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# **CARTELISATION IN THE DIGITAL ECONOMY: CHALLENGES FOR COMPETITION LAW AND ENFORCEMENT**

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## **ABSTRACT**

The growing use of machine learning and algorithmic decision-making systems in today's business markets has significantly changed the competitive landscape, especially in digital and data-driven industries. Companies now often use pricing algorithms that rely on large datasets, predictive analytics, and adaptive learning techniques. These tools help optimize prices, manage inventory, and react to market changes in real time. While these advancements improve efficiency and responsiveness to consumers, they also create new risks for market competition, particularly the rise of algorithmic cartels. Algorithmic cartels form when pricing algorithms enable coordinated outcomes among competitors, either through intentional design, indirect signaling, or self-learning processes that lead to collusive pricing without direct human agreement. This abstract looks at how these algorithmic cartels are formed and how they function, along with their legal implications. It explores how algorithms trained on historical and current market data can predict competitors' actions and adjust prices, which may keep prices above competitive levels. Unlike traditional cartels, algorithmic collusion can operate continuously and adapt quickly to market changes, leaving behind few signs of communication or intent. This poses challenges for conventional competition law that relies on proving agreements and human actions. The paper also examines whether existing competition law frameworks can effectively address these new forms of collusion. Most competition laws, including antitrust regulations worldwide, were designed for human actions and may not adequately account for cases where coordination results from independent algorithmic learning. Important issues like who is responsible, the standards for intent, and how foreseeability applies to algorithmic outcomes are discussed. The abstract emphasizes the difficulties competition authorities face in detecting and prosecuting algorithmic cartels due to the complexity of machine learning models, the speed of algorithm interactions, and the global nature of digital markets. In light of these challenges, the abstract suggests possible regulatory and enforcement changes, including requiring algorithmic transparency, implementing pre-compliance measures, using market-stimulation tools, and improving technical expertise within competition

agencies. It argues that competition law does not need a complete overhaul but should be understood and applied with a focus on technology to stay effective. A balanced approach is crucial one that prevents anti-competitive practices while allowing the benefits of machine learning innovations to flourish. Ultimately, this study underscores the urgent need for competition law to adapt to evolving technology. By addressing the threats posed by algorithmic cartels and enhancing regulatory oversight, legal frameworks can promote fair competition in these algorithm-driven markets while encouraging sustainable innovation and protecting consumer welfare.

**Keywords:** business market, algorithmic collusion, machine learning, cartels, Competition Act, enforcement authorities, CCI.

## INTRODUCTION:

Competition law plays a vital role in balancing the fairness in the business markets and safeguard Article 38 and Art 39 of the Indian Constitution by stabilising the economic conditions of our country by preventing concentration of resources and upholding distribution of wealth. It is meant to prevent the practises that prevent competition, such as anti-competitive agreements like Cartels, price fixing, bid rigging, abuse of dominant position, and unlawful combinations. In a well-structured economy, healthy competitive markets encourage entities and firms to innovate new ideas, reduce prices, and improve the quality of goods and services. Consumers in return get benefit from greater choices and better value. However, when firms co-ordinate their behaviour in spite of competing the market mechanism is disturbed, leading to inefficiencies and consumer harm.<sup>1</sup>

Cartels are considered to be one of the most serious threats to competition because they directly affect the price mechanism and market outcomes. Traditionally, cartels were formed through explicit agreements, secret meetings, and direct communication among the competitors. In my opinion competition law is a 'sealed packet'; only the person who dealt with it knows what is inside. The competition authorities detect such type of practices through documentary evidence, by leniency program, through whistleblowers and market analysis or economic analysis.

The establishment of the WTO (World Trade Organization) in 1995 encouraged many countries to adopt and strengthen their Competition laws. Due to Liberalisation of trade

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<sup>1</sup> OECD, *Competition and Consumer Policy*, 2015.

globally, it has become necessary to ensure that the benefits of liberalisation are not utilised negatively by forming anti-competitive practices like cartels, monopolies, or abuse of dominance. Many countries have passed competition law to promote fair competition and protect consumer welfare within their domestic markets. Though the WTO does not directly emphasise competition law, it is formed to regulate free, fair, and non-discriminatory trade internationally, which indirectly influences countries to implement their own effective Competition policies to ensure fair competition and regulate unfair trade practices. India has developed a robust competition law framework for governing it, namely the Competition Act, 2002, which replaced the earlier Monopoly Restrictive Trade Practices Act, 1969. The Competition Act prohibits anti-competitive agreements under section 3, including cartels and empowers the CCI (Competition Commission of India) to investigate and impose penalties and competition advocacy.

