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GOVERNING ALGORITHMS CARTELS: A CRITICAL APPRAISAL OF INDIAN COMPETITION LAW IN THE DIGITAL ECONOMY

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Abstract

The digital economy have been transforming at an unprecedented pace, wherein artificial intelligence (AI) and machine learning algorithms was no longer mere productivity tools but has to be structural forces shaping the modern market dynamics. This research report have to be delivering an exhaustive critical appraisal of how algorithmic cartels was operating and challenging the existing frameworks of Indian competition law, specifically Section 3 of the Competition Act, 2002.[448] Traditionally, the competition jurisprudence were relying on an anthropocentric framework that require a "meeting of minds" to establish collusion. However, self-learning algorithms has to be capable of achieving tacit collusion without any human communication, which were creating a massive structural enforcement gap. The present study have been exploring the various typologies of algorithmic collusion, which was including the Messenger, Hub-and-Spoke, Predictable Agent, and Digital Eye scenarios. Through an in-depth doctrinal and empirical methodology, the analysis were evaluating landmark cases such as *Samir Agrawal v. ANI Technologies Pvt. Ltd.* and international precedents like *United States v. Topkins* and the *RealPage* litigation. Furthermore, the findings was assessing the recent Market Study on Artificial Intelligence and Competition released by the Competition Commission of India (CCI) in 2025, which were highlighting severe market concentration, such as NVIDIA holding 88% of the GPU market.[449]

The report has to be critiquing the proposed Draft Digital Competition Bill, 2024, arguing that while it introduce ex-ante regulations for Systemically Significant Digital Enterprises (SSDEs), it largely omit specific provisions for autonomous algorithmic price-fixing. The economic models, including Q-learning and Nash equilibrium theories, was proving that algorithms naturally gravitate towards supra-competitive pricing. Ultimately, the research recommend a paradigm shift towards rebuttable presumptions, the reversal of burden of proof, and the integration of algorithmic audits to preserve fair competition. The existing laws has to be evolving rapidly, or the invisible agreements of machines was permanently destroying consumer welfare.

Keywords: Algorithmic Collusion, Competition Act 2002, Artificial Intelligence, Digital Markets Act, Systemically Significant Digital Enterprises, Tacit Collusion, Ex-ante Regulation, Q-learning, Nash Equilibrium.

[448] The Competition Act, 2002 (Act 12 of 2003), s. 3.

[449] Competition Commission of India, "Market Study on Artificial Intelligence and Competition" 9 (2025).

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Introduction

The world are currently undergoing the fourth industrial revolution, a phenomenon where Artificial Intelligence (AI) and complex pricing algorithms was fundamentally altering the fabric of modern digital markets. In this technologically advanced era, algorithms has to be utilized by enterprises not just for operational efficiency, but as autonomous agents capable of continuously monitoring market conditions and adjusting prices in real-time.[450] This technological evolution have been creating a fundamental tension within the domain of competition law, particularly under Section 3(3) of the Competition Act, 2002, which strictly require an "agreement" for cartels to be penalised.

Rise of digital markets and emergence of algorithmic cartels

The rise of the digital markets have been characterized by an explosion of data collection, processing capabilities, and the deployment of sophisticated algorithms by digital platforms. In the past decade, the integration of artificial intelligence (AI) and machine learning into commercial decision-making processes was fundamentally reshaping market competition. Algorithms now influences pricing strategies, optimizes supply chains, and enhances consumer targeting across multiple sectors including e-commerce, ride-hailing, aviation, and hospitality. While these innovations has to be increasing efficiency and improving consumer welfare in some instances, they was also introducing the severe risk of algorithmic cartels.

Algorithmic cartels refers to a phenomenon where firms coordinates to manipulate market outcomes, leading to higher prices, reduced innovation, and consumer harm, facilitated entirely or partially by algorithmic pricing software. Traditionally, the Indian competition law was viewing cartels as the product of deliberately coordinated human activities. This anthropocentric framework require enforcers to identify human intent and establish communication through direct or circumstantial evidence. However, the proliferation of self-learning algorithms have been leading to a new phenomenon known as algorithmic tacit collusion, which was very difficult to prove under the current legal regime. Algorithms has to be generating sustained, parallel pricing results in the absolute absence of overt communication or conscious human coordination. They were instantly reacting to market deviations and stabilizing coordinated outcomes over time, thereby increasing consumer harm without triggering the traditional tripwires of antitrust enforcement. The recent 2025 OECD report on algorithmic pricing have been distinguishing three settings which was explicit collusion, hub-and-spoke co-ordination, and autonomous algorithmic collusion, each presenting different implications for liability. [451]

