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ALGORITHMIC COLLUSION: ASSESSING LIABILITY FOR AI-DRIVEN PRICE FIXING UNDER INDIAN ANTITRUST REGIME

~ *Bhuvan Raj A*

ABSTRACTS

The advent of artificial intelligence and algorithm-driven pricing strategies has changed the dynamics of markets all over the world. Companies are taking up algorithms to enable pricing optimally, predict consumer preferences, and respond quickly to market dynamics. In addition to enhancing efficiency, algorithmic pricing strategies create the possibility of anti-competitive coordination akin to a classic cartel. Algorithmic coordination can occur in the absence of direct or explicit communication, unlike human collusion. Issues related to algorithmic collusion¹ raise difficult questions for antitrust, including under the Competition Act² in India. This paper discusses (i) how Indian competition law may respond to algorithmic collusion, (ii) the doctrinal and evidentiary challenges it presents, (iii) international developments, and (iv) recommendations for modifying the law to maintain the efficacy of Indian antitrust to account for artificial intelligence as it develops. This paper proposes that the law should be amended to consider coordination by both humans and machines while continuing to balance innovation and competition.

INTRODUCTION

The economics of the marketplace have changed drastically, due to technological innovations. In the digital age of rapid access to products and the rise of technologies like algorithms and artificial intelligence systems, they are playing a large role in determining prices, predicting consumer behaviour, and controlling stock/inventory and supply chain logistics. These automated tools are able to systematically analyse marvellous amounts of data faster than humans can comprehend or respond to. Ultimately, for businesses operating in competitive

¹ OECD, Algorithms and Collusion (2017).

² The Competition Act 2002

marketplace environments, the algorithmic decision systems represent a "pure" advantage through dynamic pricing, or the ability for prices to change automatically in response to changing market conditions. When multiple firms start using the same or similar pricing algorithms, this can result in a coordinated increase in prices, even if that is not the intent—thereby crippling competition and harming the consumer.

Traditional antitrust frameworks, such as India's Competition Act, were created when collusion occurred with human intent, communications, and agreements. The rule of reason- the cornerstone of liability for price fixing and cartelization- was built on the notion to establish a "meeting of minds." In an algorithmic marketplace, though, coordination may happen without the fundamental need for humans to agree. Two or more algorithms that interact in a marketplace may independently "learn" that keeping an artificially high price could benefit all of them. It becomes more challenging if firms are using the same pricing third party software, or if pricing authority is entirely delegated to the artificial intelligence systems. Algorithmic collusion thus raises a fundamental challenge for what is assumed to be an agreement, requiring a reconsideration of first principles of legal doctrine, evidentiary standards, and enforcement mechanisms within the Indian antitrust framework. This article will investigate these issues by discussing the nature of algorithmic collusion, assessing whether the Indian Competition Act provides a framework for addressing algorithmic collusion, identifying gaps in enforcement capacity, and recommending reforms that address this issue.

2. Understanding Algorithmic Collusion

Algorithmic collusion³ describes the circumstance in which algorithms, either deliberately or instinctively, align their prices or conduct in a manner that suppresses competition. In order to analyse this behaviour, it is necessary to distinguish various types of algorithmic collusion.

The first form is explicit algorithmic collusion, in which firms purposefully design or employ algorithms to coordinate their prices or conduct. In this situation, there is no doubt that there is an agency to collude, and the algorithm is just a vehicle to implement or maintain the cartel. This can happen when competing firms agree to use a common software provider or pricing algorithm to facilitate their prices move in conjunction. In this case, the human intention

³ Ezrachi and Stucke, *Virtual Competition: The Promise and Perils of the Algorithm-Driven Economy* (Harvard University Press 2016)

is clear, and the conduct's illegality is based on human agency, which is unaffected by the use of algorithms.

The second type is tacit algorithmic collusion, which happens without any direct communication or explicit agreement between firms. Companies employ self-learning algorithms to observe the market data, detect patterns, and adjust prices by observing competitors. Over time, the algorithms may converge toward a sustainable price point that maximizes profit for all firms. This type of coordination can happen without any human agreement or engagement, achieving the same economic effect as a cartel agreement. This method of price coordination is particularly difficult to detect and prove since it isn't a conscious decision but instead happens automatically as an outgrowth of machine learning optimization.

