Antitrust Regulation of Algorithmic Collusion

Li Cheng

School of Law, Shandong University of Technology, Zibo, Shandong, 255049, China

Abstract: With the development of science and technology and the progress of the times, the design and application of algorithms have a clear impact on market competition. While the deepening of their application has brought great convenience to economic life, it has also given opportunities to "speculators". In order to seek higher profits, operators may conspire to monopolize based on algorithms that collect information about consumer choices and changes in the market environment. This paper will analyze the concept of algorithmic collusion, the challenges brought by algorithmic collusion to traditional antitrust law and how to regulate it to justify the necessity and reasonableness of antitrust regulation of algorithmic collusion.

Keywords: Algorithms; Algorithmic collusion; Antitrust regulation

Any technological revolution and technological development will produce both positive and negative effects. The digital economy not only overturns the traditional economic development model, but also creates new trading opportunities and stimulates the vitality of global economic growth, but it also causes some negative effects, and the operating entities, out of their proficiency in algorithm technology, use algorithms to intervene in collusion and generate new monopoly problems. In the information age, collusion with the help of big data algorithms is not only characterized by concealment, but also by generalization, causing greater impact.

1. Overview of algorithmic collusion

1.1. Definition of the algorithm

Today, algorithms influence almost all the information we come into contact with on the Web. The American scholar Anany Levitin sees algorithms as a series of explicit instructions for solving problems, where the required output can be obtained in a limited time by means of inputs that conform to certain specifications.[1] As defined in OECD's Algorithms and Collusion, an algorithm is more properly classified as a precise and clear, simple and easy to manipulate list, and systematically and mechanically deepened in a set of tokens or objects. Zhou Wei considers an algorithm as an operational process that is systematically applied to a specific token or object. [2]With the progress of modern information technology, algorithms have gradually been able to handle tedious data and complex tasks independently. With the assistance of algorithms, computers can make predictions and judgments more swiftly and accurately than humans. For example, in the field of Go, the Alpha Dog developed by Google has already defeated the world champion Ke Jie.

Algorithms are now widely used in business activities, especially in Internet companies. The OECD's "Algorithms and Collusion" categorizes the business applications of algorithms into two main areas: the first area is predictive analysis, where algorithms can make predictions based on existing historical data and make reasonable forecasts about customer preferences and possible price changes. These predictions can help companies to make strategic adjustments in subsequent development to better adapt to changes in market demand. The second aspect is the optimization of business processes, where companies use algorithms to segment consumers and optimize business processes to reduce transaction costs in order to arrive at the best price for the market. Some scholars point out that algorithms are positively correlated with the market, and operators can gain a competitive advantage through algorithms. Algorithmic big data competition among operators has already broken out, and this competitive pressure has also profoundly changed the current traditional retail model, with more and more companies investing costs in the process of developing algorithms. Operators can use algorithms to provide better service and predict market trends, thereby improving their ability to compete, but the widespread use of algorithms can also lead to anti-competitive outcomes. Using algorithms operators can more easily understand competitors' prices, update their own price levels in a timely manner, and

quickly develop a competitive response, which operators can more easily achieve and seek without any formal agreements or interactions between operators. At the 2017 OECD roundtable on "Algorithms and Collusion," antitrust enforcement authorities in many countries began to express concern about the potential for collusion arising from algorithms.

1.2. Manifestations of algorithmic collusion

Professor Ariel Ezrachi has conducted a related study on algorithmic collusion and classified the manifestations of algorithmic collusion into messenger-like algorithmic collusion, hub-and-spoke algorithmic collusion, predictable algorithmic collusion, and autonomous learning collusion according to the different scenarios in which algorithms enable collusion.

1.2.1. Messenger-like algorithmic collusion

In messenger-type algorithmic collusion, the computer or algorithm plays the role of messenger, and the algorithm is a tool to assist the collusion, and its behavior is carried out according to the plan of the person, and the algorithm only plays the role of assistance, and the person is the controller of the messenger-type collusion. The operator first reaches a clear agreement on the price, and then the algorithm executes the person's instructions according to the pre-designed procedures and collected data. The operator monitors the behavior of the conspirators by operating the computer, and once there is a betrayer, he can identify the violator of the agreement through the capture of big data, so that he can be punished.

1.2.2. Center-spoke class algorithm collusion

The participants of the hub-and-spoke collusion are not the same level of operators, and the developers and users of the algorithms are not horizontal competition, but because the operators use the same or similar pricing algorithms, the prices set by the pricing algorithms will become the accepted prices in the market, even if the operators do not intend to restrict competition, but if the range of spokes is wide enough, it is easy to reach collusion to make the prices uniform and restrict competition, and the convergent pricing strategy may endanger the order of market competition and the rights and interests of consumers.

