

## Anti-Monopoly Regulation of Algorithm Collusion in Big Data Era

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**Abstract:** In the era of big data, with the improvement of algorithms and the frequent use of them in the market competition, the monopoly problem of algorithm collusion becomes increasingly prominent. At present, algorithm collusion can be divided into four categories: Messenger algorithm collusion, hub-and-spoke algorithm collusion, predictive algorithm collusion and autonomous learning algorithm collusion. It is difficult to identify algorithm collusion because of its characteristics of intelligence and occult, and it develops beyond the definition of monopoly agreement in the anti-monopoly law. The present anti-monopoly law enforcement tools have certain limitations, and can not well supervise algorithmic collusion. In order to regulate the monopoly behavior of algorithm collusion, the boundary of algorithm collusion should be further clarified, the block chain technology be brought into the category of anti-monopoly law enforcement tools, and the censorship of algorithm collusion monopoly be further improved. From the standpoint of law enforcement under modest and restrained principle, the anti-monopoly regulation of algorithmic collusion will effectively promote the establishment of a unified, open, competitive and orderly modern market system, which is conducive to the creation of a fair and orderly market development environment.

### 1. Introduction

In a global view, it is easy to find that countries are beginning to attach importance to big data, and the trend of data globalization is obvious. From a domestic perspective, the State Council issued the “Action Plan for Promoting the Development of Big Data” in 2015, proposing to build a powerful data-based country. Since then, from the central government to the local government, various rules have been issued to promote the development of big data. At the same time, we should also note that artificial intelligence and machine algorithm bring good and fresh life experience to the public and the welfare of rapid development of social economy in the full digital environment. Meanwhile, algorithm programming and artificial intelligence may be unreasonably used. They can possibly become monopoly tools to manipulate unreasonable prices, to harm the interests of market participants, and to challenge law enforcement agencies. With the continuous development of big data, the diversification of data utilization forms is accelerated along with the diffusion of digital technology, and the behavior of platform using new competition elements such as data and algorithms may “erode” the traditional competition mechanism. We should consider the algorithm collusion in the new monopoly agreement, which has aroused widespread concern and high concealment in recent years. Algorithms can achieve personalized requirements based on the analysis of big data through a variety of instructions. Traders can quickly reach the optimal trading scheme through different algorithm strategies, especially in the process of capital trading, so algorithm plays an increasingly important role in the current market trading center. important role in the market trading center. Due to the availability of data and the intelligence of algorithms, adopting algorithms to reach monopoly agreements can reduce the cost required and improve the efficiency of reaching agreement. There is no consensus on the definition of algorithm collusion monopoly. In the author's opinion, algorithm collusion refers to the behavior that operators use algorithms to explore and analyze big data and limit the price and quantity of products and services so as to realize monopoly [1-3].

## 1.1 Types of Algorithm Collusion

The types of algorithm collusion are more complex. Based on the different functions of algorithms, Professor Ariel Ezrahi from Britain divides the algorithms known to be beneficial to collusion into four categories: Messenger algorithm collusion, hub-and-spoke algorithm collusion, prediction algorithm collusion and autonomous learning algorithm collusion. (3) Great divides lie in the intelligence and number of different kinds of algorithms. With the development of the times, the types of algorithms in the future may be more diversified and complicated.

Messenger-type algorithm collusion means that the computer or algorithm assumes the role of Messenger and executes commands according to the plan set by human beings. Therefore, this kind of conspiracy algorithm or computer only stands in a passive position, and in essence, it is the human's will that enables this kind of algorithm to achieve a collusion monopoly, and then the algorithm is only a tool and medium. On the whole, the algorithm is dominated by human will, and if the algorithm can achieve algorithm collusion, it can be regarded as the collusion monopoly of the operator's own will. The monopoly of Messenger algorithm is relatively simple compared with other kinds of algorithm collusion, because it mainly embodies the will of human.