For the third form of collusion, we will overview hub-and-spoke or platform collusion. A hub or central algorithm coordinates pricing by creating agreements among competing firms. For example, maybe all firms use the same online platform or use the same pricing software that sets prices or recommends prices for them. The algorithms may operate under the auspices of different firms, and the firms may claim they act completely independently, though the fact of their interdependence is clear through the nature of the central algorithm, which is coordinating pricing decisions across competing firms, resulting in the same price across the competitive landscape.

What connects all of the examples above is that competition is distorted by algorithmic interactions/data processing, and not by explicit agreements between firms. What is interesting about algorithmic collusion is that the collusive behaviour proceeds invisibly, at speed, and often without any human knowledge or agency once deployed. This poses unique and challenging questions for the enforcing of competition law, which is traditionally predicated on evidence of discussion and agreement and the explicit or indirect communication of goals.

3. Indian Legal Framework: The Competition Act, 2002

The Competition Act, 2002, represents the foundation of India's antitrust regime. Its main aim is to curb practices that have an adverse effect on competition, promote and protect competition in markets, safeguard consumers' interests, and ensure freedom of trade. According to section 3 of the Act, anti-competitive agreements are prohibited, particularly those involving price fixing, supply limiting agreements, or market-sharing arrangements.

Section 3(1) of the Act makes clear that any agreement that causes or is likely to cause an appreciable adverse effect on competition (AAEC) is void. Additionally, section 3(3) establishes that agreements regarding price-fixing, output-limiting agreements, bid-rigging, or market allocation agreements will be presumed to produce AAEC. These rules were mainly framed with human collusion in mind, which sped up collusive agreements through in-person or telephone conversations.

The main issue under Indian Law, I believe, is related to the definition of "agreement." Under Section 2(b), an "agreement" is broadly defined to include any arrangement, understanding, or concerted action between parties, regardless of whether it was intended to be formal or informal. The courts and the Competition Commission of India have thus interpreted "agreement" to include tacit coordination or conduct in which there is evidence of a meeting of minds.

However, algorithmic collusion challenges this view. If algorithms coordinate prices without any input from a human, should we still say that there is a "meeting of minds"? If collusion is reached because machines interact without any explicit or implied understanding from people, it is not clear how it can be properly characterized as an agreement under Section 3. This creates a potential doctrinal gap in India, because liability under the Competition Act is largely predicated on being able to establish that an agreement or understanding existed between competitors.

4. The Role of the Competition Commission of India

The Competition Commission of India (CCI) has the role of implementing the Competition Act and promoting fair market conduct. The CCI has voiced awareness about possible issues related with artificial intelligence and algorithmic pricing in recent years. While no significant case of algorithmic collusion has emerged in India, the CCI's market studies and policy statements have recognized that algorithms promote coordination amongst firms even without communication.

The CCI has previously engaged in cases involving online platforms and digital markets, such as cab aggregators and e-commerce price-fixing. The Commission has specifically looked at how algorithms determine price, and if the platforms are harming competition. Although no

formal finding of algorithmic collusion has occurred, the CCI's approach implies that it will have an open mind about whether digital technologies will enable anti-competitive conduct.

By applying an effects-based approach, the CCI has always been concerned about whether conduct has a significant adverse effect on competition. This focus on effects and not intentions is helpful to give a foundation for extending enforcement in the case of algorithmic collusion. The CCI will therefore regard the use of an algorithm as a collusive mechanism if it offers a price increase, weakens competition, and reduces consumer welfare.

5. International Perspectives

At the global level, competition authorities have made varying attempts at addressing the problem of algorithmic collusion. For example, in the United States, the Department of Justice and Federal Trade Commission have opened investigations into firms using collective pricing algorithms to engage in collusive pricing behavior. Under U.S. law, this type of collusive behavior, when intentional, would be a per se unlawful restraint of trade, regardless of whether the coordination occurred through direct communication or supported by shared technology that reduces price competition.

