – Note by the United States*, No. OECD Doc. DAF/COMP/WD(2017)41 § 4 (May 26, 2017), [https://one.oecd.org/document/DAF/COMP/WD\(2017\)41/en/pdf](https://one.oecd.org/document/DAF/COMP/WD(2017)41/en/pdf) (“U.S. Note”).

9 *Roundtable: Discussing the Big Picture on Big Data*, 18 THE ANTITRUST SOURCE 1, 6 (No. 3 Dec. 2018) (“Roundtable”).

10 OECD, *Algorithms and Collusion – Background Note by the Secretariat* § 6.1, No. OECD Doc. DAF/CoMP (2017)4 (June 9, 2017), [https://one.oecd.org/document/DAF/COMP\(2017\)4/en/pdf](https://one.oecd.org/document/DAF/COMP(2017)4/en/pdf).

11 Margrethe Vestager, Comm'r, Eur. Comm'n, *Algorithms and Competition*, Remarks at the Bundeskartellamt 18th Conference on Competition, Berlin (Mar. 16, 2017), https://ec.europa.eu/commission/commissioners/2014-2019/vestager/announcements/bundeskartellamt-18th-conference-competition-berlin-16-march-2017_en.

12 Janis Kestenbaum et al., *What We Heard at the FTC Hearings: Days 12 and 13*, LAW360 (Nov. 28, 2018), <https://www.law360.com/articles/1105676/what-we-heard-at-the-ftc-hearings-days-12-and-13>.

III. “FAST-TRACK” COLLUSION USING ALGORITHMS

Under Section 1 of the Sherman Act, it is unlawful *per se* for competitors to agree to raise, depress, fix, peg, or stabilize the price of goods or services.¹³ When competitors use pricing algorithms to implement such an agreement, application of U.S. antitrust law is straightforward. Moreover, where a single firm enlists a network of suppliers who resell using dynamic algorithmic pricing made available to supplier-participants, the “hub and spoke” conspiracy construct seems to work, although this adaptation of conventional antitrust law is perhaps more debatable.

More than 20 years ago, in *United States v. Airline Tariff Publishing Co.*,¹⁴ the DOJ investigated an airline industry price-fixing conspiracy. Six airlines used an online computer program called the Airline Tariff Publishing Company (“ATPCo”) to coordinate and set airline fare prices. Through ATPCo, the airlines had full knowledge of their competitors’ prices, and they used ATPCo to discuss and coordinate their fares.¹⁵ After the DOJ sued for price-fixing, the airlines settled.¹⁶

More recently, in *United States v. Topkins*,¹⁷ the DOJ successfully prosecuted two executives and a commercial retailer who used pricing algorithms to coordinate their prices for posters sold on the Amazon Marketplace, the world’s largest e-commerce platform. Using agreed-on, aligned algorithms, the defendants avoided price competition among themselves, and increased online prices for posters. DOJ enforcers noted that “[o]nce the pricing algorithms were in place . . . the conspiracy was, to a large extent, self-executing.”¹⁸ The defendants pleaded guilty to a Section 1 violation.¹⁹

As these cases illustrate, using a pricing algorithm does not change the antitrust analysis. Like a written or oral message from one conspirator to the other informing of a price or input change, the algorithm is just a means to implement an agreement between human beings. Thus, Professors Ezrachi & Stucke refer to this arrangement — where pricing algorithms implement or disguise the intended underlying collusion — as a “messenger” scenario.²⁰ Section 1’s prohibition applies.

IV. HUB-AND-SPOKE ARRANGEMENTS

Section 1’s conspiracy element can also be met where the agreement among competitors is “informal” — rather than explicit — and is inferred from circumstantial evidence, including economic evidence (often referred to, collectively, as “plus factors”)²¹. The “hub-and-spoke” conspiracy model, for example, is a well-recognized, recurring basis for Section 1 liability. Here, competing firms use a common actor, “the hub” — to facilitate collective action by the (typically) suppliers, who form “the rim” of the wheel. The central actor can, but does not necessarily, make the pricing decisions. However, the agent acts as the intermediary through which the competing firms effectively communicate and, by inference, agree on price or otherwise restrain trade.