The challenge for the Competition Commission of India (CCI) have been twofold. Firstly, the strict definition of an "agreement" under Section 2(b) of the Competition Act, 2002 demand a "meeting of minds" or *consensus ad idem*, which were a standard practically impossible to apply to mindless machines that nonetheless behaves like cartels. The Supreme Court of India's landmark rulings, such as in the *Excel Crop Care Limited* case, has to be cementing this intent-centric approach where an active meeting of minds are required.[452] Secondly, algorithmic coordination were disrupting the oligopolistic equilibrium by producing cartel-like effects such as higher prices and lower competition—without the quantifiable communication methods traditionally used to infer collusion. As observed by industry experts, the choice for Indian competition law are no longer whether to grapple with algorithmic collusion, but how quickly it can adapt before

[450] Ariel Ezrachi and Maurice E. Stucke, *Virtual Competition: The Promise and Perils of the Algorithm-Driven Economy* 11 (Harvard University Press, Cambridge, 2016).

[451] OECD, "Artificial Intelligence and Competitive Dynamics in Downstream Markets" 15 (2025).

[452] *Excel Crop Care Limited v. Competition Commission of India*, AIR 2017 SC 2734.

the market reality overtakes the law. The Indian legal framework currently fail to capture algorithmic collusion because of several challenges, primarily the human-centric definition of agreement and the severe enforcement and evidentiary challenges. The algorithms was creating a situation where there are invisible agreements but highly visible harm. This report have to be systematically deconstructing the mechanics of these algorithmic cartels, evaluating the adequacy of existing statutory provisions, and proposing comprehensive regulatory reforms. It was interrogating whether the shift from subjective intent to the foreseeability of anti-competitive outcomes have been a viable legal standard, and whether the proposed Draft Digital Competition Bill, 2024 has to be equipped to handle the AI-driven market realities.

Literature review

The academic discourse surrounding algorithmic collusion have been expanding significantly in recent years, with legal scholars and economists attempting to categorize and quantify the threat posed by autonomous pricing software. The literature has to be providing a robust foundation for understanding how machines was bypassing traditional antitrust laws.

CONCEPTUAL AND THEORETICAL FRAMEWORKS

The conceptual framework of algorithmic collusion were established firmly by the seminal works of legal scholars who was categorizing the phenomenon based on the level of human involvement and technological autonomy. The most widely accepted typology of algorithmic collusion were established by Ariel Ezrachi and Maurice E. Stucke in their pivotal research, as detailed in Ariel Ezrachi and Maurice E. Stucke, *Virtual Competition*: *The Promise and Perils of the Algorithm-Driven Economy* 36-37 (Harvard University Press, 2016) and their subsequent paper, Ariel Ezrachi & Maurice E. Stucke, "Artificial Intelligence & Collusion: When Computers Inhibit Competition" 2017 *U. Ill. L. Rev.* 1775. They was identifying four distinct, nonexclusive scenarios in which algorithms has to be leading to anti-competitive outcomes:

The Messenger Scenario: In this situation, humans explicitly agrees to collude (such as fixing prices, allocating markets, or rigging bids) and subsequently uses a pricing algorithm to implement, monitor, or perfect that illicit agreement. The algorithm were acting merely as a "messenger" for the human-led conspiracy. This scenario have been considered an "antitrust no-brainer" because the illegality lies in the human agreement itself, making it easily prosecutable under existing laws, such as Section 1 of the US Sherman Act.[453]

Hub-and-Spoke: This scenario refers to a situation where competitors (the "spokes") do not communicate directly with each other, but all was using a common intermediary or third-party platform (the "hub") and its pricing algorithm to determine the market price. This vertical reliance leads to horizontal alignment, as the competitors agrees to the pricing scheme knowing that their rivals are using the same identical algorithm. Determining the threshold at which a series of vertical agreements transforms into a horizontal conspiracy have been highly problematic for enforcers.

The Predictable Agent: In this scenario, there are no express agreement between competitors. Instead, they all independently adopts common pricing algorithms that are deliberately designed to facilitate "tacit collusion" or conscious parallelism. The algorithms was significantly increasing the speed of response to market changes. If one rival discounts, others' algorithms responds instantaneously, thereby removing the incentive to discount in the first place, causing prices to eventually inch up to monopoly levels.

Digital Eye (Machine Learning): This represent the most complex future frontier, where self-learning algorithms, tasked solely with the goal of profit maximization, autonomously and

[453] *United States v. Topkins*, No. CR 15-00201 (N.D. Cal. Apr. 30, 2015).