In the European Union, the European Commission has included algorithmic collusion within its general enforcement approach. Competition authorities in the EU have maintained as straight-forward that the engagement of collusion through an algorithm is no less unlawful than through human communication, and likewise are focusing on monitoring whether artificial intelligence may underlie tacit collusion in concentrated markets.

The Competition and Markets Authority (CMA)⁴ conducted a study in the United Kingdom on how algorithms might generate “self-learning cartels.” The CMA emphasized that firms should ensure that algorithms in their pricing software do not result in anti-competitive outcomes—intentions do not matter. Other jurisdictions, such as Australia, Japan, and Singapore, have published policy papers detailing the need for accountability, oversight, and transparency of algorithms.

India can learn much from these lessons about overseas experimenting. Many jurisdictions have applied an “effects-based” test that relies on whether or not algorithms would have produced outcomes similar to collusion and not whether a human intent can be proven to create

⁴ European Commission, Competition Policy for the Digital Era (Report by Special Advisers, European Commission 2019).

the anti-competitive outcome. Such an approach could help Indian regulators develop enforcement mechanisms and strategies to monitor artificially intelligent markets.

6. Challenges in Establishing Liability under Indian Law

Establishing liability for algorithmic collusion in the Indian competition framework is a complex amalgamation of legal theory, technology, and considerations of practical enforceability. The Competition Act, 2002 was developed in the context of human actors, and extending its principles and concepts to algorithmic understanding uncovers several theoretical and operational gaps. These issues can be separated into three different sets of doctrinal, evidentiary, and policy considerations, and relevant challenges also have serious implications for CCI enforcement.

Challenges at the Doctrinal Level

The primary doctrinal challenge relates to determining whether algorithmic coordination constitutes an "agreement" as that term is understood within the meaning of Section 2(b) of the Competition Act, 2002. The statute defines the term "agreement" to include any arrangement or understanding—not necessarily formal, written, oral, and even inferred through conduct. However, competition law has assumed that there will always be some type of communication or meeting of minds between human actors. The issue arises when algorithms independently engage in collusive behavior without any form of human interaction or direction.

When firms employ pricing algorithms that self-learn and independently monitor the conditions in the market, they may reach the same, or convergent, prices, or stabilize prices in a manner that bears similarities to the conduct of a cartel. If the firms engaged in no express agreement or tacit understanding, it is unclear what doctrine would allow a finding of liability under Section 3(3). Indian courts have traditionally sought to identify cartels through evidence of meetings, correspondence, or information being exchanged and may have a difficult time believing an interaction between algorithms could constitute an "understanding."

Challenges for Providing Evidence

There will still be a significant challenge related to providing evidence even if doctrinal barriers are addressed. Proving and detecting algorithmic collusion involves understanding deeply what algorithms are, as well as how algorithms are designed, trained, and deployed. The investigator is tasked with sifting through potentially enormous datasets, source codes, and pricing outcomes to determine if there has been coordination. Many of the more recent algorithms in

use are based on complicated neural networks and reinforcement learning models, which leads to a situation in which they are fundamentally opaque and resistant to human understanding. This “black box” phenomenon makes establishing the causal connection between inputs, algorithmic reasoning, and the ultimate pricing decision difficult.

In the context of a classic cartel investigation involving humans, evidence, such as documents like emails, meeting notes, or records of phone calls, may indicate communication or collective action. Algorithmic collusion has no such traces of human involvement. The evidence available may only be patterns of market conduct, such as parallel pricing or including overall pricing strategies. While parallel conduct is not illegal per se, when paired with some facilitating mechanism, such as shared data sources or same algorithms, the conduct becomes more problematic. The methods to establish some of these links requires the technical forensics that the CCI currently does not have the institutional framework to do such investigation effectively.

Digital evidence also poses issues relating to volume and verification. Algorithms operate in real-time, and are likely to produce thousands of pricing decisions per day. Determining the precise time or reasoning, based on evidence, that collusive behavior occurred will require advanced timeline studies assertively reconstructing data. If the CCI does not establish the preservation of digital evidence or algorithmic transparency, enforcement as a whole will remain largely hypothetical.