In *Interstate Circuit v. United States*,²² a movie theatre communicated simultaneously, albeit independently, with eight movie distributors, insisting that each agree on minimum ticket prices and bar double-feature showings in their licensing terms. Each distributor knew the theatre communicated the same message to its competitors, and each accepted the theatre’s conditions. Although all the distributor-witnesses testified at trial that they made no “agreement,” the district court inferred a Section 1 conspiracy. The Supreme Court affirmed, holding that the

¹³ See, e.g. *United States v. Socony-Vacuum Oil Co.*, 310 U.S. 150, 223 (1940).

¹⁴ *United States v. Airline Tariff Publ’g. Co.*, 836 F. Supp. 9 (D.D.C. 1993).

¹⁵ *Id.*

¹⁶ Final Judgment, *United States v. Airline Tariff Publ’g Co.*, No. 92-2854 (Nov. 1, 1993), <https://www.justice.gov/atr/final-judgment-us-v-airline-tariff-publishing-company-et-al>.

¹⁷ *United States v. Topkins*, No. CR 15-00201 (N.D. Cal. Apr. 6, 2015) (Information and Plea Agreement).

¹⁸ U.S. Note, *supra* note 8, at ¶ 15.

¹⁹ Press Release, U.S. Department of Justice, Former E-Commerce Executive Charged with Price Fixing in the Antitrust Division’s First Online Marketplace Prosecution (April 6, 2015), <https://www.justice.gov/opa/pr/former-e-commerce-executive-charged-price-fixing-antitrust-divisions-first-online-marketplace>.

²⁰ ARIEL EZRACHI & MAURICE E. STUCKE, VIRTUAL COMPETITION: THE PROMISE AND PERILS OF THE ALGORITHM-DRIVEN ECONOMY 46 (Harvard Univ. Press 2016) (“Ezrachi & Stucke, VIRTUAL COMPETITION”).

²¹ See, e.g. *Interstate Circuit v. United States*, 306 U.S. 208 (1939); *Klor’s, Inc. v. Broadway-Hale Stores, Inc.*, 359 U.S. 207 (1959); *In re Text Messaging Antitrust Litig.*, 630 F.3d 622, 629 (7th Cir. 2010); Kovacic et al., *Plus Factors*, *supra* note 3, 110 MICH. L. REV. at 396.

²² 306 U.S. 208 (1939).

distributors' individual acceptances permitted "the inference of agreement from the nature of the proposals made . . . [and] from the substantial unanimity of action taken upon them by the distributors."²³ Reviewing the circumstantial evidence, the Court wrote: "[i]t was enough that, knowing that concerted action was contemplated and invited, the distributors gave their adherence to the scheme and participated in it."²⁴

Similarly, in *Klor's v. Broadway-Hale Stores*,²⁵ a dominant retailer communicated with several suppliers, each of whom thereafter refused to sell to a rival retailer. Although there were no explicit communications between the suppliers, the Court inferred a conspiracy from circumstantial evidence, and held the arrangement *per se* illegal under Section 1.²⁶ The recent "ebooks case," in which Apple orchestrated a conspiracy among online book publishers to change the industry's pricing model, is another example of hub-and-spoke liability.²⁷

As the *ebooks* case illustrates, e-commerce can package old wine in new wine bottles. The recent action against Uber, the world's largest transportation network company, is particularly noteworthy.²⁸ Uber provides a platform for riders to request car services from drivers who (Uber contends) are independent contractors. Uber uses a pricing algorithm to set the prices that drivers charge riders. While Uber has not disclosed the algorithm, it reportedly uses input factors that include supply, demand, and other external considerations such as bad weather, rush hour, and special events.²⁹ When the algorithm determines that the demand for rides has increased — or that the supply of Uber-available drivers has declined — the prices to riders go up to a "surge price." The surge price is communicated to riders as a multiplier of the standard rate, for example, 1.8 or 2.5 times the standard fare.³⁰ Uber requires drivers to charge the price that Uber's algorithm dictates.