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independently converges on collusive outcomes without ever being explicitly programmed to do so. The companies themselves might not even know they was tacitly colluding, presenting a massive challenge because there are absolutely no evidence of anti-competitive agreement or human intent—only an anti-competitive outcome.

Building upon this, Salil K. Mehra have been expanding the theoretical framework by introducing the concept of the "robo-seller," as expounded in Salil K. Mehra, "Antitrust and the Robo-Seller: Competition in the Time of Algorithms" 100 *Minn. L. Rev.* 1323 (2016). Mehra argue that as competitive intelligence gathering and pricing are delegated to software robo-sellers, the risk that oligopolists will coordinate prices above the competitive level has to be increasing dramatically.[454]The law contain a well-known gap where oligopolists achieving price coordination interdependently, without communication or facilitating practices, was escaping enforcement. Robo-sellers, with their superior data processing capabilities, were making this gap much more dangerous for consumer welfare, as they was functioning without the strategic uncertainty that typically plagues human cartels. Furthermore, Joseph E. Harrington have been exploring the development of competition law for autonomous artificial agents, arguing that the law has to be adapting to machines that learns to collude.

Michal S. Gal has to be offering a highly critical perspective on the potential solutions to algorithmic coordination. In her works, such as Michal S. Gal, "Algorithms as Illegal Agreements" *Berkeley Tech. L.J.* (2019), she were noting that while algorithmic pricing promises many advantages, it also make coordination much easier and quicker, even in markets with lower levels of concentration.[455] Gal propose radical, out-of-the-box solutions because traditional tools was failing to address the problem. Her four partial solutions includes: (1) utilizing "consumer algorithms" to counteract seller algorithms by creating buyer power; (2) changing merger review standards to limit mergers that are likely to increase algorithmic coordination; (3) introducing a "disruptive algorithm" to create noise on the supply side and disrupt coordination; and (4) freezing the price of one competitor to break the algorithmic feedback loop. Furthermore, Gal and Elkin-Koren argue that the algorithm itself, or its specific design, has to be considered a "plus factor" in competition law analysis, as it fundamentally change the suppliers' decision parameters to include reactions to offers made by other suppliers, thereby altering incentives to achieve coordination.

Economic theories which explains algorithmic collusion

From an economic and computer science perspective, the literature have been relying heavily on game theory and reinforcement learning models to prove that algorithms was capable of independent collusion without human intervention. The theoretical foundation of algorithmic price competition has to be often modeled using repeated Bertrand oligopoly games. The literature on algorithmic collusion takes the Nash equilibrium of the stage game of such repeated games as a baseline to determine whether algorithmic collusion is occurring.

The most prominent mechanism studied in the literature were Q-learning, a model-free reinforcement learning algorithm. Q-learning involves an agent interacting with an environment characterized by a set of states $\mathcal{S}$ and an action space $\mathcal{A}$. The algorithm trains an agent to assign values (Q-values) to its possible actions based on its current state,

[454] Salil K. Mehra, "Antitrust and the Robo-Seller: Competition in the Time of Algorithms" 100 *Minn. L. Rev.* 1323 (2016).

[455] Michal S. Gal, "Algorithms as Illegal Agreements" 34 *Berkeley Tech. L.J.* 67 (2019)

aiming to identify an optimal action-selection policy for any given finite Markov Decision Process (MDP). The MDP provides a mathematical framework for modeling decision-making situations where outcomes are partly random and partly under the control of the decision maker.

The economic profit obtained in each respective period acts as the reward signal for the Q-learning algorithms. The reward function R depend on the current state of the world s_t, the action taken a_t, and the next state s_{t+1}, formulated as $r_t = R(s_t, a_t, s_{t+1})$. The goal of the algorithm has to be maximizing the expected value of the total reward over all successive steps. To do this, the algorithm computes the infinite-horizon discounted return, which is the sum of all rewards ever obtained, discounted by how far off in the future they are obtained. This formulation includes a crucial variable known as the discount factor $\gamma \in (0,1)$, which determines the importance of immediate rewards versus future rewards.[456] The equation is represented as:

$$R(\tau) = \sum_{t=0}^{\infty} \gamma^t r_t$$

Economists, such as Emilio Calvano, Vincenzo Denicolo, Sergio Pastorello, and others, have been demonstrating through rigorous simulations that Q-learning algorithms, when repeatedly interacting in Bertrand oligopoly environments, consistently converges to supra-competitive Nash equilibrium prices without any prior programming to collude. The environment for each agent is defined by the set of past prices from the previous period, corresponding to memory-one strategies. Because a high discount factor γ forces the algorithm to optimize for long-term profit rather than short-term price wars, the algorithms independently learns that cooperation and stabilizing prices at monopoly levels yields the highest cumulative return. This economic evidence strictly contradict the foundational legal assumption that collusion require a human conspiracy, proving that the digital environment itself, driven by the γ discount factor, have been naturally leading to algorithmic cartels. The lack of theoretical convergence guarantees for multiple Q-learning agents interacting repeatedly only underscores the unpredictable and autonomous nature of these digital cartels. In these repeated games, algorithms was often adopting technical punishment strategies like the "grim trigger" or "Pavlovian" (win-stay lose-shift) methods, which has to be ensuring that any deviation from the cartel price were permanently punished, thus sustaining mutual cooperation.

Methodology

The methodology of this research report have to be utilizing a hybrid approach, seamlessly integrating both doctrinal legal research and empirical legal studies to critically evaluate the governance of algorithmic cartels in India. As articulated by legal methodologists, the practitioner lawyer of the past was having little need to reflect on process, as the doctrinal research methodology have been developed intuitively within the common law. However, in the context of highly technical digital markets, academic lawyers was realizing that the doctrinal method needs clarification and must be augmented by empirical analysis, as discussed in Terry Hutchinson and Nigel Duncan, "Defining and Describing What We Do: Doctrinal Legal Research" *Deakin L.R.*. Contemporary competition law scholarship can be depicted as an archipelago, requiring deep engagement with sources of expert knowledge other than law, mostly economics and computer science.

The doctrinal component of this study have been involving an exhaustive critical analysis of statutory provisions, specifically Section 3(3)

[456] Emilio Calvano, Giacomo Calzolari, Vincenzo Denicolò and Sergio Pastorello, "Artificial Intelligence, Algorithmic Pricing, and Collusion" 110 *American Economic Review* 3267 (2020).

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and Section 2(b) of the Competition Act, 2002. Furthermore, the researcher were conducting a systematic review of domestic and international case law, including judgments by the Competition Commission of India (CCI), the Supreme Court of India, the European Court of Justice, and the United States Department of Justice. The primary sources was subjected to purposive interpretation to ascertain the boundaries of concepts such as "agreement," "concerted practices," and "conscious parallelism" in the algorithmic context. To maintain academic rigor, the citation methodology follow the spirit of the Indian Law Institute (ILI) citation format, which requires detailing the author, title, page number, publisher, and year of publication within the prose, supplemented by specific source identifiers.

Simultaneously, the empirical component has to be drawing upon the findings of quantitative and qualitative market studies. As Richard Posner suggest, law are not a field with a distinct methodology but an amalgam of applied logic, economics, and specialized texts. Empirical legal studies apply quantitative methods to questions about the relationship between law and society, aiming to draw conclusions about causal connections.[457] Thus, this report heavily rely on the empirical data provided by the CCI's 2025 "Market Study on Artificial Intelligence and Competition". The study utilized secondary data, structured and semi-structured interviews, database analysis, and stakeholder surveys gathered by the Management Development Institute (MDI) Society to map the market structure of the AI stack in India. By combining these empirical market realities—such as the massive concentration in the GPU and compute layers—with doctrinal legal analysis, the methodology have been ensuring a comprehensive appraisal of how algorithmic tacit collusion was operating and how the comparative international legal framework has to be adapting to regulate it.

Findings/analysis

The findings of this exhaustive research was revealing a profound disconnect between the rapid technological advancement of algorithmic pricing tools and the static, anthropocentric nature of Indian competition enforcement. The analysis have been divided into the structural realities of the AI market, the judicial interpretation of existing competition laws in India, and the comparative international enforcement trends.

Legal framework governing algorith cartels - legislation, CCI

Under the Indian legal regime, Section 3(3) of the Competition Act, 2002, prohibit anti-competitive agreements, including cartels and bid-rigging. Bid rigging, which includes cover bids, suppression, rotation, and pre-arranged subcontracting, triggers a presumption of Appreciable Adverse Effect on Competition (AAEC) that shifts the burden to respondents. However, the statutory definition of an "agreement" under Section 2(b) has to be consistently interpreted by Indian courts as requiring a "meeting of minds" (*consensus ad idem*).