The landmark case on cartels is Builders Association of India Vs Cement Manufacturers (2012)<sup>2</sup> The CCI found major Indian cement companies guilty of cartelisation, price-fixing, and restricting production to create artificial scarcity and ordered the companies to stop their anti-competitive actions and pay 0.5 times their annual profits as a penalty. Similarly, in Excel Crop Care Ltd Vs CCI (2017), the Supreme Court upheld the findings of bid-rigging, reinforcing strict enforcement against cartels<sup>3</sup> The nature of the business markets has been transformed along with the growth of digital technology and artificial intelligence. The traditional business market has been upgraded to a digital platform. Businesses mostly relied on algorithms and machine learning to make pricing and strategic decisions. The advancement helps to improve the efficiency, but also creates new risks for competition law, the possibility of algorithmic collusion with and sometimes without the interference of human behaviour. It is difficult to identify the pattern of algorithmic collusion. The same was highlighted by the Supreme Court in Rajasthan Cylinders Vs UOI (2018). It was held that mere parallel behaviour is insufficient to establish cartelization.<sup>4</sup> The same situation exists in algorithmically-driven markets, where, in some cases, a similar pattern arises even without the intervention of human beings. At the world level, in cases like United States Vs Topkins (2015)<sup>5</sup> and Eturas (EU 2016)<sup>6</sup> The courts of the US and the European Court of Justice have

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<sup>2</sup> *Builders Association of India v. Cement Manufacturers*, CCI Case No. 29 of 2010 (2012).

<sup>3</sup> *Excel Crop Care Ltd. v. CCI*, (2017) 8 SCC 47.

<sup>4</sup> *Rajasthan Cylinders v. Union of India*, (2018) 13 SCC 472.

<sup>5</sup> *United States v. Topkins*, No. 3:15-cr-00201 (N.D. Cal. 2015)

<sup>6</sup> *Eturas UAB v. Lithuanian Competition Council*, Case C-74/14 (2016).

explained that the use of software does not make cartel behaviour legal and illustrate how digital platforms can facilitate indirect coordination among firms even in the absence of direct communication, thereby expanding the scope of collusion in the algorithmic era. These developments show that the advent of digital technology E-commerce platform has created new challenges to the competition laws, which are implemented for the traditional way of business markets.

## **ECONOMICS AND COMPETITION LAW: A CONCEPTUAL LINK**

Economics acts as the analytical tool to understand how a market functions and how a business entity coordinates among themselves. Economics stands as the backbone of competition law. Economic principles help to assess whether the system of operation affects the competition in the markets, or protects and promotes effective markets. The main objective is to ensure that markets remain competitive, thereby enhancing consumer welfare and overall economic efficiency<sup>7</sup>. Market power plays a significant role that influences the market conditions specially with reference to pricing and output. Firms in a dominant position may engage in practices that restrict competition, such as predatory pricing and exclusionary practices. Competition law seeks to prevent the misuse of such power while allowing firms to compete on merit<sup>8</sup>. The importance of economic analysis is evident in judicial decisions; it is relevant in *Rajasthan Cylinders Vs UOI*<sup>9</sup>, the Supreme Court emphasised the importance of economic evidence in determining cartelization, noting that parallel behaviour alone is insufficient without proof of agreement<sup>4</sup>. This reflects the growing reliance on economic reasoning in competition law enforcement. Economics and competition law are an intertwined thread. The concept of digital markets, algorithm-driven pricing, data analytics, and platform-based business markets requires a deeper understanding of market dynamics. Traditional indicators of collusion may not always fit for the recently transformed business markets, thus the authorities must rely on advanced economic tools to assess competitive harm<sup>10</sup>. As there is a change in the market due to the rise of artificial intelligence and machine learning the integration of economic analysis into competition law will become most important.

