

INTERNATIONAL JOURNAL FOR LEGAL RESEARCH AND ANALYSIS



Open Access, Refereed Journal Multi Disciplinary
Peer Reviewed

www.ijlra.com

DISCLAIMER

No part of this publication may be reproduced, stored, transmitted, or distributed in any form or by any means, whether electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the Managing Editor of the *International Journal for Legal Research & Analysis (IJLRA)*.

The views, opinions, interpretations, and conclusions expressed in the articles published in this journal are solely those of the respective authors. They do not necessarily reflect the views of the Editorial Board, Editors, Reviewers, Advisors, or the Publisher of IJLRA.

Although every reasonable effort has been made to ensure the accuracy, authenticity, and proper citation of the content published in this journal, neither the Editorial Board nor IJLRA shall be held liable or responsible, in any manner whatsoever, for any loss, damage, or consequence arising from the use, reliance upon, or interpretation of the information contained in this publication.

The content published herein is intended solely for academic and informational purposes and shall not be construed as legal advice or professional opinion.

**Copyright © International Journal for Legal Research & Analysis.
All rights reserved.**

ABOUT US

The *International Journal for Legal Research & Analysis (IJLRA)* (ISSN: 2582-6433) is a peer-reviewed, academic, online journal published on a monthly basis. The journal aims to provide a comprehensive and interactive platform for the publication of original and high-quality legal research.

IJLRA publishes Short Articles, Long Articles, Research Papers, Case Comments, Book Reviews, Essays, and interdisciplinary studies in the field of law and allied disciplines. The journal seeks to promote critical analysis and informed discourse on contemporary legal, social, and policy issues.

The primary objective of IJLRA is to enhance academic engagement and scholarly dialogue among law students, researchers, academicians, legal professionals, and members of the Bar and Bench. The journal endeavours to establish itself as a credible and widely cited academic publication through the publication of original, well-researched, and analytically sound contributions.

IJLRA welcomes submissions from all branches of law, provided the work is original, unpublished, and submitted in accordance with the prescribed submission guidelines. All manuscripts are subject to a rigorous peer-review process to ensure academic quality, originality, and relevance.

Through its publications, the *International Journal for Legal Research & Analysis* aspires to contribute meaningfully to legal scholarship and the development of law as an instrument of justice and social progress.

PUBLICATION ETHICS, COPYRIGHT & AUTHOR RESPONSIBILITY STATEMENT

The *International Journal for Legal Research and Analysis (IJLRA)* is committed to upholding the highest standards of publication ethics and academic integrity. All manuscripts submitted to the journal must be original, unpublished, and free from plagiarism, data fabrication, falsification, or any form of unethical research or publication practice. Authors are solely responsible for the accuracy, originality, legality, and ethical compliance of their work and must ensure that all sources are properly cited and that necessary permissions for any third-party copyrighted material have been duly obtained prior to submission. Copyright in all published articles vests with IJLRA, unless otherwise expressly stated, and authors grant the journal the irrevocable right to publish, reproduce, distribute, and archive their work in print and electronic formats. The views and opinions expressed in the articles are those of the authors alone and do not reflect the views of the Editors, Editorial Board, Reviewers, or Publisher. IJLRA shall not be liable for any loss, damage, claim, or legal consequence arising from the use, reliance upon, or interpretation of the content published. By submitting a manuscript, the author(s) agree to fully indemnify and hold harmless the journal, its Editor-in-Chief, Editors, Editorial Board, Reviewers, Advisors, Publisher, and Management against any claims, liabilities, or legal proceedings arising out of plagiarism, copyright infringement, defamation, breach of confidentiality, or violation of third-party rights. The journal reserves the absolute right to reject, withdraw, retract, or remove any manuscript or published article in case of ethical or legal violations, without incurring any liability.

TACIT COLLUSION BY ALGORITHM: RETHINKING HORIZONTAL AGREEMENT FRAMEWORKS UNDER COMPETITION LAW

With Special Reference to the Competition Act, 2002 (India)

AUTHORED BY - HARSH VARDHAN SINGH

(4th Year B.A. LL.B. (Hons.), National Law Institute University, Bhopal)

CO-AUTHOR - KRITI SHARMA

(4th Year B.Sc. LL.B. (Hons.), National Law Institute University, Bhopal)

Abstract.

Competition law draws its central line between unlawful agreement and lawful independent conduct. Self-learning pricing algorithms blur that line: they can reach and sustain supra-competitive prices without any exchange of assurances between human decision-makers. This paper asks whether the horizontal-agreement frameworks of the United States, the European Union and, in particular, India can accommodate that phenomenon. It classifies algorithmic pricing into three categories (algorithms as instruments of human cartels, shared-software or “hub-and-spoke” arrangements, and autonomous machine collusion) and compares the Sherman Act, Article 101 TFEU and Section 3 of the Competition Act, 2002. Drawing on the Supreme Court’s reading of “agreement” in section 2(b), the Competition Commission of India’s cartel jurisprudence, the Competition (Amendment) Act, 2023 and the CCI’s 2025 Market Study on Artificial Intelligence and Competition, the paper argues that the first two categories are largely manageable under existing doctrine, whereas the third exposes a genuine enforcement gap. It proposes a structured evidentiary approach built on algorithmic plus factors, rebuttable presumptions and a standard of “algorithmic foreseeability,” together with Indian-specific reforms in evidence, remedies and institutional capacity.

Keywords: *algorithmic collusion; concerted practice; hub-and-spoke; Competition Act, 2002; Competition Commission of India; Article 101 TFEU; Sherman Act; plus factors.*

I. Introduction

In 2015 the US Department of Justice secured a guilty plea from David Topkins, an e-commerce executive who had agreed with competitors to fix the prices of posters sold on Amazon Marketplace and who had used specially written code to implement that agreement.¹ The case was doctrinally unremarkable: there was an agreement, and the software merely carried it out. Its significance lay elsewhere. It showed enforcers that pricing software can serve as the machinery of a cartel, and it raised a harder question that remains unresolved a decade later. What if no human ever reaches an agreement, and the software alone discovers that cooperation pays?

The question matters because of how markets now operate. Pricing algorithms observe rivals' prices in real time, reprice within minutes and, where they rely on reinforcement learning, improve through trial and error. These are precisely the conditions that economists identify as making tacit coordination easier to sustain: market transparency, rapid detection of deviation and credible retaliation.² Enforcers have taken notice. Margrethe Vestager, then European Commissioner for Competition, told firms in 2017 that those who deploy automated systems will be held responsible for what those systems do, and so had better understand how they work.³

India is not insulated from these developments. Online marketplaces, ride-hailing platforms, aggregators and travel portals now set or recommend prices algorithmically for hundreds of millions of Indian consumers, and the Competition Commission of India (CCI) identified the spread of pricing algorithms as a potential source of coordination risk in its 2020 study of e-commerce.⁴ The Indian statute is also drafted more broadly than its American counterpart: it reaches any "arrangement or understanding or action in concert, whether or not formal or in writing."⁵ Yet the Supreme Court's only encounter with algorithmic pricing so far, *Samir Agrawal v. Competition Commission of India*, was resolved on the footing that there was no agreement to speak of,⁶ and the CCI's own 2025 Market Study on Artificial Intelligence

¹*United States V. Topkins*, No. Cr 15-00201 (N.D. Cal. 2015); Press Release, U.S. Dep't Of Just., Former E-Commerce Executive Charged With Price Fixing In The Antitrust Division's First Online Marketplace Prosecution (Apr. 6, 2015).