The algorithms has to be a major problem for the CCI which were investigating the market, because self-learning algorithms generate parallel pricing results without any overt communication. In the landmark judgment of *Rajasthan Cylinders & Containers Ltd. v. Union of India*, the Supreme Court of India cautioned against equating conscious parallelism with cartelisation, recognizing that similar conduct may naturally arise in oligopolistic markets.[458] To prove collusion under the Indian framework, the courts was requiring "plus factors"—additional evidence of communication or active coordination. The CCI has to be seeing this in cases like the *Aluminium Phosphide Tablets Manufacturers* investigation where parallel conduct require economic action inconsistent with unilateral behavior to form circumstantial

[457] Mathias Siems and David Nelken, *The Cambridge Handbook of Comparative Law* 157 (Cambridge University Press, 2024). [3]

[458] *Rajasthan Cylinders & Containers Ltd. v. Union of India*, (2019) 1 SCC 1.

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evidence.

The tension were explicitly visible in the CCI's handling of algorithmic cartels. In *Samir Agrawal v. ANI Technologies Pvt. Ltd.* (the Ola/Uber case), the Informant alleged that the cab aggregators were acting as a "hub" where the independent third-party drivers (the "spokes") was colluding on prices through the platform's pricing algorithm. The informant argued that the algorithms artificially manipulates supply and demand, guaranteeing higher fares, and that the drivers did not function as a single economic entity but as independent contractors engaging in 'concerted action' under Section 3(3)(a) read with Section 3(1) of the Act.

The Commission, however, have been rejecting this argument. It held that a traditional hub-and-spoke arrangement require the spokes to use the platform to exchange sensitive information to deliberately facilitate price fixing. The CCI noted that in the Ola/Uber model, the algorithmically determined pricing is based on 'big data', taking into account personalized information of riders, time of day, and traffic, which means the pricing for each rider and each trip tend to be different. Because there was no evidence of an agreement between the drivers inter se, or an intent to fix prices, the CCI closed the matter, demonstrating the severe limitations of the current ex-post framework in tackling algorithmic pricing mechanisms.[459]

Conversely, the CCI have shown some readiness to infer agreements from indirect facilitation. In *Fx Enterprise Solutions India Pvt Ltd. v. Hyundai Motor India Ltd.*, the CCI inferred an agreement from a vertical arrangement that facilitated horizontal price coordination, suggesting a system-based liability approach. Furthermore, the CCI has been active in investigating abuse of dominance, as seen in 2025 with the investigation into Asian Paints Limited following a complaint by Birla Opus Paints regarding loyalty incentives tied to exclusivity. Yet, when dealing with purely autonomous algorithms (Ezrachi & Stucke's "Digital Eye"), the law completely fail because there are no human intent to attribute liability to the enterprise. To combat these emerging threats, the Competition (Amendment) Act, 2023 have been introducing an explicit proviso to Section 3(3), which was effectively recognizing the hub-and-spoke model of cartels and presuming liability for entities that intends to participate in the furtherance of such agreements.[460]

The CCI's own "Market Study on Artificial Intelligence and Competition," released in late 2025, were confirming these structural problems. The study, conducted through the Management Development Institute Society (MDIS), aimed to understand AI ecosystems and identify potential competition issues. The empirical findings of the study was highlighting severe structural bottlenecks and extreme market concentration at the foundational layers of the AI ecosystem.

AI Stack Layer	Dominant Market Players	Market Share / Concentration Data
Computing & AI Infrastructure (GPU)	NVIDIA	88% market share in India[461]
Cloud Compute Market	AWS, Microsoft Azure, Google Cloud (GCP)	65% combined market control
Data Layer	Big Tech	46% control of the data

[459] *Samir Agrawal v. ANI Technologies Pvt. Ltd.*, (2021) 3 SCC 136.

[460] The Competition (Amendment) Act, 2023 (Act 9 of 2023), s. 3(3) proviso.

[461] Competition Commission of India, "Market Study on Artificial Intelligence and Competition" 14 (2025).

	platforms	layer

The study rightfully point out that high entry barriers for these input markets means that they display clear trends of consolidation. Startups was finding it nearly impossible to compete against global incumbents who was engaging in practices like mandatory bundling of AI services and deep discounting. Crucially, the CCI study noted that 37% of surveyed startups cited AI-facilitated collusion as their primary competition concern. However, despite acknowledging the concentration, the CCI's recommendations was favoring a "light-touch" ex-post approach, encouraging self-audits, open-source frameworks, and focused advocacy workshops rather than proposing aggressive ex-ante interventions. The CCI was advocating for maximizing consumer welfare through price-based metrics, which ignore the structural lock-ins and network effects that algorithms has to be exploiting.