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<sup>7</sup> OECD, *Competition Law and Policy*, 2019.

<sup>8</sup> Massimo Motta, *Competition Policy: Theory and Practice* (2004).

<sup>9</sup> *Rajasthan Cylinders v. Union of India*, (2018) 13 SCC 472.

<sup>10</sup> Arl Ezrachi & Maurice E. Stucke, *Virtual Competition* (2016)

## LEGAL FRAMEWORK OF COMPETITION LAW IN INDIA:

The legal framework governing competition in India has evolved significantly after independence and with the increase in industrialisation over time, in response to changing economic conditions. Initially, competition-related issues were addressed under the Monopolies and Restrictive Trade Practices (MRTP) Act, 1969, which focused primarily on controlling monopolies and preventing concentration of economic power. However, with the liberalization of the Indian economy in the 1990s, the MRTP Act was considered inadequate and obsolete to deal with the complexities of a modern, market-oriented economy. To address these limitations, the Competition Act, 2002 was enacted, marking a shift from controlling monopolies to promoting competition. The Act aims to prevent practices that harm competition, promote and sustain competition in markets, protect the interests of consumers, and ensure freedom of trade.<sup>11</sup> It reflects a more dynamic and economically grounded approach to market regulation. The Act is structured around three core areas:

- Anti-competitive agreements (Section 3)
- Abuse of dominant position (Section 4)
- Regulation of combinations (Sections 5 and 6)

Section 3 of the Act prohibits agreements that cause or are likely to cause an appreciable adverse effect on competition (AAEC). This includes cartels involving price-fixing, market allocation, bid-rigging, and output restrictions. Section 4 deals with the abuse of dominant position, preventing firms with substantial market power from engaging in unfair or exclusionary practices. Sections 5 and 6 regulate mergers and acquisitions to ensure that they do not substantially reduce competition in the market. The enforcement of the Competition Act is entrusted to the Competition Commission of India (CCI), which acts as the primary regulatory authority. The CCI has the power to investigate anti-competitive conduct, impose penalties, and issue directions to ensure compliance with the law. It is assisted by the Director General (DG), who conducts investigations into alleged violations.

Another important development in Indian competition law is the recognition of digital markets and platform-based competition. In *Matrimony.com Ltd. v. Google (2018)*, the CCI

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<sup>11</sup> Competition Act, 2002, Preamble, No. 12, Acts of Parliament, 2003 (India).

found Google guilty of abusing its dominant position in the online search market by favouring its own services. This case marked a significant step in addressing competition concerns in the digital economy. The CCI has initiated investigations into major e-commerce platforms such as Amazon and Flipkart for alleged anti-competitive practices, including preferential treatment and deep-discounting strategies<sup>12</sup> These developments indicate that Indian competition law is gradually adapting to the challenges posed by digitalization and algorithm-driven markets. Overall, the Competition Act, 2002, provides a comprehensive legal framework for addressing anti-competitive practices in India. But still, the increasing use of algorithms and artificial intelligence in business decision-making has given rise to new questions about the adequacy of the existing antitrust laws to face the new challenges posed by modern technology, and the expertise & strength of the enforcement authority to handle the situation is the need of the hour to be analysed.

### **CARTELS: CONCEPT AND TRADITIONAL FORMS OF CARTELS:**

Cartels represent a form of anti-competitive agreements which causes serious threat to the economic development of a nation. It is an erroneous attitude shown towards the competitive market. A cartel is a kind of mutual understanding or agreement formed between competing firms or entities to coordinate their market behaviour rather than competing independently. Such understanding may involve fixing prices, limiting production, allocating markets, or manipulating bidding processes to seek maximum profits at the expense of consumers' interests and market efficiency<sup>13</sup>. The Competition Act, 2002 Section 2(c) defines "Cartel" -includes an association of producers, sellers, distributors, traders or service providers who, by agreement amongst themselves, limit, control or attempt to control the production, distribution, sale or price of, or trade in goods or provision of services. Section 3 of the Act further prohibits such agreements if they cause or are likely to cause an (AAEC) appreciable adverse effect on competition<sup>14</sup>. In my opinion, cartels are sealed packets that can be revealed only by the person who sealed them. Certain characteristics of cartels are that there should be coordination among the competitors, and secondly, they often operate in secrecy, which cannot be identified easily. Third, they usually set up a mechanism to monitor compliance and punishment for deviations. Thus, it makes cartels more harmful and difficult to regulate.