Hub-and-spoke algorithm collusion, also known as pricing algorithm, means that operators adopt the same or similar algorithm, thus forming a very stable price Alliance, and reaching a horizontal collusion agreement. On April 6, 2015, the U.S. department of Justice accused a merchant on Amazon of using an algorithm to fix the sales price of goods. This is the first criminal lawsuit filed in the United States against algorithm collusion, which confirms the ability of the pricing algorithm written by Topkins to help coordinate prices among competing operators. the pricing algorithm can collect pricing information on posters sold on Amazon and use pre-established pricing rules to coordinate selling prices. The case ended with a fine on the ground that the act was a monopoly and violated the law. Hub-and-spoke algorithms collusion achieves dynamic price changes through algorithms, where the word hub means the developer of computer algorithms. In hub-and-spoke collusion, there is no horizontal competition between developers and users, so the contractual relationship between them should be defined as the nature of vertical agreement. The price exploitation may not be realized by the collusion of a single algorithm of this kind, but if multiple operators use the algorithm at the same time, the price of the whole industry can be reduced or increased, and the price monopoly can be realized.

Prediction algorithm collusion, is a more hidden class of algorithms. Prediction collusion refers to the following behavior and supervision deviation behavior of each operator through independent design of similar computer algorithms. Considering that the operators only reach agreement to use the prediction algorithm, the prediction algorithm can reach tacit collusion, and does not need monopoly agreement, which brings great challenges to monopoly supervision and law enforcement.

Autonomous Learning Algorithm collusion, is also known as artificial intelligence algorithm collusion. Compared with other algorithms, Autonomous Learning Algorithm is more special. Because of its deep learning function, it can even break away from human's subjective intention, so as to realize the collusion behavior of machine autonomy. At this time, the main body of responsibility is relatively vague, and the main body of responsibility is the algorithm developer and user, and there is a certain dispute. In autonomous learning algorithm, whether the collusion is the autonomous behavior of the machine or the behavior of the developers and users, how should this be determined? If it is the collusion generated by the algorithm itself, it is necessary to regulate the developers and users. This series of problems need to be clarified and solved in the collusion of autonomous learning algorithm.

## 1.2 Characteristics of Algorithm Collusion

Algorithm collusion is characterized by its intelligence. This is because the algorithm itself has a certain degree of intelligence which often affects our lives. For example, an eyeful of goodlies dazzles people when they open Taobao, and as they browse a certain goods, other goods you may like will be popped up. The analysis of these related commodities is achieved through algorithms.

(10) Taking the pricing algorithm as an example, the pricing algorithm can adjust the pricing more automatically according to the market price, thus realizing monopoly. In this process, the algorithm can realize intelligent operation even without human intervention. Autonomous learning algorithm can also carry out in-depth learning, according to the past data to simulate and make certain decisions independently.

Algorithm collusion is characterized by its concealment. Since whether the operator uses the algorithm or not and what kind of algorithm are generally a trade secret not known by outsiders, some operators make use of its concealment, thus making the algorithm become a tool to achieve tacit collusion. Some scholars point out that in the traditional situation, human collusion needs a lot of negotiation and bargaining, and the emergence of algorithm makes the gray zone between illegal explicit collusion and legal implicit collusion. It is precisely because of the hidden nature of algorithm collusion that many operators take advantages of the grey area of algorithmic collusion to reach tacit collusion.

## **2. Monopoly Risk Analysis of Algorithm Collusion**

### **2.1 Impacts of Algorithm Collusion on Definition of Traditional Monopoly Agreement**

After the emergence of the case of algorithm collusion, scholars in various countries have re-examined whether the existing Antitrust Law system can regulate the emerging internet monopoly behavior well. For example, Professor Ariel Ezrachi of Cambridge University expressed the concern that the definition of monopoly agreement in the antitrust law may be too narrow and may not prevent the tacit collusion of algorithms. “since algorithmic collusion is a new form of monopoly, it was impossible to predict all possible forms of monopoly in the future when the anti-monopoly law was enacted. At that time, Antitrust Law adopted the legislative method of enumeration, and most of the listed types of traditional monopoly agreements, so the definition of monopoly agreements in Antitrust Law can not include algorithmic collusion. Algorithm collusion does not take the traditional monopoly agreement as the core, but the computer algorithm, so a large part of its characteristics are different from the current traditional monopoly agreement. Sometimes even the monopoly agreement has not been achieved, algorithm collusion behavior happen.

