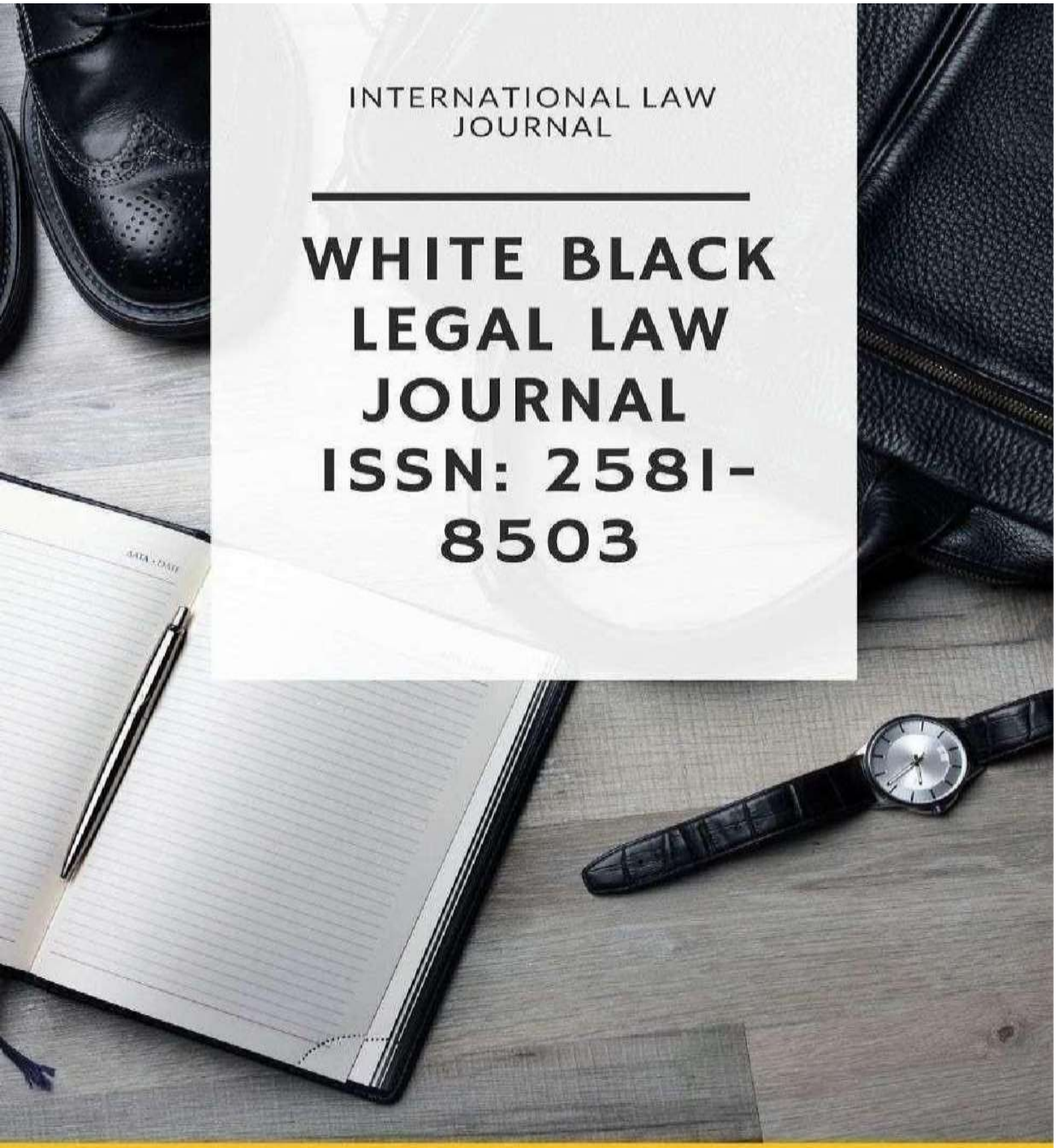

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ALGORITHMIC CARTELS AND SILENT COLLUSION IN DIGITAL MARKETS

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ABSTRACT

The increasing reliance on algorithmic pricing in digital markets has introduced complex challenges for competition law, particularly in identifying and regulating collusive conduct. Traditional antitrust frameworks, including the Indian Competition Act, 2002, are premised on the existence of an "agreement" between enterprises as a foundational requirement for establishing cartelisation. However, in platform-based markets, pricing decisions are frequently determined by algorithms that independently adjust to market conditions, often resulting in price parallelism without any demonstrable human coordination.