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<sup>12</sup> *Re: Alleged Anti-Competitive Practices in E-commerce*, CCI, Case No. 40 of 2019 (2020).

<sup>13</sup> Richard Whish & David Bailey, *Competition Law* (9th ed., Oxford University Press, 2018)

<sup>14</sup> The Competition Act 2002, Sec 3

The harmful effects of cartels are well recognized in competition law. By fixing prices or restricting output, cartels lead to higher prices, reduced consumer choice, and decreased innovation. This results in a loss of consumer welfare and stabbing of the economic development. As a result, most competition regimes treat cartels as per se illegal, meaning they are presumed to be harmful without requiring detailed economic analysis<sup>15</sup>

Section 3(3) – Horizontal Agreements (Cartels) These are agreements between competitors (same level of market). It includes:

- Price fixing
- Limiting production or supply
- Market sharing
- Bid-rigging

These are presumed to have AAEC (per se illegal). The common form of cartels is price fixing, which may reflect either directly or indirectly on the pricing instead of competing and artificially inflating prices. This type of agreement affects the welfare of the consumer's interest and affects the economic efficiency of the country; as a result, cartels are considered to be 'per se illegal.' The enforcement authorities have dealt with several cases of cartels. In *Builders Association of India v. Cement Manufacturers*, the CCI found that cement companies had coordinated production and pricing decisions, thereby restricting supply and increasing prices<sup>16</sup> The Commission relied on evidence such as parallel pricing, production data, and communication among firms to establish cartelization.

The transformation in the markets has also created a change in the formation of cartels. The traditional form of cartels represents mainly the direct human coordination and communication in secrecy to overcome the detection of cartels by the enforcement authorities. Though traditional cartels are made confidentially, they can be identified by the existing recognisable patterns and methods through the investigation of competition authorities and punished<sup>17</sup>. Traditional cartels often relied on informal enforcement mechanisms to ensure

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<sup>15</sup> OECD, *Cartels and Anti-Competitive Agreements*, 2017.

<sup>16</sup> *Builders Association of India v. Cement Manufacturers*, CCI Case No. 29 of 2010 (2012).

<sup>17</sup> OECD, *Cartels: Detection and Deterrence*, 2015.

compliance among members. These included regular meetings, exchange of sensitive information, and monitoring of each other's market behaviour. Firms that deviated from the agreement could face retaliation, such as price wars or exclusion from the cartel. Such mechanisms helped maintain stability within the cartel despite the absence of formal contracts<sup>18</sup>. Proving a cartel is found to be difficult because it is not that easy to gather the evidence relating to their secret communications and establish cartelisation. However proving the existence of a cartel is not always straightforward. In *Rajasthan Cylinders v. Union of India*, the Supreme Court emphasized that mere parallel behaviour is not sufficient to establish a cartel. There must be evidence of an agreement or meeting of the minds between the parties. This principle is considered prominent in business markets, whether traditional or modern, where similar behaviour may arise due to market conditions rather than collusion. The concept of digital markets has become even more complex. Algorithms and machine learning have started to create similar pricing patterns even without the direct intervention of competitors. This situation raises the question of whether such outcomes should be considered cartelisation or not under the existing legal frameworks. Modern forms of cartels are entirely different from the traditional coordination or communication. Traditional cartels are formed by direct human communications and explicit agreements, while modern forms of collusion occur through automated systems, making it difficult to apply conventional legal tests. To identify the traditional cartelization, the enforcement authorities relied on circumstantial evidence, including communication records, which made it more challenging for them to identify the cartels. To address these challenges, many jurisdictions, including India, have introduced leniency programmes that encourage cartel members to disclose information exchange for reduced penalties voluntarily. This has become an effective tool in uncovering secret agreements and strengthening enforcement: Section 46 of the Competition Act, 2002 provides for a leniency programme, allowing the Competition Commission of India to impose a lesser penalty on cartel members who make full and true disclosure.