Liability Attribution

A further significant issue is the attributing of liability in instances of collusion via algorithms. Because the Competition Act is an enterprise-focused law, it places liability on firms rather than individuals, and traditional forms of liability attribution already do not apply when collusion occurs via algorithms. When a firm commissions a third-party developer to create a pricing algorithm, and that algorithm enables its competitors to coordinate, it may not be clear how liability will be assigned — the deploying firm, the third-party developer, or both.

One way to approach this may simply be to assign strict liability to firms based on the consequence of the algorithms they deploy, without requiring intent or knowledge. The hope is that strict liability would compel firms to conduct due diligence in their selection and monitoring process of their technology assets. Regardless, strict liability is an imperfect remedy, especially as one may find collusion occurs in an unpredictable fashion through self-learning processes outside of a firms control. An alternative approach, the firm’s liability could rest on negligence or foreseeability, i.e. whether the firm could have reasonably identified the

risk of collusive outcomes using the algorithm and a reasonable opportunity to mitigate. This approach is inherently fair but introduces evidentiary concerns and risk of asymmetrical enforcement. The Indian framework offers no clear path in extending liability to third-party developers, illustrating the necessity for a more nuanced process of joint liability.

Mens Rea and Intent

The Competition Act does not include a mens rea requirement to establish a violation of the Act. Still, the consideration of intent affects not only enforcement policy but also liability questions. Traditional antitrust enforcement assumes that collusion is an intentional act that is meant to lessen or eliminate competition. When it comes to algorithmic firms, however, intent becomes an ambiguous concept. The developers who created the algorithms may not have had an understanding or an ability to predict how algorithms will behave, and the firm that utilizes the algorithm may not even understand the firm's own internal decision-making process.

This leads to a normative question around whether it is fair to impose liability absent an intention. Should regulators treat firms as strictly liable for the actions of their autonomous systems, or should they demand some foreseeability? A strict liability standard creates deterrence, but it also imposes liability on otherwise innocent firms who acted on good faith. Conversely, a negligence standard may not create deterrence because firms will consistently find a way to demonstrate that they didn't know, or could not have known, what their algorithms could do. The challenge will be balancing these competing interests to create a fair and effective enforcement model.

In conclusion, the attribution of culpability for algorithmic collusion in Indian law is rife with doctrinal uncertainty, proofs complexity, and policy tension. The conventional legal structure of the Competition Act, which is fundamentally based on human behaviour, does not easily accommodate the independent and data-driven nature of contemporary algorithms. Responding to these complexities will require not just reform of the law but also a shift in enforcement philosophy which comprehensively merges legal reasoning with technological engagement so that law can develop with the markets it seeks to regulate.

7. Possible Legal and Policy Approaches

To appropriately tackle the threat of algorithmic collusion, India needs to create a forward-thinking legal and regulatory framework that attempts to achieve these two objectives (the

development of technology and the protection of competition). The Competition Act, 2002 should be not only amended to adequately adjust to the context of a digital market but also provide clear direction on firms' accountabilities when using artificial intelligence tools/material for decision making in commerce.

Broadened definition of “agreement”:

The term “agreement” in Section 3 should be defined in a broader fashion to incorporate algorithmic coordination even when no explicit discussions occur between humans. Multiple companies could deploy the same pricing algorithms or interoperable algorithms to deliver a homogeneous outcome in the market, which constitutes an “agreement” or, at the least, should be construed to reflect a “concerted practice.” A broader definition of “agreement” would directly align with the aims and objectives of the Act to eliminate all forms of collusion and rid loopholes from firms seeking to provide defence based on a claim of algorithmic autonomy.