This paper examines whether such forms of algorithm-driven coordination can be meaningfully addressed within the existing legal framework governing anti-competitive agreements. It focuses on the limitations of Section 3 of the Competition Act, 2002, which requires proof of an agreement, and evaluates whether this requirement is adequate in the context of self-learning systems and real-time pricing tools.

The analysis is anchored in the decision of the Competition Commission of India in *Samir Agrawal v. ANI Technologies Private Limited*, where allegations of collusion through algorithmic pricing in the ride-hailing sector were examined. The paper critically evaluates the reasoning adopted by the Commission and questions whether the dismissal of liability on the absence of a traditional agreement reflects a gap in regulatory understanding.

Further, the paper situates the Indian position within broader global discourse on algorithmic collusion, highlighting the evidentiary and conceptual difficulties posed by non-human coordination. It argues that a strict reliance on the notion of agreement may allow economically harmful outcomes to escape scrutiny. The paper concludes by suggesting that competition law

must evolve towards an effects-based approach that is capable of addressing coordinated outcomes arising from algorithmic systems, while maintaining doctrinal clarity and legal certainty.

Keywords: *Algorithmic Cartels; Competition Law; Tacit Collusion; Digital Markets; Pricing Algorithms; Section 3 Competition Act; Platform Economy; Antitrust Enforcement.*

INTRODUCTION

The development of digital markets has altered the manner in which prices are determined and competition is structured. Enterprises operating through platform-based models increasingly rely on automated systems to determine pricing in real time, drawing upon large volumes of data and predictive analytics. This shift has reduced the role of direct human decision-making in price setting, particularly in sectors such as ride-hailing, e-commerce, and online services.

Competition law, however, continues to be grounded in concepts that presuppose human conduct and communication. Section 3 of the Competition Act, 2002 prohibits agreements that cause or are likely to cause an appreciable adverse effect on competition within India.[1] The statutory framework thus places the existence of an "agreement" at the centre of cartel enforcement. While the term has been interpreted broadly to include tacit understandings, the requirement nonetheless assumes some form of meeting of minds between market participants.

The emergence of algorithmic pricing challenges this foundational assumption. Algorithms deployed by competing firms may react to similar market signals and converge towards profit-maximising pricing strategies. In such circumstances, price parallelism may arise without any direct or indirect communication between competitors. The resulting market outcome may resemble that of a cartel, yet it may not satisfy the evidentiary threshold required to establish an agreement under existing legal standards.

This issue has gained prominence in India in the context of the ride-hailing sector, where platforms such as Uber and Ola utilise algorithmic systems to determine fares dynamically. Allegations have been raised that such systems facilitate coordinated pricing among drivers, effectively reducing competition. These concerns were examined by the Competition Commission of India in *Samir Agrawal v. ANI Technologies Pvt. Ltd.,* where the informant

argued that the use of a common pricing algorithm amounted to cartelisation.[2]

The Commission rejected this contention, holding that there was no agreement between drivers and that the algorithmic pricing mechanism did not, by itself, establish collusion.[3] This decision reflects a broader reluctance to extend cartel liability to situations where traditional markers of agreement are absent. At the same time, it raises important questions regarding the adequacy of existing legal tools in addressing new forms of coordination enabled by technology.

This paper seeks to examine whether competition law, in its current form, is equipped to address algorithmic collusion. It analyses the conceptual limits of the agreement requirement, the evidentiary challenges posed by algorithmic systems, and the potential need for a shift towards an effects-based approach.