### **2.2 Limitations of Existing Anti-Monopoly Tools**

Since cartels require clear communication in their formation and realization, traditional antitrust tools can be used to prevent such behaviour as long as prices and other trading conditions are adjusted by humans. However, the algorithm collusion is different from this. The algorithm can achieve tacit collusion, and no clear communication is needed in this process. It is difficult for the anti-monopoly law enforcement organ to identify this monopolistic behavior through the evidence of relevant communication process. Moreover, with the efficiency of powerful computing of algorithm, the frequency of tacit collusion can be reached is very high, and the benefits that the operator can obtain are also very large. Therefore, the existing anti-monopoly tools have some limitations on the effective identification of algorithm collusion.

At the 6th China Competition Policy Forum in 2017, some scholars pointed out that the anti-monopoly tools originally applicable to traditional industries are no longer applicable to the new economy. Law enforcement agencies need to adjust the tools and ideas of anti-monopoly law enforcement, and deal with the relationship between anti-monopoly and protection innovation. That is to say, the existing anti-monopoly tools can not adapt to the big data era well, and other new anti-monopoly tools need to be found to assist monopoly enforcement. Therefore, the author proposes that new anti-monopoly law enforcement tools such as anti-monopoly review algorithm and block chain can be used in order to reduce the cost of anti-monopoly law enforcement, improve the efficiency of anti-monopoly law enforcement and maintain a fair and transparent market competition order in the new era of big data.

### **2.3 Algorithm Collusion Monopoly is Difficult to Recognize and Identify**

Since the algorithm collusion is difficult to identify, it will be difficult to prevent in advance. Relying on the traditional antitrust enforcement experience or tools can not identify hidden algorithm collusion characteristics inevitably because the algorithm itself is very complex and technical. Some foreign scholars believe that the interaction between algorithms and tacit collusion is still a developing field, and future policymakers may need to reconsider the current antitrust tools to adequately address misconduct. (16)

Due to the intelligence of algorithm, such a setting makes it difficult to identify the algorithm collusion, especially the operator. Algorithm collusion is not centered on traditional monopoly agreements, but on computer algorithms, which will make it difficult to identify the subjective will of the operator's collusion, especially when there is tacit collusion between the operators. If no agreement is reached between the two operators, instead, the same or similar algorithm used coincidentally, and the same or approximate price got, this is the algorithm autonomous realization of collusion. Whether it needs to be regarded as algorithmic collusion is still controversial in academic circles. At present, the author thinks that the probability of monopoly reached by operators who happen to use similar algorithms is low, and the main enforcement efforts should be put into the case of collusion monopoly reached by operators who intentionally use algorithms.

### **3. Countermeasures for Algorithm Collusion Monopoly**

#### **3.1 Defining the Boundary of Algorithm Collusion Monopoly**

In order to better regulate algorithmic collusion monopoly, many scholars have proposed to reconsider the definition of monopoly agreement in the Anti-trust Law. In order to better regulate algorithmic collusion monopoly, many scholars have proposed to reconsider the definition of monopoly agreement in the Anti-trust Law. Therefore, the author suggests that the term “algorithm” should be added to the definition of monopoly agreement in the second chapter of China's “Anti-Monopoly Law.” It should be clear that algorithm can be used as one of the technical means of monopoly, to ensure that the law enforcement of monopoly regulatory agencies can be based on, to remind law enforcement agencies to pay attention to the monopoly risk of algorithm collusion, and to guide the benign development of computer algorithm Research and Application.