An Uber user, suing on behalf of a proposed class of riders, claimed that Uber violated Section 1 by requiring all its independent contractor-drivers to charge riders prices called for by Uber's pricing algorithm. Instead of setting their own prices, the drivers let Uber do it as a condition of doing business on the Uber platform. In the world of hub and spoke conspiracies, Uber was like the movie theatre in *Interstate Circuit*, and the drivers were like the movie distributors furnishing product. A conspiracy, the plaintiff argued, could be inferred from the circumstantial evidence even absent an explicit agreement among the drivers.

Uber asserted that a conspiracy involving "hundreds of thousands of independent transportation providers all across the United States" would be "implausible."³¹ But Judge Rakoff of the Southern District of New York was unpersuaded: "the advancement of technological means for the orchestration of large-scale price-fixing conspiracies need not leave antitrust law behind."³² The Court thus denied Uber's motion to dismiss. Significantly, however, Judge Rakoff did not decide whether the alleged conspiracy was *per se* illegal or had to be analyzed under the rule of reason, preferring instead to resolve that question only after discovery allowed fact development.³³ The answer to this question will have to await another case against an online platform because after Judge Rakoff's motion to dismiss ruling, the action was held subject to Uber's mandatory arbitration clause.³⁴

The *Uber* ruling looks like a canary in the mine shaft. Algorithmic pricing may, indeed, have anticompetitive consequences affecting consumers. And while antitrust law is accustomed to proscribing explicit and inferred agreements among competitors, and even to inferring conspiracy from circumstantial evidence in a hub and spoke setting, the law may need to adapt when algorithmic pricing operates independently of these sorts of circumstances.

²³ *Id.* at 221-22.

²⁴ *Id.* at 226.

²⁵ 359 U.S. 207 (1959).

²⁶ *Id.* at 209-210. *See also Toys "R" Us, Inc. v. FTC*, 221 F.3d 928 (7th Cir. 2000) (retailer orchestrated a conspiracy with suppliers to restrain competition from "discount" rivals).

²⁷ *United States v. Apple, Inc.*, 791 F.3d 290 (2d Cir. 2015), *cert denied*, 136 S. Ct. 1376 (2016).

²⁸ Rebecca Elaine Elliot, *Sharing App or Regulation Hack(ney)?: Defining Uber Technologies, Inc.*, 41 J. CORP. L. 727, 729 (2016).

²⁹ *How Surge Pricing Works*, Uber, <https://www.uber.com/drive/partner-app/how-surge-works/>, (last visited Dec. 20, 2018).

³⁰ *Id.*

³¹ *Meyer v. Kalanick*, 174 F. Supp. 3d 817, 825 (S.D.N.Y. 2016).

³² *Id.*

³³ *Id.* at 827.

³⁴ *Meyer v. Uber Techs., Inc.*, 868 F.3d 66 (2d Cir. 2017).

Under the current law, price coordination among firms that produces increased prices — traditional “tacit” collusion or conscious parallelism — is unlikely to be a U.S. antitrust violation. The evidence must prove, instead, “a unity of purpose” or “a conscious commitment to a common scheme” by participants.³⁵ Indeed, in at least some fact settings, the evidence also should exclude the possibility of independent action.³⁶ U.S. antitrust enforcers have themselves opined that use of independent pricing algorithms is unlikely to result in antitrust liability absent additional facts suggesting concerted action.³⁷

V. ALGORITHMIC PRICING AND MARKET HARM

Let us suppose that competing firms each use algorithmic pricing to respond to ever-changing conditions. While the various stages of the competing firms’ businesses are by no means identical, there will be similarities in input, manufacturing (or assembly) and distribution costs. Each firm’s pricing algorithm is likely to take account of similar factors, and even though the two algorithms may not weigh each factor identically, there will still be constraining similarities. Further, as industry firms themselves increasingly use algorithmic pricing, the data points available for capture and analysis will increase, improving each algorithm’s operation.³⁸ With analysis of increasing amounts of data and improvingly sophisticated artificial intelligence (“AI”) capabilities, the competing firms will land on price points that are increasingly near each other.