THE STATUTORY FRAMEWORK: SECTION 3 AND THE REQUIREMENT OF AGREEMENT

The prohibition on anti-competitive agreements in Indian law is contained in Section 3 of the Competition Act, 2002. Section 3(1) provides that no enterprise or association of enterprises or person or association of persons shall enter into any agreement in respect of production, supply, distribution, storage, acquisition or control of goods or provision of services, which causes or is likely to cause an appreciable adverse effect on competition within India.[4] Section 3(3) specifically addresses horizontal agreements, including those that directly or indirectly determine purchase or sale prices, and such agreements are presumed to have an appreciable adverse effect on competition.[5]

The term "agreement" is defined under Section 2(b) of the Act to include any arrangement or understanding or action in concert, whether or not formal or in writing, or whether or not intended to be enforceable by legal proceedings.[6] This definition is deliberately expansive and has been interpreted by the Commission and courts to cover tacit understandings and concerted practices, even where no formal contract exists.

The Supreme Court of India, in *Excel Crop Care Limited v. Competition Commission of India*, affirmed that agreements under Section 3 need not be express and may be inferred from surrounding circumstances and market conduct.[7] The Court held that a meeting of minds could

be established through circumstantial evidence, including parallel behaviour coupled with additional factors suggesting coordination. However, the Court also cautioned that mere parallelism, without more, would not suffice to establish an agreement.[8]

This position was reiterated in *Rajasthan Cylinders and Containers Limited v. Union of India*, where the Supreme Court observed that conscious parallelism, meaning independent but similar responses to market conditions, is a rational commercial strategy in oligopolistic markets and does not, by itself, constitute an anti-competitive agreement.[9] The Court emphasised that there must be evidence of a prior understanding or communication, however informal, to bring conduct within the scope of Section 3.

The statutory framework therefore creates a threshold requirement: liability under Section 3 attaches only where an agreement, understood broadly, can be established. This requirement serves an important function in distinguishing between coordinated conduct that results from independent commercial judgment and conduct that results from collusion. However, in the context of algorithmic pricing, this distinction becomes considerably more difficult to apply.

ALGORITHMIC PRICING: TYPOLOGY AND COMPETITIVE IMPLICATIONS

To assess the adequacy of existing legal frameworks, it is necessary to understand the different forms that algorithmic pricing may take and the distinct competitive concerns each raises. Scholarship in this area has identified several categories of algorithmic coordination, which differ in the degree of human involvement and the mechanism through which parallel outcomes emerge.[10]

The first category involves algorithms that are used as instruments to implement an existing human agreement. In such cases, competing firms reach an understanding to fix prices or allocate markets, and subsequently deploy algorithmic tools to monitor compliance and adjust prices accordingly. This form of algorithmic involvement does not pose novel legal difficulties, as the underlying agreement between human actors satisfies the requirements of Section 3. The algorithm is merely the means of execution, analogous to any other technology used to give effect to a cartel.[11]

The second category, often described as the hub-and-spoke model, involves a common intermediary or platform that facilitates price coordination among otherwise independent competitors. In such arrangements, the platform operator may design or deploy a pricing algorithm that sets prices for all participants, who acquiesce to this arrangement by continuing to use the platform. The Competition (Amendment) Act, 2023 has expressly recognised hub-and-spoke cartels under Section 3(3), providing a clearer basis for enforcement in such cases.[12] The European Court of Justice addressed a similar situation in *Eturas*, where travel agencies were held to have engaged in a concerted practice by failing to publicly distance themselves from a platform-imposed discount cap.[13]

The third category, which presents the greatest doctrinal difficulty, involves autonomous algorithmic collusion. In this scenario, self-learning algorithms deployed by competing firms independently converge on supra-competitive pricing strategies without any prior human instruction to collude and without any communication between the firms or their algorithms.