²ORG. FOR ECON. CO-OPERATION & DEV., ALGORITHMS AND COLLUSION: COMPETITION POLICY IN THE DIGITAL AGE 17–32 (2017); George J. Stigler, *A Theory Of Oligopoly*, 72 J. POL. ECON. 44 (1964).

³Margrethe Vestager, Comm'r For Competition, Eur. Comm'n, *Algorithms And Competition*, Address At The Bundeskartellamt 18th Conference On Competition (Mar. 16, 2017).

⁴COMPETITION COMM'N OF INDIA, MARKET STUDY ON E-COMMERCE IN INDIA: KEY FINDINGS AND OBSERVATIONS (Jan. 8, 2020).

⁵Competition Act, 2002, No. 12, Acts Of Parliament, 2003, § 2(B) (India).

⁶*Samir Agrawal V. Competition Comm'n Of India*, (2021) 3 S.C.C. 206 (India).

concedes that autonomous collusion strains a statute built around agreement.⁷ The Indian position therefore deserves sustained analysis rather than a passing comparative reference. This paper examines whether the concept of horizontal agreement, the foundation of cartel prohibition, can bear the weight that algorithmic markets place on it. It asks three questions. First, how far do existing agreement-based prohibitions in the United States, the European Union and India reach algorithmic pricing? Second, where, if anywhere, do they fail? Third, what evidentiary and institutional reforms would close the gap without penalising legitimate dynamic pricing? The method is doctrinal and comparative, drawing on statutes, case law, agency decisions and the economic literature. Parts II and III explain the doctrinal limits of “agreement” and classify algorithmic pricing; Part IV outlines the US and EU approaches; Part V analyses the Indian framework in depth; Part VI compares the three; and Part VII proposes evidentiary standards for attributing algorithmic intent. The argument is that existing law adequately reaches algorithms used to implement human collusion and, with some strain, shared-software arrangements, but that truly autonomous collusion requires a recalibrated, evidence-based liability standard rather than a wholesale rewriting of the prohibition.

II. The Limits of “Agreement” and “Concerted Practice”

Cartel law in each of the three jurisdictions rests on a shared premise: firms must determine their commercial strategy independently. The Court of Justice articulated the principle in *Suiker Unie*, holding that it strictly precludes any direct or indirect contact between competitors whose object or effect is to influence a rival’s conduct or to disclose the course of conduct a firm has itself decided to adopt.⁸ Crucially, the same passage confirms that the rule does not deprive operators of the right to adapt intelligently to the existing and anticipated conduct of their competitors. Law thus tolerates rational interdependence but condemns communication that replaces it.

The EU’s category of “concerted practice” was created to catch conduct falling short of a formal agreement. In *Dyestuffs* the Court described it as a form of coordination in which firms knowingly substitute practical cooperation for the risks of competition.⁹ Yet the concept has always required some form of contact. In *Wood Pulp* the Court held that parallel behaviour is

⁷COMPETITION COMM’N OF INDIA, MARKET STUDY ON ARTIFICIAL INTELLIGENCE AND COMPETITION (Oct. 6, 2025).

⁸Joined Cases 40/73 Et Al., *Suiker Unie V. Comm’n*, 1975 E.C.R. 1663, ¶ 174.

⁹Case 48/69, *Imperial Chem. Indus. Ltd. V. Comm’n*, 1972 E.C.R. 619, ¶ 64.

not proof of concertation unless concertation is the only plausible explanation for it.¹⁰ The US position is materially identical. The Supreme Court has held that acceptance by competitors, without prior agreement, of an invitation to participate in a plan whose necessary consequence is restraint of trade may establish a conspiracy,¹¹ but it has equally insisted that conscious parallelism is not itself unlawful. In *Brooke Group* it described tacit collusion, “sometimes called oligopolistic price coordination or conscious parallelism,” as a process that is “not in itself unlawful,”¹² and in *Twombly* it held that parallel conduct without more does not suggest conspiracy.¹³

The resulting “oligopoly problem” is old. Donald Turner argued in 1962 that a rational firm in a concentrated market that raises price, expecting rivals to follow, has not “agreed” to anything; it has simply recognised interdependence.¹⁴ Richard Posner, by contrast, suggested that tacit collusion should be reachable where its anticompetitive effects are demonstrable,¹⁵ and Louis Kaplow has more recently argued that the very concept of “agreement” is an unreliable proxy for harm.¹⁶ The law has largely followed Turner. Tacit collusion is tolerated because it is hard to prove, hard to remedy without ordering firms to compete irrationally, and hard to distinguish from legitimate pricing.

Algorithms disturb this equilibrium in two ways. First, they expand the zone of tacit coordination: transparency and speed that were once rare in oligopolistic markets become standard features of online retail. Second, they erode the conceptual basis of the “meeting of minds” that courts and competition authorities treat as the hallmark of agreement. Where a self-learning system converges on a collusive equilibrium, there is no communication to find, no assurance exchanged and, arguably, no human state of mind to examine. The question is therefore whether liability should keep tracking a human “agreement,” or attach to the foreseeable creation of coordinated outcomes through tools that firms design, deploy and control.¹⁷

¹⁰Joined Cases C-89/85 Et Al., *A. Ahlström Osakeyhtiö V. Comm’n*, 1993 E.C.R. I-1307, ¶ 71.

¹¹*Interstate Circuit, Inc. V. United States*, 306 U.S. 208, 226–27 (1939).

¹²*Brooke Grp. Ltd. V. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 227 (1993).

¹³*Bell Atl. Corp. V. Twombly*, 550 U.S. 544, 556–57 (2007).

¹⁴Donald F. Turner, *The Definition Of Agreement Under The Sherman Act: Conscious Parallelism And Refusals To Deal*, 75 HARV. L. REV. 655 (1962).

¹⁵Richard A. Posner, *Oligopoly And The Antitrust Laws: A Suggested Approach*, 21 STAN. L. REV. 1562 (1969).

¹⁶LOUIS KAPLOW, *COMPETITION POLICY AND PRICE FIXING* (Princeton Univ. Press 2013).