The rapid and dynamic responses to changes in the market — which will include reactions to competitors’ own prices — create the potential for firms to coordinate on prices without ever communicating with each other directly or through a central hub. The ability of firms to collect and analyze enormous banks of information allows sellers to adjust prices at exponentially faster rates using a variety of real-time inputs — much faster and efficiently than human actors can.³⁹ Equally important, an algorithm’s ability to detect real-time market changes, as well as to self-learn, enable it to adjust selling prices to, ideally, the optimal profit-seeking level in real-time.⁴⁰ Companies will seek to implement price changes like Amazon, not Wal-Mart. Thus, using similar advanced algorithms, each calibrated to profit-maximize, companies may be expected to independently reach the same pricing levels. By their very design, these algorithms will coordinate prices with their competitors.

Now, if we were confident that algorithmic pricing will produce unbiased price changes, both up and down, our worries might be slight. But what basis is there for this assumption? As profit-maximizing firms, suppliers can be expected to build into their algorithms an upward bias, which attempts to capture as much consumer surplus as possible. At the same time, consumers as buyers are disadvantaged. Sellers tend to have more information about their product and its attractiveness in the market, and about market trends in general, than do buyers. Thus, informational asymmetry favors suppliers. Suppliers also sell to a customer base en masse, whereas buyers purchase for individual needs and tend toward disorganization. In consequence, buyer ability to resist rising prices — particularly when they are informationally disadvantaged — is frequently ineffective. Although organized buyers can gain negotiating leverage from volume purchasing, absent this type of buyer power, the pressure to drive prices down typically needs to come from competitors willing to sell below the price increase.

Conventional economics posits that announced or implemented price increases can be countered by companies that offer lower priced products. Buyers will identify the offerings and purchase accordingly. Absent capacity limitations, an equally (or more) efficient competitor or group of independently acting competitors — and even a timely new entrant — can provide buyers with the alternatives needed to defeat a price increase. This *is* the competitive process, conventionally understood. But for the process to work lower price offerings need “breathing space” — time for consumers to identify and purchase the alternatives.

35 See, e.g. *Monsanto Co. v. Spray-Rite Serv. Corp.*, 465 U.S. 752, 764 (1984) (citation and quotation marks omitted); *Am. Tobacco Co. v. United States*, 328 U.S. 781, 809–10 (1946).

36 See, e.g. *Matsushita Elec. Indus. Co., Ltd. v. Zenith Radio Corp.*, 475 U.S. 574, 587 (1986).

37 U.S. Note, *supra* note 8, at § 4.1. *Compare* Judgment, Case C-74/14, “*Eturas*” *et al. v Lietuvos Respublikos konkurencijos taryba* (Eur. Ct. Justice Jan. 21, 2016) (where a travel booking service implemented an online cap on discounts by travel agents using the service, an agent with knowledge of the cap could be presumed a participant in collective action), <http://curia.europa.eu/juris/document/document.jsf?jsessionid=8271678F4CF01FB31C5B6BED549CFAA5?text=&docid=173680&pageIndex=0&doclang=en&mode=lst&dir=&occ=first&part=1&cid=3297309>.

38 OECD, *Algorithms and Collusion: Competition Policy in the Digital Age* 33 (2017), www.oecd.org/competition/algorithms-collusion-competition-policy-in-the-digital-age.htm.

39 Salil K. Mehra, *Antitrust and the Robo-Seller: Competition in the Time of Algorithms*, 100 MINN. L. REV. 1323, 1352 (2016). But see *Roundtable, supra* note 9, 18 THE ANTITRUST SOURCE at 8 (“If you’ve got an algorithm that can make a pricing decision in a microsecond, which otherwise would take a marketing department a week or even a day to figure out, that’s probably a good thing.”).

40 *Id.*

By enabling real-time price adjustments, however, algorithmic pricing eliminates that necessary time window. Fine-tuned algorithms would recognize that one company's reduced price will be met by another's even lower price, and that pursuing a price-cutting strategy would assure a downward price spiral. The better response will be to price upward—matching the leader's increased price because anything less risks triggering the downward spiral.⁴¹ Algorithmic pricing eliminates the incentive, and hence the ability, for competitors to discipline price increases.⁴²

The story several years ago of algorithms “gone wild” is well-known. Two booksellers on Amazon bettered each other's price for a reference title, *THE MAKING OF A FLY*, until the online offering reached \$23,698,655.93, plus \$3.99 for shipping.⁴³ A more fine-tuned algorithm, informed by AI, would turn off the bid switch at a profit-maximizing level. But the risk that today firms will follow each other's price to that point is plain enough.