In traditional markets, cartels are created by direct human meetings and explicit agreements; the growth of technology has transformed the formation of cartels in a sophisticated way, i.e., algorithmic and machine learning collusion. This shift pushed us to an emergency to re-examine the legal framework about the effectiveness and stability of the Act to address the new forms of cartelization.

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<sup>18</sup> Richard Whish & David Bailey, *Competition Law* (9th ed., 2018)

## TECHNOLOGICAL TRANSFORMATION OF THE MARKETS:

Digitalisation, artificial Intelligence, algorithmic patterns, and machine learning have transformed the world, the way they operate and compete. In the early period, business operations were done by manual decisions with available data. But due to the digitalisation, the operations or decisions of a business are made using digital tools, like big data, algorithms, and machine learning. The advancement of technology has made a remarkable impact in almost all fields; similarly, they have created a great impact on the economic strategy of the business markets, and automatically it influenced the competition laws by imposing new challenges to balance between improved efficiency markets and handling of it by the enforcement authorities

Wilson, R. A.: E. C. Keil, *The MIT Encyclopedia of the Cognitive Sciences*, MIT Press, 1999. Wilson and Keil's widely cited definition of an algorithm in the literature is an unambiguous, precise list of simple operations applied mechanically and systematically to a set of tokens or objects, where the initial state of the token is the input and the final state is the output. To summarize, it is a sequence of operations that transforms an input into an output. Firms and entities started to work with a large amount of information about the customers, prices, and their demand, which helps to predict the market better, and they can easily adjust the prices to meet customers' needs. This has made competition faster and more dynamic. The platform used is the same for the buyer and seller, recruiters and job seekers, etc., ie, the online platform, like the search engines, e-commerce platforms, ride-sharing applications, etc., is automated with some algorithms that rapidly change the traditional business market, by price visibility, customers decision and the platform owner is given more power as he connects both sides of people on the same platform. Though the transaction is made easier, it can still be highly influenced by the market power, and they can shape the competition in the market, which is not habitable in the traditional business system<sup>19</sup>. The advancement of technology has made changes in the world, and brought more sophistication to us by making our work much easier than in the past; at the same time, it imposes more challenges to the enforcement authorities by reshaping the basic market structure and creating a fog in identifying the anti-competitive behaviour in the algorithmic and machine learning-driven markets. The traditional methods used to identify collusions in the older type of business markets are insufficient to trace out the existence of collusion in modern business markets; Competition authorities should be experts in algorithmic patterns-driven markets, digital interactions, and should know how to identify

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<sup>19</sup> OECD, *Rethinking Antitrust Tools for Multi-Sided Platforms*, 2018.

coordination created by machines and humans. The impact of technological transformation is evident in several competition law cases. In *Matrimony.com Ltd. v. Google*, the Competition Commission of India recognized the role of algorithms in shaping search results and influencing market outcomes.<sup>20</sup> Similarly, international cases such as the Google Shopping case (EU, 2017) highlight how algorithmic decision-making can be used to favour certain products or services, thereby distorting competition<sup>21</sup>

The Algorithmic collusion and Machine learning behaviour has started to influence the markets with a low level of human intervention. These technologies are now widely used in areas such as pricing, demand forecasting, inventory management, and consumer targeting<sup>22</sup>. Algorithms are used to analyse real-time data to adapt changing market conditions. For example, it can monitor consumer demand, market trends, automatic pricing to regulate more profits which is used mostly in e-commerce platform impacts the competition. Machine learning is a method used to learn from the past data to improve the future performance. It is parallel pricing behaviour without any explicit agreement, if it by way of cartelization creates a problem<sup>23</sup>. Algorithm may also enhance the competition and help to provide better services to the consumers by personalized recommendations imposing a new challenge to the competition authorities to distinguish between pro-competitive and anti-competitive use of algorithms.

Thus, the present scenario has imposed new challenges to the competition laws in identifying the algorithmic collusion, analyzing the data pattern to find out whether the decision is made individually or by the emergence of network effects, whether it is for consumer welfare or for pricing. Sometimes it may create barriers to entry for new firms and increase the risk of anti-competitive practices<sup>24</sup>, and the competition law is awaiting a new epoch by addressing to the new challenges.