¹⁷Salil K. Mehra, *Antitrust And The Robo-Seller: Competition In The Time Of Algorithms*, 100 MINN. L. REV. 1323 (2016); Michal S. Gal, *Algorithms As Illegal Agreements*, 34 BERKELEY TECH. L.J. 67 (2019).

III. A Taxonomy of Algorithmic Pricing

Ariel Ezrachi and Maurice Stucke's influential typology distinguishes four scenarios: the "Messenger," the "Hub-and-Spoke," the "Predictable Agent" and the "Digital Eye."¹⁸ For legal analysis it is more useful to collapse these into three categories according to the role of human agreement.

A. Algorithms as Instruments of Human Collusion

In the first category, humans agree and the algorithm implements and polices the agreement. *Topkins* is the paradigm. So is the UK Competition and Markets Authority's decision concerning online poster sales, in which two sellers agreed not to undercut each other on Amazon UK and used automated repricing software configured to give effect to that agreement.¹⁹ The technology made the cartel more effective and harder to detect, but it did not change its legal character: the algorithm is a mere messenger, and traditional doctrine applies.²⁰

B. Shared Algorithms and Hub-and-Spoke Arrangements

The second category involves competitors who independently adopt the same pricing tool supplied by a third party, the "hub." The legal difficulty is that the spokes may never communicate with each other, and the hub is not a competitor. Two cases illustrate the range. In *Eturas*, Lithuanian travel agencies used a common online booking platform whose administrator sent a message to users announcing a cap on discounts and then technically implemented it. The Court of Justice held that agencies that were aware of the message could be presumed to have participated in a concerted practice unless they publicly distanced themselves from it or reported it to the authorities, but that a presumption could not rest merely on the message having been sent.²¹ In the United States, the *RealPage* litigation alleges that landlords supplied non-public, competitively sensitive data to a common software vendor whose recommendations were then largely followed, producing aligned rents.²² Earlier, in *Meyer v. Kalanick*, a federal court allowed a hub-and-spoke theory based on Uber's surge-

¹⁸ARIEL EZRACHI & MAURICE E. STUCKE, VIRTUAL COMPETITION (Harv. Univ. Press 2016); Ariel Ezrachi & Maurice E. Stucke, *Artificial Intelligence & Collusion: When Computers Inhibit Competition*, 2017 U. ILL. L. REV. 1775.

¹⁹Competition & Mkts. Auth., *Online Sales Of Discretionary Consumer Products*, Case 50223 (Aug. 12, 2016).

²⁰ORG. FOR ECON. CO-OPERATION & DEV., *Supra* Note 2, At 26–28.

²¹Case C-74/14, *Eturas Uab V. Lietuvos Respublikos Konkurencijos Taryba*, ECLI:Eu:C:2016:42, ¶¶ 27–50 (Jan. 21, 2016).

²²*In Re Realpage, Inc., Rental Software Antitrust Litig. (No. II)*, 709 F. Supp. 3d 478 (M.D. Tenn. 2023).

pricing algorithm to survive a motion to dismiss.²³

Such cases are prosecutable because a plausible agreement exists at some level, whether between the vendor and each user or among users who understand that their rivals are also adopting the tool. The critical variables are what data the tool uses, whether users retain discretion to depart from its recommendations, and what users know about their rivals' participation. The Indian ride-hailing litigation, discussed in Part V, shows what happens when these variables point the other way: where drivers merely accept a platform's fares without any understanding among themselves, the hub-and-spoke theory fails for want of a rim.

C. Autonomous Machine Collusion

The third category is the genuinely novel one. Here competitors deploy independently designed, self-learning algorithms with no shared vendor, no communication and no instruction to collude, and the algorithms nonetheless learn to price above competitive levels. The evidence for this possibility is stronger than sceptics once assumed. In a widely cited experiment, Calvano and co-authors let Q-learning algorithms interact repeatedly in a simulated oligopoly. The algorithms consistently learned supra-competitive prices and sustained them through punishment strategies, namely temporary price cuts after deviation followed by a return to high prices, without any communication.²⁴ Later work qualifies the result: some experiments find that collusive outcomes depend on the learning environment and are less robust than first thought.²⁵ Field evidence is limited but suggestive. A study of the German retail gasoline market found that adoption of algorithmic pricing was associated with significantly higher margins in markets where competitors also adopted it.²⁶

Two caveats are warranted. Simulations use simplified markets, so the real-world prevalence of autonomous collusion remains uncertain. Moreover, as Joseph Harrington has argued, the legal question is not whether collusion can occur, but whether its outcomes can be attributed to a firm's choices about how its algorithm is designed and trained.²⁷ That attribution problem is the heart of the matter.

²³*Meyer V. Kalanick*, 174 F. Supp. 3d 817 (S.D.N.Y. 2016).

²⁴Emilio Calvano Et Al., *Artificial Intelligence, Algorithmic Pricing, And Collusion*, 110 AM. ECON. REV. 3267 (2020).

²⁵Timo Klein, *Autonomous Algorithmic Collusion: Q-Learning Under Sequential Pricing*, 52 RAND J. ECON. 538 (2021); Zach Y. Brown & Alexander Mackay, *Competition In Pricing Algorithms*, 15 AM. ECON. J.: MICROECON. 109 (2023).

²⁶Stephanie Assad Et Al., *Algorithmic Pricing And Competition: Empirical Evidence From The German Retail Gasoline Market*, 132 J. POL. ECON. 723 (2024).

²⁷Joseph E. Harrington Jr., *Developing Competition Law For Collusion By Autonomous Artificial Agents*, 14 J. COMPETITION L. & ECON. 331 (2018).

IV. The United States and the European Union

A. United States: Section 1 of the Sherman Act and Section 5 of the FTC Act

Section 1 of the Sherman Act prohibits “contract[s], combination[s] . . . or conspirac[ies]” in restraint of trade.²⁸ Because *Twombly* demands factual allegations that make agreement plausible, rather than merely consistent with parallel pricing, plaintiffs must plead some form of “plus factor.” The recent algorithmic cases show courts applying this standard with attention to the role of the software. In *Duffy v. Yardi Systems* a federal court allowed claims to proceed where landlords allegedly fed confidential data into a common platform and the vendor’s recommendations were said to be effectively followed.²⁹ By contrast, the Ninth Circuit in *Gibson v. Cendyn* affirmed dismissal where hotels independently licensed revenue-management software, holding in substance that the complaint did not plausibly allege an agreement among the hotels, and noting that the analysis might differ if the vendor had pooled competitors’ confidential information.³⁰ Federal enforcers have meanwhile pursued the information-pooling theory directly: in November 2025 the Department of Justice filed a proposed consent decree with RealPage restricting its use of non-public competitor data in generating pricing recommendations, without findings of wrongdoing.³¹

Section 5 of the Federal Trade Commission Act, which prohibits “unfair methods of competition,” offers a potentially wider tool because it can reach facilitating practices that do not amount to a Sherman Act conspiracy.³² However, the leading appellate authority, *E.I. du Pont de Nemours & Co. v. FTC* (the *Ethyl* case), cautions that such liability requires evidence of oppressive conduct or anticompetitive intent, or the absence of a legitimate business justification.³³ That requirement is difficult to satisfy where the defendant has simply adopted a profit-maximising algorithm.