The algorithms, through repeated interaction and reinforcement learning, may discover that coordinated pricing maximises profits and may sustain such coordination indefinitely.[14] Experimental studies have demonstrated that even relatively simple pricing algorithms can learn to collude tacitly, achieving outcomes that resemble those of explicit cartels.[15]

This third category raises fundamental questions for competition law. If the algorithms reach a collusive equilibrium without any human decision to collude, can there be said to be an agreement at all? The meeting of minds that Section 3 requires is, by definition, a human cognitive act. An algorithm, however sophisticated, does not possess a mind in any legally cognisable sense. The collusive outcome is an emergent property of the algorithm's optimisation process, not the result of any understanding between the firms that deploy it.

THE CCI's APPROACH: SAMIR AGRAWAL AND ITS IMPLICATIONS

The decision of the Competition Commission of India in *Samir Agrawal v. ANI Technologies Pvt. Ltd.* represents the most significant Indian pronouncement on algorithmic collusion to date. The informant, an independent legal practitioner, alleged that Ola and Uber, the two dominant ride-hailing platforms in India, had engaged in price-fixing through their respective pricing algorithms. The allegation was that drivers affiliated with these platforms were unable to set

their own fares and were compelled to accept prices determined by the platform's algorithm, thereby facilitating horizontal price coordination among drivers who would otherwise compete.[16]

The Commission examined whether this arrangement could be characterised as a cartel among drivers, with the platforms acting as facilitators or hubs. It concluded that no such agreement existed. The Commission observed that the pricing algorithm operated on the basis of large datasets, including factors such as demand, supply, time of day, traffic conditions, and special events, and that prices varied dynamically across trips and riders.[17] This variability, in the Commission's view, was inconsistent with the notion of a fixed or coordinated price.

More fundamentally, the Commission held that there was no evidence of any agreement between drivers to delegate pricing authority to the platform or to coordinate their prices through the platform's algorithm. The drivers, according to the Commission, had merely acceded to the terms of service offered by the platform, which included acceptance of algorithmically determined fares.[18] This unilateral acceptance of platform terms did not, in the Commission's analysis, constitute a horizontal agreement among competitors.

The Commission also rejected the analogy to a trade association facilitating a cartel. It observed that Ola and Uber operate as independent commercial entities providing a service to riders, not as associations of drivers pursuing collective interests.[19] The fact that drivers using the same platform charge similar prices was, in this view, a consequence of the platform's business model rather than evidence of collusion.

This reasoning was upheld on appeal by the National Company Law Appellate Tribunal, which additionally questioned the informant's locus standi to file the complaint.[20] The Supreme Court, in a subsequent appeal, affirmed that the informant had standing to file information under Section 19(1)(a) of the Act but did not disturb the Commission's findings on the merits.[21]

The *Samir Agrawal* decision has been criticised on several grounds. First, the Commission's analysis appears to conflate the variability of algorithmic pricing with the absence of coordination. The fact that prices vary across trips does not preclude the possibility that the algorithm systematically sets prices above competitive levels or that drivers benefit collectively from reduced price competition.[22] Second, the decision does not adequately address the hub-

and-spoke theory of liability, under which the platform's role in setting prices for all drivers could itself constitute facilitation of a horizontal arrangement.[23] Third, the Commission's observation that drivers merely acceded to platform terms overlooks the possibility that such accession, when accompanied by awareness of the pricing mechanism and its effects, may constitute tacit participation in a concerted practice.[24]

COMPARATIVE PERSPECTIVES: GLOBAL APPROACHES TO ALGORITHMIC COLLUSION

The challenges posed by algorithmic coordination have been recognised by competition authorities across jurisdictions, though no consensus has emerged on how existing legal frameworks should be adapted.

In the European Union, the European Commission has pursued enforcement actions against resale price maintenance implemented through algorithmic monitoring tools. In a series of decisions in 2018, the Commission fined consumer electronics manufacturers including Asus, Philips, Pioneer, and Denon & Marantz for using sophisticated algorithms to monitor the resale prices charged by their online retailers and to intervene when prices fell below specified levels.[25] These cases, however, involved vertical agreements where the algorithm was used to enforce a pre-existing understanding on pricing.