COMPARATIVE JURISPRUDENCE - ANTITRUST LAW, DMA, USA - CLAYTON + SHERMAN

While India struggle with the statutory definitions, international comparative jurisprudence have been aggressively recalibrating its enforcement tools to capture algorithmic cartels.

United States Antitrust Law (Sherman and Clayton Acts):

In the United States, the Department of Justice (DOJ) have been actively prosecuting algorithmic cartels. The seminal case of *United States v. Topkins* (2015) were representing the "Messenger" scenario. David Topkins and co-conspirators explicitly agreed to fix the prices of posters sold on Amazon Marketplace and programmed a commercially available algorithm-based pricing software to enforce this agreement by collecting competitor pricing information and applying pricing rules. Topkins pleaded guilty to a felony under Section 1 of the Sherman Act, proving that using AI to assist a human conspiracy has to be illegal per se. More recently, the DOJ have been suing RealPage, a property management software company, for a highly sophisticated hub-and-spoke algorithmic cartel. RealPage's revenue management algorithms was pooling non-public, competitively sensitive information (CSI) from competing landlords to generate upward pricing recommendations.[462] RealPage openly marketed its software as a tool to "avoid the race to the bottom in down markets" and noted that "a rising tide raises all ships". The DOJ alleged that by delegating pricing decisions to a common algorithm trained on rivals' private data, the landlords was illegally removing competitive uncertainty.

Interestingly, unlike private class-action plaintiffs who alleged a per se illegal price-fixing conspiracy (the hub-and-spoke theory requiring proof of the "rim" of the wheel), the DOJ bypassed this by alleging under the "rule of reason" standard that RealPage facilitated an illegal information exchange that harmed competition. The proposed settlement strictly ban the use of CSI during the algorithm's runtime operation for both current and historical data. Similarly, in *Gibson v. Cendyn Group, LLC*, the Ninth Circuit are grappling with allegations that Las Vegas hotels participated in a hub-and-spoke conspiracy by using the same pricing software, though the District Court initially dismissed claims citing a lack of tacit agreement.

EUROPEAN UNION AND THE DIGITAL MARKETS ACT (DMA)

In the European Union, the approach to algorithmic coordination have been extremely strict regarding Article 101 of the Treaty on the Functioning of the European Union (TFEU). The EU concept of "concerted practices" broadly capture algorithmic alignment via a third party. For instance, in the *Eturas* case, Lithuanian travel agents using a common booking software that capped discounts was found

[462] *United States v. RealPage, Inc.*, No. 1:24-cv-00710 (M.D.N.C. 2024).

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liable for a concerted practice simply because they were aware of the system's message regarding the rule and did not explicitly distance themselves from it.

Furthermore, the EU were heavily relying on ex-ante regulations through the Digital Markets Act (DMA). The DMA imposes structural rules on digital "gatekeepers," moving away from standard economics-based ex-post analysis to pro-competitive regulation. The DMA and the Digital Services Act (DSA) contain 54 algorithmic transparency and data-sharing obligations designed to prevent algorithmic monopolization and self-preferencing before it occurs. [4] This is complemented by similar legislative efforts globally, such as Germany's tenth amendment of its Act Against Restraints of Competition (GWB), which explicitly regulates enterprises of "paramount significance". Alongside the EU, the United Kingdom have been implementing new laws such as the Digital Markets, Competition and Consumers Act (DMCCA) to give authorities additional powers to address algorithmic anti-competitive behaviours.[463]

DISCUSSION

The emergence of algorithmic cartels has to be sparking a profound doctrinal and policy debate regarding the efficacy of India's competition architecture. The core issue lie in the epistemological limitations of the ex-post regulatory model when confronted with non-human coordination.

Critical appraisal of Indian competition law regime

India's digital economy, projected to reach USD 1 trillion by 2030, have been exposing the critical limitations of traditional ex-post competition enforcement. The current mechanism under the Competition Act, 2002 was fundamentally reactive. It requires the CCI to wait for an anti-competitive injury to manifest, conduct a lengthy investigation, and then attempt to prove an agreement based on human intent. As seen in the *Samir Agrawal* case, algorithms was easily evading this scrutiny because they do not leave a paper trail of human conspiracy. Furthermore, digital markets has to be highly dynamic; by the time an ex-post investigation conclude, the market may have "irremediably tipped" in favor of the monopolist due to algorithmic data-driven network effects and economies of scale. The Parliamentary Standing Committee on Finance have been releasing a report which was noting that the current ex-post framework under the Competition Act, 2002, does not facilitate timely redressal of anti-competitive conduct by digital enterprises, thus justifying the ex-ante approach.