As the DOJ and FTC have themselves warned: algorithms could be highly effective in facilitating collusion due to the “speed and ease of algorithmic pricing . . . likely reduce[s] the benefit that a firm would otherwise enjoy from... defecting from collusive pricing.”⁴⁴ Although the enforcers wrote in the context of the ability of algorithmic pricing to detect — and thereby deter — conspirator defection, their observation applies equally to low pricing that is intended to resist a price increase. That, too, would be quickly detected and reduce any expected benefit from trying to capture sales by offerings below the increased price.

Under a traditional pricing model where firms apply non-dynamic trial and error in a “repeated game,” it is difficult for firms to sustain monopoly profits “because firms would prefer to deviate in order to make a positive profit in the short run.”⁴⁵ In contrast, dynamic algorithmic pricing allows for real-time changes, or “revision opportunities,” which are “frequent enough . . . [that] there is a high probability that any potential deviation will be detected even before the next customer arrives.”⁴⁶ As a result, the “revising firm could react to the deviation before the deviating firm has an opportunity to make any profits.”⁴⁷

Even before machines entered the picture, concentrated industries were susceptible to follow-the-leader pricing, which could be maintained at supra-competitive levels. Use of algorithmic pricing can be expected to exacerbate this condition, thereby producing a market result similar to that of explicit collusion. Professor Bruno Salcedo cautions that this tacit collusion between firms enjoying market power “is not only possible but rather, it is *inevitable*.”⁴⁸ Professors Ezrachi & Stucke similarly describe this harm as the “predictable agent” scenario — “Tacit Collusion on Steroids.”⁴⁹

Circling back to ride-sharing, the algorithmic pricing models used by Uber and Lyft illustrate this potential market harm. While neither company has disclosed the input factors driving its pricing algorithm for rider fares, each admits that similar factors, such as dynamic supply and demand, are prioritized. Both companies use surge pricing when the perceived demand in an area rises (or the driver supply declines). The pricing algorithm increases the fare to incent more drivers to “activate” and enter surge areas. As then-Uber CEO Kalanick has claimed, “We are not setting the price, the market is setting the price . . . we have algorithms to determine what that market is.”⁵⁰ Similarly, Lyft states that its

41 See Hogan Lovells, *Exploring the Contrasting Views About Big Data in the US and EU*, ANTITRUST, COMPETITION AND ECONOMIC REGULATORY NEWSLETTER 15, 17 (Autumn 2018) (“if everyone applies a similar algorithm [monitoring competitors’ online prices], and if these algorithms are probably even self-learning, the computer programs may conclude that they are all better off if they increase prices.”), <https://www.hoganlovells.com/en/publications/antitrust-competition-and-economic-regulation-quarterly-newsletter-autumn-2018>; Šmejkal, *Cartels by Robots*, *supra* note 4, at 6

42 Cf. Dennis W. Carlton et al., *Communication Among Competitors: Game Theory and Antitrust*, 5 GEO. MASON L. REV. 423, 428-30 (1997) (offering the example of two gas stations engaged in coordinated pricing, leading to a price increase, despite the absence of communications between the stations).

43 Olivia Solon, *How a Book About Flies Came to be Priced \$24 Million on Amazon*, WIRED (Apr. 27, 2011), <https://www.wired.com/2011/04/amazon-flies-24-million/>.

44 U.S. Note, *supra* note 8, at ¶ 5.

45 BRUNO SALCEDO, PRICING ALGORITHMS AND TACIT COLLUSION 19 (Penn St. Univ. Nov. 1, 2015), brunosalcedo.com/docs/collusion.pdf.

46 *Id.*

47 *Id.*

48 *Id.* at 3.