Some scholars put forward that when regulating the unreasonable algorithm information exchange, we should put aside the traditional monopoly agreement with the core of the algorithm as a tool to achieve the operator monopoly agreement. when it is difficult to capture the intention of the operator collusion through the algorithm code, it is very important to regulate the possible algorithm collusion by the cooperative behavior.

Although there remain some disputes in the interpretation of the concept of the agreement by the judiciary, they generally determine the existence of the agreement on the basis of some direct or indirect evidence that can show that the companies do not act independently of each other, i.e., the so-called “agreement of will.” In this paper, the author believes that the law enforcement can judge whether the algorithm has the possibility of monopoly by examining the source code of the algorithm. We can record the running data of the algorithm in a period of time, and judge whether the algorithm has monopoly risk by the running trend of the algorithm. In addition, the algorithm can also be simulated to test whether the algorithm can be used in the monopoly collusion.

#### **3.2 Monopoly of Regulatory Algorithm Using Block Chain Technology**

Foreign scholars point out that although the current debates on AI, data governance, surveillance capitalism, predictive strategies, algorithmic discrimination and related fields are very rich and in-depth, there is little effort to link them to the issue of regulation using blockchain technology. Therefore, the author opines that the block chain can be connected with algorithm collusion, the block chain as an anti-monopoly law enforcement tool, and the block chain technology can be used to monitor the running dynamic of the algorithm. To some extent, this can also reduce the cost of supervision and enforcement, and improve the feasibility of algorithm supervision.

As mentioned above, in order to deal with the monopoly crisis caused by the development of

computers in the future, we need to consider updating the current anti-monopoly tools, and blockchain is a good choice. In essence, blockchain technology is a shared database for storing data or information. It has three major characteristics: decentralization, distributed accounting and non-usurpation. Blockchain technology is like a huge shared book, where everyone can record and view what others have recorded in the book. At the same time, the block chain technology is very stable and secure, so if hackers want to Attack the Block chain and tamper with the data in it, they must conquer every user point in the block chain. With the extension and expansion of the block chain, this is almost impossible to achieve. Therefore, the security, stability and data of block chain technology can not be usurped, and it can well meet the demand of monopoly law enforcement. On account of the advantages that block chain technology owns, decentralization and distribution, it can directly act on the monopoly behavior of the concentration of operators and weaken its monopoly position. In addition, since the block chain technology is a distributed account book, each subject on the data link can share data, and the data can not be usurped, which will effectively promote the transparent and orderly development of the competitive market. And because the field of algorithm is more specialized, and the amount of information that needs to be tracked, processed and analyzed is very large, which is a great problem for the regulatory agencies lacking professional algorithm enforcement personnel. However, blockchain technology can independently evaluate a large number of variables, helping regulators track, understand, and interpret the decisions of AI algorithms. At present, many scholars in the academic circles have agreed to apply blockchain technology to the field of anti-monopoly law enforcement and make it a new generation of anti-monopoly law enforcement tools.

Although blockchain technology can be a new anti-monopoly tool for law enforcers, it also has certain monopoly risks. The OECD has confirmed that blockchain technology may be a hindrance to antitrust enforcement. For example, in addition to the common block chain, there is also a private block chain. Since the private block chain is difficult to be regulated, it may lead to the risk behaviors of sharing user data, sharing price information, conveying monopoly collusion and so on. Therefore, in order to balance the advantages and disadvantages of block chain, when using block chain technology to carry out anti-monopoly supervision, we need to pay attention to the monopoly risk of block chain technology. Block chain technology has a high value in assisting antitrust enforcement, so we should also clarify the application rules of this technology in law. Although blockchain technology itself takes a neutral standpoint, it may lead to monopoly risk if it is used maliciously.