1.2.3. Predictable algorithm collusion

Predictable collusion can be achieved by signaling algorithms, in which different operators develop their own algorithms and track prices by collecting information from other operators. The operator sends signals to other competitors after the algorithm determines the price, and the other operators choose to match the price or not to increase the price and provide feedback based on the price signals sent by the operator, and the operator who sent the signals can also choose to adjust the pricing after receiving the feedback. The predictable type of collusive operators are closely linked and often maintain the same price level through algorithms, which is essentially an implied collusion that does have a substantial competitive effect despite the absence of verbal or written agreements.

1.2.4. Self-learning algorithm collusion

With the continuous development of algorithm technology, there will be more and more operators using self-learning class algorithms. Self-learning class algorithms have obvious intelligent features, and are algorithms with autonomous decision-making and learning capabilities, which can independently perform deep learning and choose the optimal execution plan for price adjustment. Such algorithms operate independently and do not need to follow the instructions of developers or operators, and human intervention in this type is limited. The algorithm can update the operator's data flow in real time and continuously make new decisions to adapt to new situations. When all price decisions in the market are made by self-learning algorithms representing different operators, they are likely to reach some kind of mutual cooperation in pricing after a lot of data projection and self-learning with the goal of maximizing corporate profits.

1.3. Impact of algorithms on collusion-related factors

According to the results of OCED's "Algorithms and Collusion" report, collusion refers to the joint planning and formation of synergies between operators with competitive relationships to implement relevant strategic behaviors to maximize profits at the expense of consumers' rights and interests. There are two types of collusion: explicit and tacit. Explicit conspiracies are mainly based on written or oral agreements and are externalized in anti-competitive behavior. Implied collusion, on the other hand,

relies on the "inner collusion," between operators, i.e., to reach a certain dependence, without adhering to externalized agreements and other formal vehicles, so as to reach cooperation under the guise of competition.

Impact of algorithms on market transparency. The more transparent the market is, the more frequently firms will interact with each other, which can make it easier for market players to reach collusion. In order to benefit from the predictive power of algorithms, firms will tend to use them to collect various kinds of data to store in their computers. As long as a few companies benefit from investing in algorithms, other companies in the industry will have a strong incentive to invest in algorithms, with the result that all players in the industry are constantly collecting data on competitors, consumer preferences, and market changes through algorithms. The result is a transparent market environment that facilitates collusion.

Impact of algorithms on market supply and demand. In a given industry, a decrease in demand can lead to a slump in the market, which may prevent collusion from occurring. The widespread use of algorithms among consumers can improve their decision making process by using demand theory to purchase "good value" goods. On the other hand, supply factors also play an important role in the process of market collusion, and the most critical factor in supply is innovation. Supply is an important driving force in innovation. Companies can use algorithms to save costs and obtain data, and companies can use algorithms to innovate new business models to gain more profits. For some companies with algorithms as a competitive advantage in the market, such as search engines, navigation and other companies will invest more costs to develop algorithms, but if the use of algorithms makes the company's products, services and other jagged, which in turn leads to cost discrepancies, then the possibility of collusion between companies will be lower.

2. Challenges of Algorithmic Collusion to Traditional Antitrust Law

The optimization and upgrading of consumption methods have contributed to the deepening of market algorithm collusion, and the increase in the level of automation of computer network technology has gradually changed the purchasing strategies and methods of consumers. Today's consumers can easily select and purchase items online with the goal of "good value for money". The increasing popularity of online shopping has greatly enhanced the shopping experience of consumers, but online information platforms are collecting, analyzing, and using consumers' personal information all the time, and information and data platforms are gradually changing the nature of market competition.

2.1. Analysis of the advantages and disadvantages of algorithmic collusion for the market

The increasing data and technology-based transactions have increased the transparency of the marketplace, allowing for a more efficient allocation of resources. In addition to these positive effects on competition in the marketplace, digital-based marketplaces allow operators to track user behavior and collect user data through algorithms and other technologies, and use them to optimize and upgrade corporate advertising, personalize marketing, and differentiate pricing. Operators can use algorithms to track consumers' personal data, understand their purchasing preferences and spending power, and then differentiate pricing to achieve superior revenue. For consumers, they are at the mercy of colluders. Algorithmic collusion is only the tip of the iceberg in digital market competition. New technologies, while generating economic benefits, will also continue to impact traditional antitrust law theories and pose new challenges to the implementation of antitrust law, which at this stage is still a tool to assist humans in implementing collusion and has not yet broken through the framework of antitrust regulation. Users of algorithms should respect the instrumental properties of algorithms and bring into play the economic efficiency value of new technologies in compliance with relevant legal norms. The online trading market has certain complexity and specificity, but it is still necessary to establish and maintain a safe, free and fair trading environment, and to create a trading atmosphere for consumers equal to that of the traditional market.