49 Ezrachi & Stucke, *VIRTUAL COMPETITION*, *supra* note 20, at 41.

50 Salil K. Mehra, *supra* note 39, 100 MINN. L. REV. at 1324.

surge pricing, known as “Prime Time,” is based on dynamic supply and demand in the market.⁵¹ Despite differences in exactly how each pricing algorithm applies specific input factors, any increase or decrease by one of the two firms will likely result in the other responding similarly. After all, Uber and Lyft seek to derive profit by offering an attractive price to riders, compared to the alternatives.

Uber and Lyft may say that the “market” determines their prices. But each company’s goal is to maximize the profit derived from each transaction — not to provide the cheapest car service. Each firm’s financial incentive inevitably prioritizes the ability to charge the highest possible price without losing riders to its rivals. If both Uber and Lyft’s pricing algorithms conclude that the optimal price — the price that generates the most profit for the firm per transaction — is higher *and* that aligning prices with the other yields the highest return, then the pricing algorithms will select that higher price. There is no “agreement” between Uber and Lyft, nor any use of a common agent for the two firms. Rather, each independent pricing algorithm sets a price at which each could maximize profit. And if Uber and Lyft — the market’s two largest ride-share companies — use similar algorithms to price in lock-step, riders will pay the price the companies make available — not a price determined by “the market.”

Take away algorithmic pricing: neither Uber and Lyft could raise their prices without danger of losing riders to the other — unless, of course, they agreed to price-fix. The very efficiency of the pricing algorithm, however, creates the market harm that we need to worry about.

VI. THE TOOLS OF ANTITRUST — AND BEYOND

Antitrust “urban” legend touts the adaptability U.S. antitrust law. It’s a like a Swiss army knife. Every once in a while, a different feature has to be used, or a blade needs to be sharpened. But in the end, everything needed is there to do whatever needs to be done. The increasing pace of technological change behooves us to question this article of faith. Before cars populated streets, the pace of travel did not call for stop lights or pedestrian walk signs. And so, today, we should be thinking deeply about how algorithmic pricing, souped up with big data and AI, can change the competitive process itself. Even while that reflective process is underway, however, there are approaches to try.

For example, the Federal Trade Commission should not be a shrinking violet. Section 5 of the Federal Trade Commission Act declares “unfair methods of competition” to be unlawful.⁵² Section 5 reaches conduct outside the boundaries of federal antitrust law: “in measuring a practice against the elusive, but congressionally mandated standard of fairness, [the Commission], like a court of equity, considers public values beyond simply those enshrined in the letter or encompassed in the spirit of the antitrust laws.”⁵³ The FTC’s 2015 statement on Section 5 reiterates that the statute covers “not only those acts and practices that violate the Sherman or Clayton Act but also those that contravene the spirit of the antitrust laws and those that, if allowed to mature or complete, could violate the Sherman or Clayton Act.”⁵⁴

Accordingly, the FTC has sued under Section 5 when conduct approaches, but does not satisfy, a Sherman Act violation. For instance, although an “invitation” to collude may not violate the Sherman Act, sufficient potential for anticompetitive harm can give rise to liability under Section 5.⁵⁵ Thus, challenging algorithmic pricing that produces supra-competitive, coordinated pricing is within the FTC’s wheelhouse. To be sure, years ago the Second Circuit rejected, as a bridge too far, the Commission’s effort to apply Section 5 to distribution restraints that four companies adopted independently, but that the Commission argued facilitated price parallelism at increased price levels.⁵⁶ The prevalence of algorithmic pricing today, however, should represent significantly changed circumstances, which warrant revisiting this and similar doctrinal approaches, such as “collective” monopolization.

51 Lyft (@Lyft), TWITTER, (Jan. 1, 2018, 3:10 AM), https://twitter.com/lyft/status/947787167077507072?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Cwtter%5E947787167077507072&ref_url=https%3A%2F%2Fdatarootlabs.com%2Fuber-lyft-gett-surge-pricing-algorithms%2F.

52 15 U.S.C. § 45(a)(1).

53 *FTC v. Sperry & Hutchinson Co.*, 405 U.S. 233, 244 (1972).