The more difficult question of autonomous algorithmic collusion has been addressed primarily at the level of policy discussion rather than enforcement. The joint paper issued by the Bundeskartellamt and the Autorité de la concurrence in 2019 acknowledged that self-learning algorithms could, in principle, achieve tacit collusion without human intervention but noted the evidentiary and conceptual difficulties in addressing such conduct under existing law.[26] The Competition and Markets Authority of the United Kingdom similarly observed in 2021 that algorithms could reduce competition and harm consumers but stopped short of proposing specific amendments to the legal framework.[27]

In the United States, the Department of Justice has prosecuted cases involving algorithmic implementation of explicit cartels, such as *United States v. Topkins*, but has not brought enforcement actions based solely on tacit algorithmic collusion.[28] Academic commentary in the United States has debated whether Section 1 of the Sherman Act, which requires a contract,

combination, or conspiracy, can reach autonomous algorithmic coordination, with most scholars concluding that it cannot under current doctrine.[29]

China has taken a more proactive approach. The amended Anti-Monopoly Law of the People's Republic of China, effective from August 2022, expressly prohibits the use of algorithms and other technical means to achieve monopoly agreements.[30] This amendment reflects an explicit legislative choice to bring algorithmic facilitation of collusion within the scope of cartel prohibition, though the precise application of this provision remains to be developed through enforcement practice.

The comparative survey reveals a common pattern: jurisdictions have been able to address algorithmic collusion where it involves human agreements or clear vertical restraints but have struggled to extend liability to autonomous algorithmic coordination. The reason for this difficulty lies in the foundational requirement, common to most competition law systems, that cartel liability requires some form of agreement or concerted action.

THE DOCTRINAL GAP: AGREEMENT, INTENT AND EFFECTS

The preceding analysis reveals a structural gap in competition law's capacity to address algorithmic collusion. This gap arises from the law's reliance on the concept of agreement, which carries with it assumptions about human cognition, communication, and intent that do not map neatly onto the behaviour of autonomous algorithms.

The requirement of an agreement serves several important functions in competition law. It distinguishes between coordinated conduct, which the law prohibits, and independent parallel conduct, which the law permits even if it produces similar market outcomes. This distinction reflects a normative judgment that firms should be permitted to respond rationally to market conditions, including the observed behaviour of competitors, so long as they do not enter into arrangements that constrain their independent decision-making.[31]

The difficulty is that algorithmic systems may achieve coordination without any of the indicia traditionally associated with agreement. There may be no communication between the firms, no exchange of information, no instruction to the algorithm to collude, and no awareness on the part of the firms' management that collusion is occurring. The algorithm simply learns,

through repeated interaction with market data and competitor algorithms, that maintaining supra-competitive prices is the profit-maximising strategy.[32]

One response to this difficulty is to argue that the firms that deploy such algorithms bear responsibility for their outputs, regardless of whether the firms intended or anticipated the collusive outcome. On this view, the decision to deploy a pricing algorithm capable of learning to collude is itself a form of agreement to the consequences that the algorithm produces.[33] This argument has some intuitive appeal but faces significant objections. It effectively imposes strict liability for algorithmic outcomes, which may chill the use of beneficial pricing technologies and may be difficult to reconcile with the fault-based structure of cartel prohibition.[34]

A second response is to shift the focus of analysis from agreement to effects. Under an effects-based approach, the question would not be whether the firms agreed to collude but whether the market outcome reflects a significant and sustained departure from competitive pricing that cannot be explained by independent commercial behaviour.[35] Such an approach would require the development of new evidentiary standards and analytical tools, but it would have the advantage of bringing economically harmful outcomes within regulatory reach regardless of the mechanism by which they are achieved.

The Competition Commission of India's recent market study on artificial intelligence appears to gesture towards such an approach. The study recommends that enterprises deploying AI systems in markets with significant market power adopt a self-audit framework for competition compliance, including documentation of algorithmic objectives, monitoring of outputs for price alignments, and safeguards against sensitive data sharing.[36] These recommendations, if implemented, would represent a shift from ex post enforcement based on agreement to ex ante governance based on the potential for harmful effects.