Facilitator liability:

Both third-party vendors and content/technology platforms that intentionally build or supply an algorithm capable of collusion in the absence of human agency should be held responsible as facilitators for purposes of competition law violations. The central argument in advance of these suggested changes is that if a vendor or intermediary does supply and/or build an algorithm that enables collusion and anti-competitive conduct, they share in liability (to be held jointly and severally) with the firms that use said technology. This argument is based on the analogous relationship between the liability of different parties involved in competition law violations, whether they are a consultant or trade-association that served as facilitator for anti-competitive conduct.

Duty of oversight:

Companies that use AI-enabled pricing systems should have a legal obligation to show proper care and continuously employ human oversight of algorithmic behavior. This obligation would include regularly monitoring, auditing, and adjusting algorithms to mitigate collusive or exclusionary consequences. A negligence-based standard of liability can be invoked where firms demonstrate that algorithmic conduct predictable limited competition, and fails to take affirmatively steps to discover or remedy that conduct.

Regulatory guidance:

The Competition Commission of India (CCI) should issue specific guidance about how algorithmic pricing may violate the Act. Such documents should provide parameters for distinguishing among legitimate, efficiency-enhancing algorithms, and those that may impose anti-competitive consequences. The CCI can also consider providing safe-harbor provisions for firms that present mechanisms of accountability to suggest compliance with competition law and show algorithmic transparency through independent audits and firm accountability and transparency.

Algorithmic audits:

Algorithms would be held accountable, and the CCI's ability to enforce compliance would be enhanced, if algorithmic audits were mandatory. Firms should be required to maintain extensive records of the algorithms' specifications, inputs, modifications, and time. Auditing firms' algorithms on a regular basis by an independent review would help expose sophisticated collusion and ensure algorithmic outcomes comply with competition law principles.

Inter-agency contribution

Given that algorithmic conduct overlaps with data, consumer protection, and digital governance, an effective regulatory framework requires coordinating among authorities. The CCI should work with the Data Protection Board of India, sectoral regulators, and those regulating digital competition to create a streamlined regulatory approach to the regulation of AI dependent markets, and to mitigate jurisdictional inconsistency or overlap.

International cooperation:

Algorithmic collusion often crosses national borders; therefore, India should work with other jurisdictions to develop a regime of structured cooperation with foreign competition authorities. Engagement in multilateral forums such as the International Competition Network (ICN) for sharing investigation techniques, data, and best practices can strengthen India's regulatory and enforcement capacity, while also aiding in the development of a commonly agreed global regulatory response to algorithmic competition.

8. Enforcement Tools and Practical Measures

For legal principles to move forward in practice, the Competition Commission of India (CCI) needs to develop modern enforcement mechanisms, develop specialized technical capability, and develop modes of cooperation and collaboration. Algorithmic collusion cannot be solved

by using traditional investigative methods, but instead requires an integrated framework of competition expertise, data science, artificial intelligence literacy, and digital forensics.

Data access and analysis:

A necessary condition for detecting algorithmic collusion is that CCI needs to have comprehensive and auditable data. The CCI needs to have the power to compel a firm to provide evidence including pricing records, algorithmic logs, communication, and internal records -- all data being suggested use is a necessary condition to provide the CCI with information to facilitate closer discovery of algorithmic collusion. Once the required information is provided, advanced econometric and statistical modeling approaches can be utilized to analyze data and characterize unusual pricing behaviour, synchronization in pricing between firms, or parallel pricing that do not conform to competitive behaviour. Predictive data analytical techniques would allow for the CCI to have foresight in terms of potential collusion at an early stage to implement interventions before they become systemic.

Inspection of algorithms: regulators need to have the authority to examine and analyse the functioning of algorithms themselves. This could refer to an examination of the source code used by the firms, validated model parameters, training data, and decision-making logic applied in machine learning approaches.

Given the complicated and complex nature of these tasks, the CCI should work with independent experts in AI ethics, data science, and computer engineering to examine whether collusion was likely, or whether similar Pricing effects occurred due to shared market factors by coincidence. A new “Digital Markets and Algorithms Unit” within the CCI could make this expertise available as a permanent resource and facilitate thoughtful, coordinated enforcement.