54 Fed. Trade Comm’n, Statement on the Issuance of Enforcement Principles Regarding “Unfair Methods of Competition” Under Section 5 of the FTC Act, 80 Fed. Reg. 57,056 (Sept. 21, 2015), https://www.ftc.gov/system/files/documents/federal_register_notices/2015/09/150921commissionpolicyfrm.pdf; See also *FTC v. Motion Picture Advert. Serv. Co.*, 344 U.S. 392, 394-95 (1953).

55 Consent Order, *Quality Trailer Products Corp.*, 115 F.T.C. 944 (1992).

56 *E.I. du Pont de Nemours & Co. v. FTC*, 729 F.2d 128 (2d Cir. 1984). See also *Boise Cascade Corp. v. FTC*, 637 F.2d 573 (9th Cir. 1980) (independent adoption of a “base point pricing” system did not violate Section 5 where substantial evidence failed to show a price effect).

Whether FTC enforcement will be forthcoming is conjecture, of course. And while there is no private right of action under Section 5,⁵⁷ various states have enacted “little FTC Acts,” which similarly proscribe “unfair or deceptive acts or practices,” or “unfair methods of competition.”⁵⁸ Under these laws, twenty states have authorized private parties to sue.⁵⁹ Accordingly, private enforcement can push the envelope by challenging increased prices produced by companies using algorithms that achieve coordinated pricing not necessarily resulting from collusion prohibited by antitrust law. States can, indeed, be laboratories of democracy, and these sorts of laws provide test tubes for experimentation.⁶⁰ Moreover, if the FTC itself does blaze a trail, little FTC Acts with private rights of action can supplement agency enforcement.

There also may be opportunities to invoke state antitrust law itself. Although “harmonization” provisions, adopted by state statute or case law, instruct that federal antitrust law should inform construction of a state’s own statute, there is still play in the joints.⁶¹ For example, the California Supreme Court has noted that “[i]nterpretations of federal antitrust law are at most instructive, not conclusive, when construing the Cartwright Act.”⁶² Similarly under New York law, federal precedent informs construction of the state’s Donnelly Act, but it is “well settled that we will interpret our statute differently ‘where State policy, differences in the statutory language or the legislative history justify such a result.’”⁶³

One specific difference in New York is the Donnelly Act’s plurality element. Unlike Section 1 of the Sherman Act, the Donnelly Act applies to “[e]very contract, agreement, *arrangement* or combination” that monopolizes or restraints trade.⁶⁴ Thus, a body of New York law holds that “*undoubtedly* the sweep of Donnelly may be broader than that of Sherman”⁶⁵ Therefore, again, state law may create an opportunity to challenge algorithmic pricing that is not readily reached under federal antitrust law.

⁵⁷ See, e.g. *Holloway v. Bristol-Myers Corp.*, 485 F.2d 986, 687, 989 (D.C. Cir. 1973); *Carlson v. Coca-Cola Co.*, 483 F.2d 279, 280 (1973) (citing authorities).

⁵⁸ See, e.g. Fla. Stat. Ann. § 501.204(1) (“unfair methods of competition, unconscionable acts or practices, and unfair or deceptive acts or practices . . . are unlawful”); 815 Ill. Comp. Stat. Ann. 505/2 (prohibiting “[u]nfair methods of competition and unfair or deceptive acts or practices”); Mass. Gen. Laws Ann. ch. 93A § 2 (same).

⁵⁹ Justin J. Hakala, *Follow-On State Actions Based on the FTC’s Enforcement of Section 5*, at 6, n.26, https://www.ftc.gov/sites/default/files/documents/public_comments/section-5-workshop-537633-00002/537633-00002.pdf (Appendix collecting statutes).

⁶⁰ *New State Ice Co. v. Liebmann*, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting) (“It is one of the happy incidents of the federal system that a single courageous state may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.”).

⁶¹ See generally *In Re Dairy Farmers of America, Inc. Cheese Antitrust Litig.*, No. 9 CV 3690, 2015 WL 3988488 (N.D. Ill. June 29, 2015) (discussing various state harmonization provisions).