TOWARDS A REFORMED FRAMEWORK: RECOMMENDATIONS

The analysis in this paper suggests that the Indian competition law framework, while capable of addressing certain forms of algorithmic collusion, is not adequately equipped to deal with autonomous algorithmic coordination. Reform is necessary, but it must be calibrated to preserve the doctrinal integrity of cartel prohibition while expanding its reach to cover new forms of coordinated harm.

First, the definition of agreement under Section 2(b) of the Competition Act should be interpreted purposively to encompass situations where firms deploy pricing algorithms with knowledge of their capacity to achieve coordinated outcomes. Where a firm adopts an algorithm that is designed or known to monitor and respond to competitor pricing in ways that facilitate parallel conduct, the firm's decision to deploy and maintain that algorithm may itself constitute participation in a concerted practice. This interpretation would not require proof of communication between firms but would require proof that the firm was aware of the algorithm's coordinating capacity and chose to benefit from it.[37]

Second, the Competition Commission should develop evidentiary guidelines for algorithmic collusion cases that specify the types of circumstantial evidence that may support an inference of concerted practice. These may include evidence that algorithms were designed to monitor competitor prices, evidence that prices remained persistently above competitive levels despite the absence of cost-based justification, evidence that pricing patterns changed in response to algorithmic deployment, and evidence that firms failed to take available steps to prevent their algorithms from coordinating with competitors.[38]

Third, the legislature should consider amending Section 3 to expressly cover the use of algorithms or other automated systems to achieve or facilitate anti-competitive coordination, following the approach adopted in China's amended Anti-Monopoly Law. Such an amendment would remove any doubt about the applicability of cartel prohibition to algorithmic conduct and would provide a clear statutory basis for enforcement.[39]

Fourth, the Commission should exercise its powers under Section 49 of the Act to issue guidelines on competition compliance for enterprises deploying pricing algorithms. These guidelines should require firms operating in concentrated markets to maintain documentation of their algorithms' design objectives, to conduct periodic audits of algorithmic outputs for signs of coordination, and to implement technical safeguards that prevent algorithms from achieving tacit collusion.[40]

Fifth, the Commission should engage in sustained dialogue with competition authorities in other jurisdictions to develop common approaches to algorithmic collusion. The cross-border.

CONCLUSION

The rise of algorithmic pricing in digital markets presents a fundamental challenge to competition law. The traditional requirement of an agreement, which has served as the foundation of cartel enforcement, was developed in an era when coordination required human communication and decision-making. In the algorithmic era, coordination may emerge from the autonomous interaction of pricing systems without any human involvement in the collusive outcome.

The decision of the Competition Commission of India in *Samir Agrawal v. ANI Technologies Pvt. Ltd.* illustrates both the limitations of the current framework and the reluctance of enforcement authorities to extend liability beyond established doctrinal categories. The Commission's conclusion that algorithmic pricing does not, by itself, establish an agreement is doctrinally defensible under existing law. However, it leaves a significant regulatory gap through which economically harmful coordination may escape scrutiny.

This paper has argued that competition law must evolve to address this gap. The evolution should proceed along two tracks. First, the existing concept of agreement should be interpreted purposively to encompass situations where firms knowingly deploy algorithms capable of achieving coordination. Second, legislative amendment should be considered to expressly bring algorithmic facilitation of anti-competitive outcomes within the scope of Section 3.

These reforms must be balanced against the need for legal certainty and the risk of over-deterrence. Not all algorithmic pricing is harmful, and not all price parallelism is collusive. The challenge for competition law is to develop analytical tools that can distinguish between beneficial algorithmic efficiency and harmful algorithmic coordination. This is not a challenge that can be resolved through doctrinal analysis alone. It requires sustained engagement between competition authorities, technologists, and economists to develop the evidentiary frameworks and remedial approaches appropriate to the algorithmic age.

The alternative is a competition law that remains formally intact but substantively hollowed out, capable of addressing the cartels of the past but not the coordination of the future. That outcome would be inconsistent with the purposes of the Competition Act and would leave consumers and competitors without protection against new forms of market harm.

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