## **TYPES OF ALGORITHMIC COLLUSION:**

Firms relying more on the algorithms and machine learning in their business decisions it has become hard to identify the new form of cartel coordination as there is no direct human

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<sup>20</sup> *Matrimony.com Ltd. v. Google LLC*, CCI Case No. 07 & 30 of 2012 (2018).

<sup>21</sup> European Commission, *Google Shopping Case*, Case AT.39740 (2017).

<sup>22</sup> OECD, *Artificial Intelligence in Society*, 2019

<sup>23</sup> Ariel Ezrachi & Maurice E. Stucke, *Virtual Competition* (2016).

<sup>24</sup> Jean Tirole, *Economics for the Common Good* (2017)

communication and the regulation towards it is also difficult<sup>25</sup>. Scholars and competition authorities have identified different models of algorithmic collusion based on the level of human involvement and the role of technology. These models help in understanding how collusion can arise in digital markets.

**MESSENGER MODEL:** Simplest form of algorithmic collusion as that of a traditional cartel. In this method, firms first enter into an explicit agreement and then uses the algorithms to implement and monitor the agreed strategy. For example, in *United States v. Topkins (2015)*, firms used pricing algorithms to fix prices of posters sold on Amazon. The agreement was made by humans, while the algorithm ensured compliance by automatically adjusting prices<sup>26</sup>. The explicit agreements can be established in this case.

**2. HUB AND SPOKE MODEL:** The hub-and-spoke model involves coordination through a central entity (the “hub”), which facilitates interaction among competing firms (the “spokes”). The hub may be a digital platform, software provider, or intermediary that collects and disseminates information, indirectly aligning the behaviour of competitors. In the *Eturas case (EU, 2016)*, an online travel booking system restricted discounts that could be offered by travel agencies using the platform. The platform acted as a hub, influencing the pricing decisions of multiple firms without direct communication between them<sup>27</sup>. This model raises complex legal questions because the coordination is indirect. Competition authorities must determine whether the hub knowingly facilitated anti-competitive behaviour and whether the firms were aware of the coordinated outcome.

**3. PREDICTABLE AGENT MODEL:** In this model the firms use responsive algorithms for competitor actions, used to monitor market conditions and adjust the price strategy as to the actions, which later lead to stable coordinated outcomes in the absence of direct communications<sup>28</sup>. This type challenges the lawful parallel behaviour and anti-competitive coordination. The principle laid down in *Rajasthan Cylinders v. Union of India*—that parallel conduct alone is insufficient to prove collusion—becomes highly relevant in such cases<sup>29</sup>.

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<sup>25</sup> OECD, *Algorithms and Collusion: Competition Policy in the Digital Age* (2017).

<sup>26</sup> *United States v. Topkins*, No. 3:15-cr-00201 (N.D. Cal. 2015).

<sup>27</sup> *Eturas UAB v. Lithuanian Competition Council*, Case C-74/14 (2016).

<sup>28</sup> Ezrachi & Stucke, *Virtual Competition* (2016).

<sup>29</sup> *Rajasthan Cylinders v. Union of India*, (2018) 13 SCC 472.

4. AUTONOMOUS ALGORITHMIC COLLUSION: This is the most advanced and controversial form, where self-learning algorithms independently develop strategies that result in collusive outcomes; there is no human agreement or direct instruction to collude. Instead, algorithms learn from market data and interactions, eventually discovering that coordinated behaviour maximises profits. This form of collusion has been widely discussed in academic literature but is difficult to prove in practice. It raises serious legal and ethical questions, particularly regarding liability and intent. If no human explicitly instructed the algorithm to collude, it becomes unclear who should be held responsible: the firm, the programmer, or the algorithm itself. Currently, no major case law directly addresses fully autonomous collusion, but competition authorities worldwide, including the OECD, have recognised it as a potential future challenge.<sup>30</sup>

All the above models explain that algorithmic collusion can occur at different levels of human involvement. While the messenger model is relatively easy to regulate under existing laws, the predictable agent and autonomous models pose significant challenges. Traditional legal frameworks rely on concepts such as agreement and intent, which may not be easily applicable in algorithm-driven environments. In the digital markets, competition authorities should adapt to the new forms of cartels by modifying the regulations to address algorithmic behaviour.