B. European Union: Article 101 TFEU

Article 101(1) TFEU prohibits agreements between undertakings, decisions by associations of undertakings and concerted practices that have as their object or effect the prevention, restriction or distortion of competition. The EU framework is, on its face, better suited than the US approach to algorithmic markets, for three reasons. First, concerted practice does not

²⁸15 U.S.C. § 1.

²⁹*Duffy V. Yardi Sys., Inc.*, No. 2:23-Cv-01391 (W.D. Wash. Dec. 4, 2024).

³⁰*Gibson V. Cendyn Grp., Llc*, 148 F.4th 1069 (9th Cir. 2025).

³¹Proposed Final Judgment, *United States V. Realpage, Inc.* (M.D.N.C. Nov. 24, 2025).

³²15 U.S.C. § 45.

³³*E.I. Du Pont De Nemours & Co. V. Ftc*, 729 F.2d 128 (2d Cir. 1984).

require an agreement, only knowing substitution of cooperation for competitive risk. Second, the Court has developed evidentiary presumptions: in *T-Mobile Netherlands* it held that where firms participate in a meeting and remain active in the market, there is a presumption that they take account of the information exchanged,³⁴ and *Eturas* extended that logic to messages received through a shared digital platform. Third, *VM Remonts* establishes that an undertaking may be liable for a concerted practice implemented through an independent service provider if it knew of the anticompetitive objective, or could reasonably have foreseen and accepted the risk.³⁵ That foreseeability standard is directly relevant to firms that outsource pricing to vendors or machine-learning systems. The Commission's 2023 Horizontal Guidelines expressly address the use of algorithms in the context of concerted practices and information exchange.³⁶ Yet the EU approach has limits where no communication of any kind exists. Merger control provides a partial answer: the *Airtours* conditions for collective dominance (market transparency, a credible deterrent mechanism and absence of effective outside constraint) identify structural settings in which tacit coordination is likely, and algorithmic transparency may make those conditions easier to satisfy.³⁷ But merger control operates *ex ante* and cannot address coordination that emerges after market entry or organic growth.

V. The Indian Framework: Statute, Case Law and Institutions

A. Statutory Architecture

India's statutory language is, in several respects, the most accommodating of the three jurisdictions. Section 3(1) of the Competition Act, 2002 prohibits agreements in respect of production, supply, distribution, storage, acquisition or control of goods or services that cause or are *likely to cause* an appreciable adverse effect on competition (AAEC) within India.³⁸ Section 2(b) defines "agreement" to include "any arrangement or understanding or action in concert, whether or not formal or in writing," and Section 3(3) presumes AAEC for agreements and practices among competitors that, among other things, directly or indirectly determine purchase or sale prices.³⁹ Section 2(c) defines a "cartel" as an association of producers, sellers,

³⁴Case C-8/08, *T-Mobile Neth. Bv V. Raad Van Bestuur Van De Nederlandse Mededingingsautoriteit*, Ecli:Eu:C:2009:343, ¶¶ 51–53 (June 4, 2009).

³⁵Case C-542/14, *Vm Remonts V. Konkurences Padome*, Ecli:Eu:C:2016:578, ¶¶ 28–33 (July 21, 2016).

³⁶Commission Guidelines On The Applicability Of Article 101 Of The Treaty On The Functioning Of The European Union To Horizontal Co-Operation Agreements, 2023 O.J. (C 259) 1.

³⁷Case T-342/99, *Airtours Plc V. Comm'n*, 2002 E.C.R. Ii-2585, ¶ 62.

³⁸Competition Act § 3(1). Section 3(2) Declares Such Agreements Void.

³⁹*Id.* §§ 2(B), 3(3)(A). The Presumption In § 3(3) Extends To Any Practice Carried On, Or Decision Taken By, Any Association Of Enterprises Or Association Of Persons, Including Cartels.

distributors, traders or service providers who “by agreement amongst themselves” limit, control or attempt to control prices or supply.⁴⁰ The vocabulary of “action in concert” is therefore technology-neutral and, on its face, wider than the US “contract, combination or conspiracy.” Three features of the Indian statute nevertheless matter for algorithms. First, the Act speaks of “enterprises” and “persons”; an algorithm is neither, since the definition of “person” is confined to natural and juridical persons.⁴¹ Liability must therefore be attributed to the firm that deploys the algorithm. Second, the presumption in Section 3(3) is a presumption of *effect*, not of *agreement*: the informant or the Director General must still establish an agreement, arrangement or action in concert before the presumption operates. That is the point at which autonomous collusion escapes the statute. Third, Section 32 applies the Act to conduct outside India that has an effect on competition within India,⁴² which is significant because many pricing engines are developed and operated by foreign vendors. In assessing AAEC under Section 19(3), the CCI must also weigh factors such as barriers to entry, foreclosure, consumer benefit and improvements in production or distribution,⁴³ which gives a respondent a statutory route to argue that dynamic pricing is efficiency-enhancing.

B. “Agreement” and Circumstantial Evidence in Indian Cartel Jurisprudence

The Supreme Court has read the definition of agreement expansively. In *Coordination Committee of Artists and Technicians* it emphasised that “agreement” under the Act is wider than a formal contract and that the Act’s objectives require a purposive reading,⁴⁴ and in *Rajasthan Cylinders* it accepted that cartels may be established by circumstantial evidence, since direct evidence is rarely available.⁴⁵ In *Excel Crop Care* the Court, while confining penalties to relevant turnover, stressed that deterrence is the purpose of the penalty provisions in cartel cases.⁴⁶ The CCI’s own practice is consistent with this approach. In the cement matter it treated parallel pricing and capacity behaviour, together with information exchange facilitated by the industry association, as evidence of concerted action rather than independent adaptation.⁴⁷ In the beer cartel, the Commission found that competitors had used the All India

⁴⁰*Id.* § 2(C).

⁴¹*Id.* §§ 2(H) (Defining “Enterprise”), 2(L) (Defining “Person”).

⁴²*Id.* § 32.

⁴³*Id.* § 19(3)(A)–(F).

⁴⁴*Competition Comm’n Of India V. Coordination Comm. Of Artists & Technicians Of W. Bengal Film & Television*, (2017) 5 S.C.C. 17 (India).

⁴⁵*Rajasthan Cylinders & Containers Ltd. V. Union Of India*, (2018) 8 S.C.C. 668 (India).