It is impossible to take advantage of the interaction between legal and technical codes, for example, by combining legal and technical codes to achieve public regulation and change the existing law-only model,” Blackett said of regulatory technology. Although many scholars have different views on blockchain, some scholars are optimistic that blockchain can completely replace legal regulation in the digital field. Some scholars are pessimistic, viewing that the relationship between law and block chain will always be struggle and conflict. From the author's opinion, although there are many drawbacks in block chain technology, we can code the law, use block chain technology to carry out legal governance on the chain, and use block chain and algorithm technology to carry out reverse supervision on the two themselves. Three different types of block chains can be employed for supervision in different fields. For the supervision that can be made public, public block chain can be used for governance; for the supervision that needs to protect privacy and is not suitable for disclosure, private block chain can be used for governance, because it has good confidentiality and invisibility; for the supervision that needs to be jointly enforced, Alliance chain can be used for governance, because its nodes have relatively good cooperative relations. In order to realize the legalization of code, there are three ways: first, promote the integration of legal provisions and intelligent contract provisions. Second, promote the integration of traditional legal enforcement mechanisms and intelligent contracts. Third, promote the integration of similar legal governance procedures and block chain platforms, and integrate block chain platforms and legal governance procedures. These three approaches are the future direction of law development in the big data era. The development of legal coding will surely promote the

discipline integration of computer and law, reduce the cost of supervision and law enforcement, and improve the efficiency of law enforcement.

### **3.3 Adherence to the Modest and Restrained Principle and Improve the Censorship of Algorithm Collusion Monopoly**

Because of the difficulty to identify algorithm collusion, we need to improve the censorship of algorithm collusion, especially the prevention mechanism of algorithm monopoly. However, if the algorithm is regulated in the research and development stage, it is not conducive to the development of the computer algorithm technology, and there is a great difference between the use of the computer algorithm in the research and development and the actual effect of the application. Therefore, the author believes that it is more appropriate to supervise the algorithm when it is put into use. First of all, when the operator decides to use the algorithm, he should actively disclose the algorithm to the relevant authorities, and timely record it. Secondly, after passing the censorship, the law enforcement departments should timely monitor the operation of the algorithm and keep relevant monitoring records, especially to strengthen the monitoring of the monopoly risk of the algorithm. In order to reduce the cost of the source code of the manual examination algorithm, we can also consider designing the algorithm specially used for the review and using the block chain technology to assist in order to speed up the efficiency of the examination.

While we are improving the algorithm collusion monopoly system, we also need to follow law enforcement under modest and restrained principle. The cost of monopoly law enforcement will continue to rise because of the emerging and changing forms of monopoly law enforcement. Under modest and restrained principle, it is necessary to take anti-monopoly measures to regulate monopoly behavior, but within a proper degree. We should grasp the degree and scope of regulation, not only considering the efficiency effect of monopoly behavior, but also taking the factors of national Industrial policy and economic development into account. Modest and restrained principle was first applied in the field of criminal law. in the era of big data, it is necessary to apply the concept of modesty in the field of economic law enforcement to meet the needs of the development of the times. the experience of the application of the concept of modesty in the field of criminal law is also worthy of reference for Economic law enforcement.

## **4. Conclusion**

It is undeniable that the algorithm has its unique advantages of high efficiency, convenience, intelligence and so on, which brings us a lot of convenience in life. It is undeniable that the algorithm has its unique advantages of high efficiency, convenience, intelligence and so on, which brings us a lot of convenience in life. The tool itself cannot be defined as good or bad one. Instead, the use of the tool depends on the subjective will of the user. In the field of anti-monopoly law, algorithms can play a vital role in supervising monopoly behavior and helping monopoly law enforcement. However, at the same time, the algorithm also assumes monopoly risk, especially in the future of the algorithm technology. The algorithm not only has unlimited development potentials, but also places the risk of damaging the normal operation of the economy and society. The regulation of algorithm collusion monopoly can play an important role in regulating the use of algorithms and maintaining the order of market competition. In today's booming digital economy, we should uphold the concept of law enforcement under modest and restrained principle, constantly clarify the main body who undertakes the responsibility of algorithm collusion, adopt specific law enforcement measures with supervision as the main and crackdown as the supplementary, and ensure the innovation and development of computer algorithm field while standardizing the illegal acts of algorithm collusion.

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