### **CARTELS IN ALGORITHMIC ERA:**

One of the main ways in which cartels formed in the algorithmic era is through the use of pricing algorithms that monitor and respond to competitors' behaviour. These algorithms can instantly adjust prices based on market conditions, competitor pricing, and consumer demand. When multiple firms employ similar algorithms, they may reach a point of price alignment or stability, where none of the firms has an incentive to deviate. This can result in outcomes similar to traditional price-fixing, even in the absence of explicit agreements<sup>31</sup>. Transparency in digital markets is another factor to get informed of all information to facilitate coordination among firms. This enables the competing firms to look for competitors' actions, which pave way for coordinated behaviour in the due course. The use of common platform and intermediaries is always a pathway for algorithmic cartels to influence competing firms.

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<sup>30</sup> OECD, *artificial intelligence and competition policy*, 2020.

<sup>31</sup> Ariel Ezrachi & Maurice E. Stucke, *Virtual Competition* (2016).

Similarly as hub and spoke cartels. Sometimes the firms may intentionally design algorithms to facilitate coordination as illustrated in Topkins case. Main concept to be accounted is that whether it is explicit cartel or tacit cartel-. Explicit collusion involves a clear agreement among firms, whereas tacit collusion arises from mutual understanding and strategic interdependence. The answer to this is sometimes foggy to the competition law and the judiciary also find it difficult to give a clear view which sketches a lacuna in the legal frameworks when used for digital markets. In India there is no direct cases but in near future the CCI is about to experience it due to the increase in use of AI- based tools in digital markets. The formation of cartel in the algorithmic era road maps to a complex phenomenon but the cause for cartelisation is still to make maximum profits hence it is need of an hour to evaluate the existing legal framework to be effective in the digital ear.

### **INTERPLAY BETWEEN COMPETITION LAW AND ENFORCEMENT:**

Competition law, is the legal framework to regulate market behaviour, while enforcement ensures that these legal provisions are effectively implemented in practice. The relationship between the two is dynamic, particularly in the context of rapidly evolving digital markets. As new forms of anti-competitive conduct emerge, especially those driven by algorithms and artificial intelligence, the effectiveness of competition law increasingly depends on the adaptability of enforcement mechanisms<sup>32</sup> In India, the Competition Act, 2002 lays down substantive provisions to address anti-competitive agreements, abuse of dominance, and combinations. However, the success of the Act largely depends on the role of the Competition Commission of India (CCI), which is responsible for investigation, adjudication, and enforcement. The CCI has played a proactive role in addressing traditional cartels, as seen in cases like *Builders Association of India v. Cement Manufacturers*, where heavy penalties were imposed for cartelization. At the same time, enforcement has evolved through judicial interpretation. In *Excel Crop Care Ltd. v. CCI*, the Supreme Court clarified the principles governing penalties, emphasizing proportionality and the need to base penalties on relevant turnover.<sup>3</sup> Similarly, in *Rajasthan Cylinders v. Union of India*, the Court highlighted the importance of establishing a clear agreement before holding firms liable for cartelization.<sup>4</sup> These decisions demonstrate how enforcement practices shape the application of competition law.

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<sup>32</sup> OECD, *Competition Policy in the Digital Era*, 2019.

However, the rise of algorithmic markets has exposed certain limitations in the traditional enforcement framework. Existing legal provisions are largely based on concepts such as agreement, intent, and communication, which may not easily apply to algorithm-driven coordination. As discussed earlier, algorithms can produce outcomes similar to collusion without any explicit agreement, making it difficult for authorities to apply conventional legal standards. This has led to an increasing recognition of the need for adaptive enforcement strategies. Competition authorities are now exploring the use of advanced tools such as data analytics, algorithmic audits, and market studies to detect anti-competitive behaviour. For instance, the CCI's market study on e-commerce highlights concerns related to platform neutrality, data usage, and algorithmic pricing. Such initiatives reflect a shift from reactive enforcement to a more proactive and preventive approach. The interplay between law and enforcement is also evident at the global level. International cases such as *United States v. Topkins* and *Eturas* demonstrate how enforcement agencies are beginning to address algorithmic collusion using existing legal frameworks. However, these cases also highlight the limitations of current approaches and the need for greater clarity in legal standards.