⁴⁶*Excel Crop Care Ltd. V. Competition Comm’n Of India*, (2017) 8 S.C.C. 47 (India).

⁴⁷*Builders Ass’n Of India V. Cement Mfrs.’ Ass’n*, Case No. 29 Of 2010 (Competition Comm’n Of India June 20, 2012) (India). The Order Was The Subject Of Prolonged Appellate Proceedings; The Point Relied On Here Is The

Brewers' Association as a platform to exchange commercially sensitive information and align price changes, imposed penalties of about ₹873 crore, and gave full leniency to the applicant; the NCLAT dismissed the appeals in December 2022.⁴⁸

Two lessons follow. The first is that Indian law, like EU law, does not treat parallel conduct as unlawful in itself but allows it to be combined with "plus factors" such as information exchange through a common platform. That is the doctrinal base on which algorithmic plus factors can be built (Part VII). The second is that the CCI's cartel cases have involved human communication, trade associations and leniency applicants. The evidentiary toolkit has not yet been tested on a case in which none of these exists.

C. Algorithms before Indian Authorities

The leading Indian decision on algorithmic pricing is *Samir Agrawal*. The informant alleged that the pricing algorithms of Ola and Uber fixed fares for drivers who would otherwise compete, that the apps functioned like a trade association facilitating a cartel, and that the two platforms were in a hub-and-spoke arrangement. The CCI closed the matter at the prima facie stage under Section 26(2). It reasoned that a hub-and-spoke cartel presupposes a conspiracy to fix prices among the spokes, that evidence of a meeting of minds is a *sine qua non* of a Section 3 contravention, that the platforms were not associations of drivers, and that algorithmically determined prices set by the platform could not, without more, amount to collusion among drivers who joined independently.⁴⁹ The NCLAT dismissed the appeal in 2019,⁵⁰ and the Supreme Court dismissed the further appeal in December 2020.⁵¹

The decision is sometimes read as holding that algorithmic pricing is immune from Section 3. It does not. It turned on the absence of any horizontal agreement among the drivers, and on the unilateral character of the platform's pricing, which is a vertical matter. Notably, the Competition (Amendment) Act, 2023 would not necessarily alter the result on the same facts. The new proviso to Section 3(3) deems a non-competing facilitator to be part of an agreement only if it participates or intends to participate in furtherance of an *agreement among competitors*; absent evidence that the drivers had some understanding among themselves, there

Commission's Analytical Method, Not The Final Quantum.

⁴⁸*In Re Alleged Anti-Competitive Conduct In The Beer Market In India*, Suo Motu Case No. 06 Of 2017 (Competition Comm'n Of India Sept. 24, 2021) (India), *Aff'd Sub Nom. United Breweries Ltd. V. Competition Comm'n Of India* (Nat'l Co. L. Appellate Tribunal Dec. 23, 2022) (India).

⁴⁹*Samir Agrawal V. Ani Techs. Pvt. Ltd.*, Case No. 37 Of 2018 (Competition Comm'n Of India Nov. 6, 2018) (India).

⁵⁰*Samir Agrawal V. Competition Comm'n Of India* (Nat'l Co. L. Appellate Tribunal May 29, 2019) (India).

⁵¹*Samir Agrawal*, (2021) 3 S.C.C. 206.

is still no rim to the wheel. The case also shows the evidentiary posture the CCI adopts at the threshold: a theory of algorithmic collusion must be supported by facts indicating concertation, not by the mere observation that a common algorithm yields common prices.

Other decisions show that the CCI does not regard algorithms as a legal black box. In *Matrimony.com v. Google* the Commission examined Google's search-ranking design and attributed its effects to Google as a dominant enterprise under Section 4, rejecting the suggestion that an algorithmic output is neutral because it is automated.⁵² Similarly, in the 2022 order concerning MakeMyTrip-Goibibo, the Commission scrutinised parity obligations and their interaction with search ranking and visibility on the platform.⁵³ Both are unilateral or vertical cases, but they establish a principle that is central to Part VII: a firm is answerable for the competitive effects of the algorithms it designs and deploys.

D. The Competition (Amendment) Act, 2023 and Related Reforms

The Competition (Amendment) Act, 2023 added a proviso to Section 3(3) so that an enterprise or person not engaged in identical or similar trade is also presumed to be part of the agreement if it participates, or intends to participate, in its furtherance.⁵⁴ This is India's statutory recognition of the hub-and-spoke cartel, and it offers a direct route against software vendors who knowingly operate a common pricing tool for competing users. The Act also introduced "leniency plus," empowered the CCI to compute cartel penalties on global turnover (displacing the relevant-turnover approach of *Excel Crop Care*), and was followed by the Competition Commission of India (Lesser Penalty) Regulations 2024 and the Competition Commission of India (Determination of Monetary Penalty) Guidelines 2024.⁵⁵ These reforms strengthen deterrence and detection for human cartels. They do not address the case in which the only "participant" is a learning system.

⁵²*Matrimony.Com Ltd. V. Google Llc*, Case Nos. 07 & 30 Of 2012 (Competition Comm'n Of India Feb. 8, 2018) (India).

⁵³*Fed'n Of Hotel & Rest. Ass'ns Of India V. Makemytrip India Pvt. Ltd.*, Case No. 14 Of 2019 (Competition Comm'n Of India Oct. 23, 2022) (India).

⁵⁴Competition (Amendment) Act, 2023, No. 9, Acts Of Parliament, 2023 (India) (Amending Competition Act § 3(3)). The Reform Followed The Recommendations Of MINISTRY OF CORP. AFFS., REPORT OF THE COMPETITION LAW REVIEW COMMITTEE (2019), And STANDING COMM. ON FIN., 17TH LOK SABHA, FIFTY-THIRD REPORT ON THE COMPETITION (AMENDMENT) BILL, 2022 (2022).

⁵⁵Competition Comm'n Of India (Lesser Penalty) Regulations, 2024 (India); Competition Comm'n Of India (Determination Of Monetary Penalty) Guidelines, 2024 (India); Competition Act §§ 27(B), 46. Settlement And Commitment Procedures Under §§ 48a And 48b Are Not Available For Cartel Contraventions Under § 3(3).

E. Market Studies and the Digital Competition Bill

The CCI's 2020 e-commerce study was its first systematic engagement with algorithmic pricing.⁵⁶ In October 2025 it published a Market Study on Artificial Intelligence and Competition, prepared with the Management Development Institute. The study identifies algorithmic collusion as a significant risk, recognises that signalling and self-learning algorithms can stabilise tacit collusion even in markets previously thought immune, adopts a taxonomy of collusion-prone algorithms, and recommends that enterprises, particularly those with market power, adopt voluntary self-audit frameworks covering documentation of algorithmic objectives and data, periodic review of outputs, human-review triggers and audit logs.⁵⁷ The study candidly acknowledges that proving algorithmic collusion is difficult where the law demands evidence of a meeting of minds. A light-touch self-audit recommendation is a sensible first step, but because it is voluntary and carries no enforcement consequence, it does not answer the evidentiary question of how liability is to be established.