Behavioral remedies:

In addition to fines, the CCI should increasingly utilize behavioral and structural remedies specifically designed for conduct in the digital economy. Firms that employed algorithms in a collusive or coordination-inducing manner could be ordered to alter or turn-off certain features of the algorithm, apply a real-time monitoring tool, or employ human monitors to oversee pricing behavior. These remedies ensure that anti-competitive effects are mitigated while the invention does not need to be abandoned.

Transparency requirements:

Transparency is essential to supporting accountability as it relates to algorithms. Firms that have deployed automated pricing or recommendation/autonomation systems should be required to maintain records of the algorithm and provide periodic transparency reports to the CCI. These records and reports could broadly include (1) the purpose of the algorithm, (2) the algorithm's primary inputs, or (3) internal compliance assessments.

Implementing an "algorithmic compliance certification" scheme in sensitive sectors, such as e-commerce, aviation, or ride-sharing, would lead to institutionalized responsible use, and avoid the coalescence of the use of algorithms through hidden collusion. Over time, these disclosures will provide a base of algorithmic practices that will allow the regulators to benchmark and see similarities between sectors.

Penalties and deterrent:

Deterrence works only when there is a meaningful deterrent that corresponds with the amount of competitive harm done. For any firm which intentionally or recklessly deploys algorithms to thwart competition or distort prices, serious monetary consequences ought to be applied, including restrictions on digital operations, or delisting them from being a vendor for public procurements. For an unintentional or negligent problem, the CCI would issue a remedial order and require compliance programs. In addition, establishing personal liability against senior managers who are responsible for running the algorithms would enhance deterrence since the prospect of personal liability would increase compliance from such senior management through a level of accountability with active oversight.

Enforcement in the era of algorithmic collusion must combine regulatory incisiveness with the technological sophistication of the remedy. Continued skill-development of CCI officials, international cooperation, and partnerships with academia and experts in the provision of technical services would all be factors whenever feasible.

9. Conclusion

Algorithmic collusion provides one of the most complex and significant challenges facing competition law today. In contrast to traditional cartels, facilitated by express communication and human coordination, algorithmic conduct can occur without any direct or indirect communication between humans—emerging from machine autonomy, predictive sentiment analysis, and adaptive learning environments. In addition to complicating enforcement, the

blurring of separation or agency that is apparent in both human and machines changes how detection, attribution, and sanctioning occurs.

In India, Section 3 of the Competition Act, 2002 provides a robust basis upon which to mitigate anti-competitive agreements. However, given the nuances of digital and data-driven markets, the scope of interpretation must expand. The rigid notion of a "meeting of minds," or an express agreement, must give way to an "effects-based" approach that examines the economic effects from algorithmic performance rather than the communication. This interpretive change extends from the CCI's responsibilities to promote and sustain competition as well as optimize consumer welfare under the Act.

Companies using algorithmic systems need to understand that dependence on "black box" AI models does not exempt them from their duties to comply with law. Ultimately, accountability MUST rest with humans who engineer, deploy, and manage these systems. If firms are negligent in their supervision, don't put compliance protocols in place, or ignore early warning signs of algorithmic alignment, they should be held responsible on a negligence standard in competition law. This type of analysis would underlie a duty of care, encouraging firms to strive towards ethical and transparent use of AI.

At a broader level of planning for policy development, India's regulatory solution must occur in between deterrence and innovation. While punishment could be so harsh as to stifle technological development and proper uses of AI to advance efficiencies and consumer choice, too little regulatory, or worse no regulatory, response could embolden corporations to use algorithm opacity for their anti-competitive gain. Instead, India's approach must lean on three broad categories: accountability - clear legal standards of corporations and corresponding responsibility; transparency - either disclosure or audit of program decision-making; and collaboration-collaborating with domestic and global agencies to address cross-border digital problems.

The future of competition law is prefixes. As AI systems increasingly impact market problems, the role of regulators must shift from enforcement by reprieve toward proactive governance-Identify risk, guide compliance, and responsibly encourage innovation. If India embraces this approach, they not only will protect fairness in markets, they could actually lead the world in the governance of AI and competition policy, helping to ensure that digital growth is framed through fairness, equity and economic freedom.