⁶² *Aryeh v. Canon Bus. Sols., Inc.*, 292 P.3d 871, 877 (Cal. 2013).

⁶³ *Sperry v. Crompton Corp.*, 863 N.E.2d 1012, 1018 (N.Y. 2007) (quoting *Anheuser-Busch, Inc. v. Abrams*, 520 N.E.2d 535, 539 (N.Y. 1988)).

⁶⁴ N.Y. Gen. Bus. Law § 340(1) (emphasis added).

⁶⁵ *State v. Mobil Oil Corp.*, 38 N.Y.2d 460, 464 (1976) (emphasis added). See generally *Experiments in the Lab: Donnelly Act Diversions from Federal Antitrust Law*, 15 N.Y. LITIGATOR 61, 62-63 (No. 2 Fall 2010) (citing and discussing authorities).

VII. CONCLUSION

Under the Communications Act of 1934,⁶⁶ the Federal Communications Commission must take account of the “public interest, convenience, and necessity” in making licensing decisions.⁶⁷ The standard recognizes that because the broadcast spectrum is limited, licensees of the spectrum must act as “public fiduciaries” for the benefit of the public.⁶⁸ The mere presence or absence of competition is not, in itself, a sufficient basis for an FCC licensing decision, although the conditions of competition are a factor that the agency may consider.⁶⁹ The FCC similarly reviews telecommunications industry mergers under the “public interest, convenience, and necessity” standard.⁷⁰ Again, the FCC may consider factors beyond those informing a DOJ or FTC antitrust merger review — for example, universal service requirements, public health and safety, and foreign ownership restrictions.⁷¹ The Communications Act standard reminds that, at times, the clash of competing interests requires doing something different to avoid market harm slipping through the cracks of traditional antitrust analysis. Merely protecting the process of “competition” without regard for the result produced may not be enough.

Private businesses plying their goods and services are, of course, different than broadcast licensees. However, algorithmic pricing is enabled by scraping data from the internet and any other public sources that may be collected and inputted for analysis. Although the various components of data may, for some purposes, be protected as property owned by one person or another, perhaps the aggregation of data, as a whole, can be thought of as a public good, the use of which by individual actors can be restricted for the benefit of the public at large. The advent of algorithmic pricing challenges us to think out of the box for alternatives to traditional antitrust law — lest we wake up not too many years from now to find that we’ve sleepwalked over a cliff.⁷²

66 47 U.S.C. §§ 151 *et seq.*

67 *Id.* § 309(a).

68 See *Red Lion Broad. Co. v. FCC*, 395 U.S. 367, 389 (1969) (a licensee may be required “to share his frequency with others and to conduct himself as a proxy or fiduciary with obligations to present those views and voices which are representative of his community and which would otherwise, by necessity, be barred from the airwaves”).

69 *FCC v. RCA Commuc'ns, Inc.*, 346 U.S. 86 (1953).

70 47 U.S.C. § 214(a).

71 47 U.S.C. § 254; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, PS Docket No. 06-229, Second Report and Order, 22 F.C.C.R. 15,289 (2007). See also The Effects of Consolidation on the State of Competition in the Telecommunications Industry: Hearing Before the H. Comm. on the Judiciary, 105th Cong. 21 (1998) (statement of Joel I. Klein, Assistant Attorney General, Antitrust Division, U.S. Department of Justice), http://commdocs.house.gov/committees/judiciary/hju58805.000/hju58805_of.htm.

72 See generally Šmejkal, *Cartels by Robots*, *supra* note 4, at 12-15 (discussing various approaches). But see Sheng Li & Claire Chunying Xie, *Automated Pricing Algorithms and Collusion: A Brave New World or Old Wine in New Bottles?*, 18 THE ANTITRUST SOURCE 1, 8 (No. 3 Dec. 2018) (“while the strategic games of competitive pricing may now be played at a faster tempo by automated algorithms, the fundamental rules of the game—governed by classical economic principles of supply, demand, and profit maximization—remain the same”), https://www.americanbar.org/content/dam/aba/publishing/antitrust_source/2018-2019/atsource-december2018/dec18_bigdata_rndtbl_12_17f.pdf.

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