The draft Digital Competition Bill, 2024, recommended by the Committee on Digital Competition Law and published for consultation in March 2024, would impose ex ante obligations on “systemically significant digital enterprises.”⁵⁸ Its focus is on gatekeeper conduct such as self-preferencing and data use, not on horizontal coordination among ordinary sellers. It therefore does not fill the gap identified here.

F. Where the Indian Framework Falls Short

The Indian framework can be summarised in four observations. First, the first and second categories of algorithmic pricing are within reach: *Topkins*-type conduct falls squarely within Section 3(3)(a), and a vendor who knowingly coordinates competitors' prices is caught by the 2023 proviso. Second, the presumption in Section 3(3) does not relieve the CCI of proving agreement, so autonomous collusion falls outside it. Third, the Act has no mechanism for attributing a learning system's strategy to the deploying enterprise, other than the general principle of corporate attribution. Fourth, procedural and evidentiary rules, remedies and institutional capacity were designed for human cartels. Part VII addresses each.

⁵⁶COMPETITION COMM'N OF INDIA, MARKET STUDY ON E-COMMERCE IN INDIA, *Supra* Note 4.

⁵⁷COMPETITION COMM'N OF INDIA, MARKET STUDY ON ARTIFICIAL INTELLIGENCE AND COMPETITION, *Supra* Note 7.

⁵⁸MINISTRY OF CORP. AFFS., REPORT OF THE COMMITTEE ON DIGITAL COMPETITION LAW (Feb. 2024); Digital Competition Bill, 2024 (Draft) (India).

VI. Comparative Assessment

Table 1 summarises how the three regimes treat the three categories of algorithmic pricing.

Table 1: Treatment of algorithmic pricing across jurisdictions

Category	United States (Sherman Act § 1)	European Union (Art. 101 TFEU)	India (Competition Act, 2002, §§ 2(b), 3)
Core concept	Contract, combination or conspiracy; <i>Twombly</i> plausibility	Agreement or concerted practice; knowing substitution of cooperation for risk	Agreement, arrangement, understanding or action in concert; § 3(3) presumption of AAEC
1. Algorithm implements human cartel	Covered (<i>Topkins</i>)	Covered (CMA poster case; Messenger scenario)	Covered by § 3(3)(a); evidence of agreement required
2. Shared vendor / hub-and-spoke	Fact-dependent: <i>Duffy v. Yardi</i> proceeds; <i>Gibson v. Cendyn</i> dismissed	Covered where awareness or foreseeability shown (<i>Eturas</i> ; <i>VM Remonts</i>)	Covered by § 3(3) proviso (2023) if horizontal agreement shown; <i>Samir Agrawal</i> failed for want of one
3. Autonomous collusion	Largely outside § 1	Uncertain; <i>Airtours</i> collective dominance only in mergers	Uncertain; presumption does not supply agreement; CCI AI Study (2025) recommends voluntary self-audit
Penalties / remedies	Treble damages; criminal liability for hardcore cartels; consent decrees	Fines up to 10% of turnover; commitments	Penalty up to three times profit or 10% of (global) turnover; cease-and-desist; leniency and leniency plus

Three observations emerge. All three jurisdictions can address the first category and, with varying difficulty, the second. The EU and India have more flexible vocabulary (“concerted practice,” “action in concert”) than the US, but it remains untested against autonomous collusion. And US reliance on pleading standards and information-sharing theories leaves the autonomous scenario, with no pooled data and no vendor, outside current enforcement. India’s additional strength is statutory: the proviso to Section 3(3), the presumption of AAEC and the extraterritorial reach of Section 32. Its additional weakness is practical: a decision-making culture, shaped by *Samir Agrawal*, that demands a demonstrable meeting of minds at the threshold stage.

VII. Enforcement Challenges and Proposed Evidentiary Standards

A. The Challenges

Three obstacles stand out. The first is evidential. Traditional cartel enforcement relies on documents, witnesses, leniency applicants and dawn raids, but an autonomous algorithm leaves no meeting notes. The relevant evidence is behavioural (pricing patterns) and technical (code, training data, objective functions and logs), and agencies currently lack both the expertise and the legal powers to interrogate it systematically. In India the CCI's Director General has search and seizure and civil-court powers,⁵⁹ and electronic records are admissible if the statutory certificate requirement is met.⁶⁰ But those provisions presuppose that the relevant data can be identified, preserved and certified by a human custodian; they say nothing about reconstructing why a model chose a price.

The second is attribution. Competition law is a law of undertakings: liability presupposes that conduct can be imputed to a firm. An algorithm has no legal personality, and a self-learning system may adopt a strategy that its designers neither intended nor anticipated. Holding the firm strictly liable for any collusive outcome would be disproportionate and could chill the adoption of efficient dynamic pricing, but disclaiming liability altogether would let firms outsource anticompetitive outcomes to machines.

The third is discrimination between competition and collusion. A pricing algorithm that rapidly matches rivals' prices is doing exactly what competition law expects of a rational firm responding to market conditions. Over-enforcement would penalise legitimate responsiveness and discourage the transparency and price comparison that benefit consumers.

B. A Proposed Framework

Rather than abandoning the agreement requirement, the law should adapt its evidentiary architecture in four steps.

Step 1: Algorithmic plus factors. Courts and the CCI already use plus factors, such as actions against self-interest, motive, opportunity and traditional evidence of communication, to distinguish agreement from parallelism. These should be updated for algorithmic markets and divided into three groups. Outcome evidence includes price rigidity combined with rapid matching, observable cycles of deviation, punishment and reversion, and sustained supra-

⁵⁹Competition Act §§ 36(2), 41.

⁶⁰Bharatiya Sakshya Adhiniyam, 2023, No. 47, Acts Of Parliament, 2023, § 63 (India) (Replacing Indian Evidence Act, 1872, § 65b); *Arjun Panditrao Khotkar V. Kailash Kushanrao Gorantyal*, (2020) 7 S.C.C. 1 (India); *Anvar P.V. V. P.K. Basheer*, (2014) 10 S.C.C. 473 (India).

competitive margins that cannot be explained by costs or demand. Design evidence includes an objective function that rewards joint-profit outcomes, training environments that simulate rival behaviour, the ability to observe rivals' prices in real time, and the absence of constraints that would prevent convergence on high prices. Information evidence covers the use of non-public competitor data, vendor-mediated pooling, and the degree to which users follow recommendations without independent review. In India the CCI could adopt this list through guidance issued under its advocacy mandate in Section 49(3), and the Supreme Court's acceptance of circumstantial proof in *Rajasthan Cylinders* supplies the doctrinal footing.