2.2. Difficulties in the identification of algorithmic collusion

Algorithmic collusion, as a new form of collusion, has very different characteristics from traditional collusion and brings new problems and challenges to antitrust law. In terms of price setting, the algorithm weakens the human will. While traditional collusion often requires the agreement of the

meanings of the participants in the collusion or direct execution through human behavior, the pricing algorithm directly uses internal established procedures to calculate prices based on competitors' pricing and consumers' geographic location, and other factors, in the process, weakens the human will. On the surface, the price of a commodity is determined by the direct operation of a computer algorithm.

In the contact of meaning, the algorithm expands the form of association. Traditional collusion requires that all participants agree on a liaison of intent and coordinate their actions accordingly. A determination based on intent is out of step with the digital economy. If there is evidence that an algorithm is designed in a particular way to reduce competition, this is necessary to evaluate whether the algorithm restricts competition. Given the great complexity of the situation when evaluating the economic effects of a firm's behavior, the intent of the firm can provide a good view to examine its behavior in pursuit of purpose. In the absence of evidence of algorithmic pursuit of purpose, a fine-grained effects analysis is required, which might hinder antitrust enforcement activities.

3. The Regulatory Path of Algorithmic Collusion

In recent years, based on the rapid development of China's network technology, the governance of the Internet has also stepped onto the fast track of rule of law, but the discussion and regulation of algorithms are still in the initial stage and further research is still needed. It is necessary to regulate algorithmic collusion through prior prevention mechanism and industry self-regulation to promote the healthy and orderly development of the big data field.

3.1. Preventive measures

The concealment of algorithmic collusion, and the lagging nature of ex post relief not only make it costly to obtain evidence, but also present many technical difficulties, which make it more difficult to identify and regulate. Therefore, in the regulation of algorithmic collusion, we should pay special attention to the ex ante regulation, and focus on the legal regulation of the prevention obligations of algorithmic designers and related users, so as to provide preventive regulation for algorithmic collusion. This can, to a certain extent, enhance the preventive function of the regulation and alleviate the information asymmetry dilemma between regulators and algorithm designers and operators.[3] To strengthen the regulation of algorithmic collusion,, technical personnel with specialized knowledge are essential. To understand the operation and setting of algorithms, regulators need personnel with specialized computer and programming knowledge, otherwise they cannot accurately determine whether and in what way the relevant subjects have engaged in algorithmic collusion. Therefore, the establishment of a technical training base specifically for algorithmic collusion and the training of specialized technical regulatory personnel can be considered.[4]At the same time, the regulatory body should innovate the means of law enforcement, investigate and study the situation related to algorithms in specific market segments through market research and other means, and set a negative list for the use of methods that obviously have competitive damage, so as to regulate the reasonable competition of new technologies such as algorithms and guide market players to engage in healthy competition.

3.2. Industry self-regulation

It is especially important to set up an association or organization for self-management of the Internet industry to guide enterprises to self-regulate and industry self-regulation. The existing records of people's life, consumption and entertainment can be delivered to the cloud through various application platforms, which belong to only a few Internet companies.[5]Therefore, if companies can "self-discipline" with technology for good, avoid mixing self-interest as much as possible, and increase the rigor and morality of algorithm design with a responsible attitude, the possibility of algorithm and collusion, will be reduced. In order to guide the algorithm developers to avoid the program code that may promote collusion,, we can set up relevant development standards through the industry self-regulation norms as the main body, formulate the technical norms and standards of the Internet industry in the market economy, set certain standards to monitor the behavior that may harm competition, and avoid and limit the malicious algorithms. Industry operators can self-manage as well as supervise and restrain through industry associations, such as jointly negotiating not to adopt certain technologies or services to avoid the risk of being infringed by algorithms, such as prohibiting auditing or using anonymous tools. In addition, the industry self-management organizations are authorized by laws and regulations to close and prohibit their members who are suspected of developing malicious algorithms or committing other acts that undermine the competitive order, so as to promote healthy

operation and maintain a good market economic order. However, it should be noted that the norms for setting up development cannot restrict and influence algorithm innovation, and should adhere to the principle of prudence.[6]

4. Conclusion

With the development of big data and artificial intelligence, advanced technologies such as algorithms are increasingly changing the competitive landscape of the digital market, and algorithmic collusion is also integrating into various fields of society with an unstoppable trend. The problem of algorithmic collusion is one of the current antitrust issues, and we should invest corresponding resources in investigation and research based on the balance between the development of algorithms and the antitrust regulation system, strengthen the antitrust regulation of algorithmic collusion through ex ante regulation and industry self-management, and respond to the challenges with a new rule of law thinking and a perfect legal system.

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