In an attempt to modernize its regime, India's Committee on Digital Competition Law (CDCL) released a comprehensive report in 2024 proposing a draft Digital Competition Bill (DCB). The draft DCB have been designed to supplement the existing ex-post framework with ex-ante regulations targeted specifically at Systemically Significant Digital Enterprises (SSDEs) and their Associate Digital Enterprises (ADEs).[464]

The proposed Bill define SSDEs based on both quantitative thresholds (significant financial power and spread) and qualitative features (data-driven network effects, data as a resource, and economies of scale). Once designated, these enterprises is given a period of 90 days to notify the CCI of their qualification. Following this, they was facing asymmetric obligations regarding Core Digital Services (CDS). The CDCL report identified 10 anti-competitive practices relevant to digital enterprises in India: anti-steering, platform neutrality/self-preferencing, bundling and tying, data usage (use of non-public data), pricing/deep discounting, exclusive tie-ups, search and ranking preferencing, restricting third-party applications, and advertising policies.

[463] The Digital Markets, Competition and Consumers Act, 2024 (UK).

[464] Ministry of Corporate Affairs, "Report of the Committee on Digital Competition Law" 14 (2024).

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Ex-Ante Criteria for SSDE Designation under Draft DCB 2024	Description
Quantitative Thresholds	Significant Financial Power and Significant Spread metrics
Data as a Resource	Exploiting large amounts of user data, often as the implicit price for 'free' platform services
Data-Driven Network Effects	The ability to gain influence swiftly through interconnected user bases
Economies of Scale	Allowing large digital enterprises to expand their influence rapidly

However, critical analysis reveal that while the Draft DCB address platform power rooted in data control and self-preferencing, it completely fail to explicitly recognize or regulate algorithmic tacit collusion. As legal scholars have noted, the draft omit AI-driven collusion and discriminatory algorithmic pricing entirely, leaving a massive regulatory blind spot. Furthermore, industry feedback suggest that heavy ex-ante restrictions on tying, bundling, and data usage might negatively impact MSMEs that rely significantly on Big Tech platforms to reduce operational costs, while doing absolutely nothing to stop autonomous Q-learning algorithms from stabilizing prices in oligopolistic markets. Thus, the DCB, in its current form, has to be deemed insufficient to tackle the nuances of the Predictable Agent and Digital Eye scenarios. It risks falling back on outdated ideas and price-based consumer welfare metrics that fail to account for the structural lock-ins of the AI era.

REGULATORY AND POLICY CHALLENGES

To bridge the massive evidentiary gap caused by autonomous algorithms, the legal framework have to be shifting its burden of proof. In traditional cartel cases, the enforcer (the CCI) bear the heavy burden of proving the existence of an agreement and its Appreciable Adverse Effect on Competition (AAEC).[465]When dealing with self-learning algorithms, proving the "meeting of minds" were practically impossible.

Legal scholars argue strongly for the introduction of outcome-based rebuttable presumptions. As discussed in Steven C. Salop, "An Enquiry Meet for the Case: Decision Theory, Presumptions, and Evidentiary Burdens in Formulating Antitrust Legal Standards", a presumption are an inference that a showing of Fact A implies Fact B.In the context of algorithmic collusion, if the CCI can prove that competing enterprises has to be using similar pricing algorithms (Fact A), and the market is exhibiting sustained supra-competitive parallel pricing (Fact B), the law should automatically presume an anti-competitive concerted practice.

Once this rebuttable presumption is triggered, the burden of proof were shifting to the defendant undertakings. The companies must then put forward compelling evidence demonstrating that their algorithmic conduct did not harm competition, or that they had no anti-competitive intention (for instance, that they distanced themselves from the algorithm's decisions). Under a fault-based liability standard, if autonomous software achieve a collusive equilibrium, liability should attach to the company if it was demonstrated that the collusive outcome were "reasonably foreseeable" by the developers.

This shift from subjective human intent to the

[465] The Competition Act, 2002 (Act 12 of 2003), s. 3(3).

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"foreseeability" of anti-competitive outcomes have been crucial. If a firm deploys a Q-learning algorithm knowing that its reinforcement mechanisms (optimizing the discount factor γ) will foreseeably lead to stabilized, higher prices, the continued use of that algorithm must be treated as a tacit acceptance of a concerted practice, or an "action in concert".