Step 2: A rebuttable presumption. Where outcome evidence and at least one category of design or information evidence is established in a concentrated market, a rebuttable presumption of concertation should arise. This has a sound pedigree. EU law already presumes that participation in a meeting, or awareness of a platform message, entails participation in a concerted practice unless rebutted,⁶¹ and Section 3(3) of India's Act presumes AAEC for specified agreements. Indian law would need a small statutory step: an Explanation to Section 3 providing that the use of an algorithm by an enterprise is the act of that enterprise, and that proof of the Step 1 factors raises a rebuttable presumption of "action in concert" within Section 2(b). The firm could rebut by demonstrating algorithmic governance, namely documented design rationale, pre-deployment testing against collusion benchmarks, audit logs, human oversight and prompt correction of problematic behaviour. This turns the self-audit that the CCI's 2025 study recommends from a voluntary best practice into the central defence, giving firms a concrete reason to adopt it.

Step 3: A foreseeability standard of intent. The *VM Remonts* test of knowledge, or reasonable foreseeability and acceptance of risk, provides a workable mental element.⁶² Adapted to algorithms, a firm should be liable where it knew, or ought reasonably to have foreseen, that deploying a particular algorithm in the relevant market conditions would likely produce coordinated outcomes, and it accepted that risk. This standard stops short of strict liability yet reaches deliberate design for collusion, wilful blindness and reckless deployment. It parallels Harrington's proposal to focus on whether the algorithm's properties, as designed or trained, are such that it is likely to produce collusion rather than competition,⁶³ and it echoes the due-diligence logic already present in Indian law, where a person in charge of a company escapes

⁶¹*T-Mobile Neth.*, Ecli:Eu:C:2009:343, ¶¶ 51–53; *Eturas*, Ecli:Eu:C:2016:42, ¶¶ 40–50.

⁶²*Vm Remonts*, Ecli:Eu:C:2016:578, ¶¶ 28–33.

⁶³Harrington, *Supra* Note 27.

liability under Section 48 by proving lack of knowledge or the exercise of all due diligence.⁶⁴ The same idea applies, by analogy, to the enterprise itself.

Step 4: Calibrated remedies. Because tacit and autonomous collusion occupy a grey zone, fines at cartel levels would be disproportionate for first-time, non-intentional cases. Enforcers should instead prioritise behavioural remedies and commitments, such as mandatory audits, restrictions on data inputs, randomisation or delay in repricing, and design constraints, reserving punitive sanctions for deliberate or reckless conduct. Section 27 of the Competition Act already allows the CCI to issue cease-and-desist directions and such other orders as it deems fit,⁶⁵ and the 2024 Penalty Guidelines, with their aggravating and mitigating circumstances, provide a vehicle for recognising algorithmic governance as a mitigating factor. The RealPage consent decree, with its limits on non-public data and its monitorship, offers a preliminary template. Market-study powers, which the CCI's recent work illustrates but which India's Act does not yet pair with remedial authority, would be valuable complements.

C. Institutional Capacity and Counter-arguments

None of this is feasible without institutional investment. Agencies need data scientists, powers to demand access to code, training data and logs, and sandbox environments in which suspect algorithms can be tested against simulated rivals. For India this means building a technical unit within the CCI, amending the General Regulations to specify the form in which algorithmic evidence must be produced, and coordinating with sectoral regulators and with the data-governance regime that now applies to personal data.

The principal objection is that a presumption-based regime could deter pro-competitive innovation. Dynamic pricing delivers efficiencies, including better capacity utilisation and faster price discovery. The proposed framework answers this in three ways: it applies only where outcome evidence of supra-competitive pricing is already present, it allows firms to rebut by showing diligent design and governance, and it reserves heavy penalties for knowing or reckless conduct. Section 19(3)'s efficiency factors remain available to the defendant. A second objection is that tacit collusion is lawful and the settled boundary should not move. But the traditional justification for tolerating it was evidentiary and remedial difficulty. Where firms control a tool whose design determines the outcome, and that design can be audited, the justification weakens considerably.

⁶⁴Competition Act § 48.

⁶⁵*Id.* § 27(A), (G).

VIII. Conclusion

Algorithmic pricing does not render competition law obsolete, but it forces a choice about what that law is for. Where algorithms implement human agreements or operate through shared vendors with knowing participants, current doctrine in the United States, the European Union and India is generally adequate, as the *Topkins*, *Eturas* and *RealPage* proceedings and, in India, Section 3(3) and its 2023 proviso demonstrate. Autonomous collusion, however, exposes the gap between a law that asks whether minds met and a market in which outcomes may be coordinated without minds meeting at all.

The most defensible response is neither to abandon the agreement requirement nor to condemn all algorithm-assisted parallelism. It is to adapt how agreement is proved, through algorithmic plus factors, rebuttable presumptions and a foreseeability standard of intent, matched by proportionate, primarily behavioural remedies and stronger technical capacity in competition agencies. India, having codified the hub-and-spoke cartel, reformed its penalty and leniency regime and commissioned a major market study, is well placed to lead; but *Samir Agrawal* shows that without a clearer evidentiary rule the CCI will continue to demand a meeting of minds that autonomous systems do not supply. Whether India or any other jurisdiction moves first will determine if the “meeting of minds” remains a useful principle of cartel law or becomes a legal fiction in algorithmic markets.

Bibliography

Cases: India

- Anvar P.V. v. P.K. Basheer*, (2014) 10 S.C.C. 473 (India).
- Arjun Panditrao Khotkar v. Kailash Kushanrao Gorantyal*, (2020) 7 S.C.C. 1 (India).
- Builders Ass’n of India v. Cement Mfrs.’ Ass’n*, Case No. 29 of 2010 (Competition Comm’n of India June 20, 2012) (India).
- Competition Comm’n of India v. Coordination Comm. of Artists & Technicians of W. Bengal Film & Television*, (2017) 5 S.C.C. 17 (India).
- Excel Crop Care Ltd. v. Competition Comm’n of India*, (2017) 8 S.C.C. 47 (India).
- Fed’n of Hotel & Rest. Ass’ns of India v. MakeMyTrip India Pvt. Ltd.*, Case No. 14 of 2019 (Competition Comm’n of India Oct. 23, 2022) (India).
- In re Alleged Anti-Competitive Conduct in the Beer Market in India*, Suo Motu Case No. 06 of 2017 (Competition Comm’n of India Sept. 24, 2021) (India).
- Matrimony.com Ltd. v. Google LLC*, Case Nos. 07 & 30 of 2012 (Competition Comm’n of

India Feb. 8, 2018) (India).

Rajasthan Cylinders & Containers Ltd. v. Union of India, (2018) 8 S.C.C. 668 (India).

Samir Agrawal v. ANI Techs. Pvt. Ltd., Case No. 37 of 2018 (Competition Comm'n of India Nov. 6, 2018) (India).