Another important aspect is the role of policy development and regulatory coordination. As digital markets operate across borders, effective enforcement requires cooperation among competition authorities in different jurisdictions. Organizations such as the OECD and the International Competition Network (ICN) have been actively working towards developing common principles and best practices. In addition, there is growing debate on whether competition law should move towards ex-ante regulation, particularly in digital markets. This would involve setting rules in advance to prevent anti-competitive behaviour, rather than relying solely on post facto enforcement. While such approaches may enhance regulatory effectiveness, they also raise concerns about over-regulation and its impact on innovation.

In conclusion, the interplay between competition law and enforcement is becoming increasingly complex in the digital age. While the legal framework provides the foundation, effective enforcement requires continuous adaptation to technological developments. The success of competition law in addressing algorithmic collusion will depend on the ability of regulators to integrate legal principles with economic analysis and technological expertise.

## CONCLUSION:

The evolution of markets from traditional structures to technologically driven

ecosystems has significantly transformed the nature of competition. As this chapter has demonstrated, cartels long recognized as one of the most serious violations of competition law are no longer confined to explicit agreements and human coordination. The rise of machine learning, algorithms, and data-driven decision-making has introduced new and complex forms of coordination that challenge the very foundations of competition law.

Traditionally, cartelization was easier to conceptualize and detect, as it involved identifiable elements such as communication, agreement, and coordinated conduct. Cases like *Builders Association of India v. Cement Manufacturers* and *Excel Crop Care Ltd. v. CCI* illustrate how competition authorities effectively addressed such conduct using established legal principles. However, as highlighted in *Rajasthan Cylinders v. Union of India*, even in traditional settings, proving cartelization requires clear evidence of agreement, and mere parallel behaviour is insufficient. In the algorithmic era, this challenge becomes even more pronounced. Algorithms have the ability to monitor, learn, and respond to market conditions in real time, potentially leading to tacit or even autonomous forms of collusion. The distinction between independent decision-making and coordinated behaviour becomes increasingly blurred, raising fundamental questions about the applicability of existing legal standards. International developments indicate that while current frameworks can address certain forms of algorithmic collusion, they may not be sufficient to deal with more advanced scenarios.

The enforcement challenges discussed in this chapter such as lack of transparency, difficulty in proving agreement, issues of liability, and the need for technical expertise highlight the limitations of traditional approaches. Competition authorities, including the Competition Commission of India (CCI), must therefore adapt to this changing landscape by integrating legal, economic, and technological perspectives. In light of these challenges, several suggestions can be made to strengthen competition law enforcement in the digital era:

First, there is a need to develop technical expertise within regulatory authorities. Understanding algorithmic behaviour and data analytics is essential for detecting and analyzing anti-competitive practices in modern markets.

Second, competition law should move towards a more effects-based approach, focusing on the impact of conduct on competition rather than strictly requiring proof of agreement. This would allow authorities to address situations where algorithms produce anti-competitive outcomes without explicit coordination.

Third, regulators should consider introducing guidelines or regulations on the use of pricing algorithms, ensuring transparency and accountability. This could include requirements for firms to maintain records of algorithmic decision-making processes.

Fourth, there is a need for more international cooperation. Since digital markets operate across borders, coordination among competition authorities is essential to effectively address global forms of algorithmic collusion.

Finally, policymakers may explore the possibility of ex-ante regulatory frameworks for digital markets, particularly for dominant platforms. While such measures must be carefully designed to avoid stifling innovation, they can help prevent anti-competitive practices before they occur. In conclusion, the interplay between competition law and technological advancement represents one of the most significant challenges in contemporary legal and economic discourse. While the core objectives of competition law promoting fairness, efficiency, and consumer welfare remain unchanged, the tools and approaches required to achieve these objectives must evolve. The future of competition law will depend on its ability to adapt to the realities of the digital economy, ensuring that innovation and competition coexist in a balanced and sustainable manner.