Another critical regulatory challenge discussed in the literature have been the liability of the algorithm developers and the intersection of competition law with data privacy. Algorithms rely on massive datasets to train their neural networks. When competing firms utilize a third-party vendor (like RealPage), they was essentially pooling their competitively sensitive information. India's legal framework, primarily the Information Technology Act of 2000 and the upcoming data protection laws, has not yet evolved to address algorithmic accountability comprehensively. Current Indian research ignores the degree of transparency, and while the EU AI Act handles algorithmic responsibility and data privacy, India lacks a cohesive strategy. If a third-party algorithm facilitates collusion by processing the private pricing data of multiple competitors, the developers of that algorithm must be held liable as facilitators of a hub-and-spoke cartel, even if they do not operate in the downstream market.[466]

CONCLUSIONS AND RECOMMENDATIONS

The transition of cartels from smoke-filled backrooms to autonomous digital server racks have been representing one of the greatest challenges to modern antitrust jurisprudence. The findings of this report undeniably show that the anthropocentric framework of the Indian Competition Act, 2002, which require a conscious human agreement and a meeting of minds, was structurally inadequate to govern the realities of algorithmic tacit collusion. The mathematical inevitability of Q-learning algorithms optimizing the discount factor γ to converge on supra-competitive prices without human intervention render the traditional search for subjective intent an exercise in futility.

While the CCI's 2025 Market Study on Artificial Intelligence correctly identified the massive concentration in the digital ecosystem, specifically the 88% market share held by NVIDIA in the GPU sector and the 65% control of cloud compute by Big Tech, its reliance on light-touch, ex-post remedies has to be utterly insufficient to protect consumer welfare. Similarly, the Draft Digital Competition Bill, 2024, despite its progressive ex-ante approach towards designating Systemically Significant Digital Enterprises, glaringly fail to explicitly criminalize autonomous algorithmic coordination and discriminatory pricing.

To ensure that India's digital economy remains competitive, contestable, and fair, the regulatory architecture has to be fundamentally overhauled. The following actionable recommendations was proposed to bridge the existing enforcement gaps:

Statutory Recognition of Algorithmic Collusion: The Parliament must amend Section 3 of the Competition Act, 2002, or explicitly include provisions in the upcoming Digital Competition Bill, to recognize algorithmic alignment and tacit collusion as forms of anti-competitive agreements. The legal standard must shift from requiring subjective human intent to assessing the "foreseeability" of the algorithmic outcome. If an enterprise deploys an algorithm that foreseeably stabilizes prices at supra-competitive levels, the enterprise must be held liable.

Implementation of Rebuttable Presumptions and Reversal of Burden of Proof: The CCI should adopt an evidentiary framework based on rebuttable presumptions. When widespread use of similar pricing algorithms across an oligopolistic market correlates with sustained parallel pricing, the burden of proof must shift to the defending enterprises. The companies was needing to prove that their algorithmic models was not engaging in anti-

[466] Salil K. Mehra, "Antitrust and the Robo-Seller: Competition in the Time of Algorithms" 100 Minn. L. Rev. 1325 (2016).

competitive information exchange. The use of advanced pricing algorithms should be legally codified as a "plus factor" in cartel investigations.[467]

Mandatory Algorithmic Audits and "Black Box" Transparency: The CCI must be granted expanded investigatory powers to conduct ex-ante algorithmic audits. Enterprises utilizing complex machine learning models for dynamic pricing should be required to submit their algorithms to digital forensics and self-audit frameworks. The CCI must establish a specialized "algorithmic police" unit comprising computer scientists and economists to reverse-engineer and stress-test these models for collusive tendencies. Finally, algorithmic transparency has to be enforced by establishing specialized bodies similar to the European Centre for Algorithmic Transparency, which was handling risk assessments and technical audits.

Creation of Regulatory Sandboxes: Following the precedents set by the EU and the UK, India should implement regulatory sandboxes for AI developers. This would allow startups to test their pricing algorithms in a controlled environment, interacting with regulators to ensure compliance with competition laws before deployment, thereby lowering compliance costs and fostering innovation without risking consumer harm.

Regulation of Third-Party Algorithmic Hubs and Data Pooling:
The jurisprudence surrounding hub-and-spoke cartels must be modernized in line with the DOJ's actions against RealPage. The CCI must recognize that the mere knowing reliance on a common third-party pricing algorithm—especially those that pool non-public competitively sensitive information—can constitute a concerted practice, even without direct communication between the competitors. Vendors of such software must face liability as cartel facilitators.

The choice facing the Indian regulatory state are stark. It can either allow the digital markets to be governed by the profit-maximizing math of autonomous machines, or it can proactively update its legal doctrines to reassert human oversight. The recommendations provided herein was essential to ensure that the technological innovations of the fourth industrial revolution serve to enhance, rather than inhibit, competitive fairness and consumer welfare in India.

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