Samir Agrawal v. Competition Comm'n of India (Nat'l Co. L. Appellate Tribunal May 29, 2019) (India).

Samir Agrawal v. Competition Comm'n of India, (2021) 3 S.C.C. 206 (India).

United Breweries Ltd. v. Competition Comm'n of India (Nat'l Co. L. Appellate Tribunal Dec. 23, 2022) (India).

Cases: European Union

Case C-89/85 et al., *A. Ahlström Osaakeyhtiö v. Comm'n*, 1993 E.C.R. I-1307.

Case T-342/99, *Airtours plc v. Comm'n*, 2002 E.C.R. II-2585.

Case C-74/14, *Eturas UAB v. Lietuvos Respublikos konkurencijos taryba*, ECLI:EU:C:2016:42 (Jan. 21, 2016).

Case 48/69, *Imperial Chem. Indus. Ltd. v. Comm'n*, 1972 E.C.R. 619.

Joined Cases 40/73 et al., *Suiker Unie v. Comm'n*, 1975 E.C.R. 1663.

Case C-8/08, *T-Mobile Neth. BV v. Raad van bestuur van de Nederlandse Mededingingsautoriteit*, ECLI:EU:C:2009:343 (June 4, 2009).

Case C-542/14, *VM Remonts v. Konkurences padome*, ECLI:EU:C:2016:578 (July 21, 2016).

Cases: United States

Bell Atl. Corp. v. Twombly, 550 U.S. 544 (2007).

Brooke Grp. Ltd. v. Brown & Williamson Tobacco Corp., 509 U.S. 209 (1993).

Duffy v. Yardi Sys., Inc., No. 2:23-cv-01391 (W.D. Wash. Dec. 4, 2024).

E.I. du Pont de Nemours & Co. v. FTC, 729 F.2d 128 (2d Cir. 1984).

Gibson v. Cendyn Grp., LLC, 148 F.4th 1069 (9th Cir. 2025).

In re RealPage, Inc., Rental Software Antitrust Litig. (No. II), 709 F. Supp. 3d 478 (M.D. Tenn. 2023).

Interstate Circuit, Inc. v. United States, 306 U.S. 208 (1939).

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

United States v. Topkins, No. CR 15-00201 (N.D. Cal. 2015).

Statutes and Treaties

15 U.S.C. § 1 (Sherman Act).

15 U.S.C. § 45 (Federal Trade Commission Act).

Bharatiya Sakshya Adhiniyam, 2023, No. 47, Acts of Parliament, 2023 (India).

Competition Act, 2002, No. 12, Acts of Parliament, 2003 (India).

Competition (Amendment) Act, 2023, No. 9, Acts of Parliament, 2023 (India).

Consolidated Version of the Treaty on the Functioning of the European Union art. 101, Oct. 26, 2012, 2012 O.J. (C 326) 47.

Regulations, Reports, and Official Materials

Commission Guidelines on the Applicability of Article 101 of the Treaty on the Functioning of the European Union to Horizontal Co-operation Agreements, 2023 O.J. (C 259) 1.

COMPETITION COMM’N OF INDIA, MARKET STUDY ON ARTIFICIAL INTELLIGENCE AND COMPETITION (Oct. 6, 2025).

COMPETITION COMM’N OF INDIA, MARKET STUDY ON E-COMMERCE IN INDIA: KEY FINDINGS AND OBSERVATIONS (Jan. 8, 2020).

Competition Comm’n of India (Determination of Monetary Penalty) Guidelines, 2024 (India).

Competition Comm’n of India (Lesser Penalty) Regulations, 2024 (India).

Competition & Mkts. Auth., *Online Sales of Discretionary Consumer Products*, Case 50223 (Aug. 12, 2016).

Digital Competition Bill, 2024 (draft) (India).

MINISTRY OF CORP. AFFS., REPORT OF THE COMMITTEE ON DIGITAL COMPETITION LAW (Feb. 2024).

MINISTRY OF CORP. AFFS., REPORT OF THE COMPETITION LAW REVIEW COMMITTEE (2019).

ORG. FOR ECON. CO-OPERATION & DEV., ALGORITHMS AND COLLUSION: COMPETITION POLICY IN THE DIGITAL AGE (2017).

Press Release, U.S. Dep’t of Just., Former E-Commerce Executive Charged with Price Fixing in the Antitrust Division’s First Online Marketplace Prosecution (Apr. 6, 2015).

Proposed Final Judgment, *United States v. RealPage, Inc.* (M.D.N.C. Nov. 24, 2025).

STANDING COMM. ON FIN., 17TH LOK SABHA, FIFTY-THIRD REPORT ON THE COMPETITION (AMENDMENT) BILL, 2022 (2022).

Margrethe Vestager, Comm'r for Competition, Eur. Comm'n, *Algorithms and Competition*, Address at the Bundeskartellamt 18th Conference on Competition (Mar. 16, 2017).

Books and Articles

Stephanie Assad et al., *Algorithmic Pricing and Competition: Empirical Evidence from the German Retail Gasoline Market*, 132 J. POL. ECON. 723 (2024).

Zach Y. Brown & Alexander MacKay, *Competition in Pricing Algorithms*, 15 AM. ECON. J.: MICROECON. 109 (2023).

Emilio Calvano et al., *Artificial Intelligence, Algorithmic Pricing, and Collusion*, 110 AM. ECON. REV. 3267 (2020).

ARIEL EZRACHI & MAURICE E. STUCKE, *VIRTUAL COMPETITION* (Harv. Univ. Press 2016).

Ariel Ezrachi & Maurice E. Stucke, *Artificial Intelligence & Collusion: When Computers Inhibit Competition*, 2017 U. ILL. L. REV. 1775.

Michal S. Gal, *Algorithms as Illegal Agreements*, 34 BERKELEY TECH. L.J. 67 (2019).

Joseph E. Harrington Jr., *Developing Competition Law for Collusion by Autonomous Artificial Agents*, 14 J. COMPETITION L. & ECON. 331 (2018).

LOUIS KAPLOW, *COMPETITION POLICY AND PRICE FIXING* (Princeton Univ. Press 2013).

Timo Klein, *Autonomous Algorithmic Collusion: Q-Learning Under Sequential Pricing*, 52 RAND J. ECON. 538 (2021).

Salil K. Mehra, *Antitrust and the Robo-Seller: Competition in the Time of Algorithms*, 100 MINN. L. REV. 1323 (2016).

Richard A. Posner, *Oligopoly and the Antitrust Laws: A Suggested Approach*, 21 STAN. L. REV. 1562 (1969).

George J. Stigler, *A Theory of Oligopoly*, 72 J. POL. ECON. 44 (1964).

Donald F. Turner, *The Definition of Agreement Under the Sherman Act: Conscious Parallelism and Refusals to Deal*, 75 HARV. L. REV. 655 (1962).