Online First

International Organisations Research Journal, 2024, vol. 19, no 3, pp. 138–158
Original Article
JEL: K21
doi:10.17323/1996-7845-2024-03-08

Algorithmic Collusion: Comparative Legal Analysis of Regulation in Russia and Abroad[1]

M. Girich, A. Levashenko

Maria Girich – Researcher, The Russian Foreign Trade Academy of the Ministries Economic Development of the Russian Federation; 6A Vorobiyovskoye Shosse, Moscow, 119285, Russia; girichmari@mail.ru; ORCID: 0000-0001-8093-2665

Antonina Levashenko – Senior Researcher, Head of Russia-OECD Center under the Russian Academy of National Economy and Public Administration; 82 Prospekt Vernadskogo, Moscow, 119571, Russia; antonina.lev@gmail.com; ORCID: 0000-0002-1236-3605

Abstract

Today, companies use different pricing, monitoring, and demand and supply analysis algorithms, which, on one hand, increase profits and benefit consumers (for example, personalized discounts), but, on the other, can damage competition in cases of economic entities using algorithms to implement collusion or anti-competitive one-way behaviour or in cases of self-learning algorithms colluding with no human intervention.

Much of the subject matter of this article stems from the adoption of special regulations on the use of algorithms in collusion over the past few years. The use of algorithms for the implementation of anti-competitive agreements in 2023 in Russia (amendments to the Code of Administrative Offences of the Russian Federation) is considered an aggravating circumstance.

Foreign countries are developing similar regulation; for example, China has explicitly banned the use of algorithms not only in explicit collusion but also in tacit collusion (2021–2023). The EU has recognized "collusion by code" as a cartel agreement (2023), and the US has proposed special rules to regulate implicit collusion using algorithms that analyze competitors' data (2024).

Researchers have identified the types of harm that may result from the use of collusion algorithms by businesses. This article compares the approaches of countries to regulation of the use of algorithms, taking into account the three types of harm identified by the Organisation for Economic Co-operation and Development (OECD) and used by regulators of countries: whether algorithms are used as a tool to implement explicit collusion in existing agreements between economic entities; whether economic entities do not conclude agreements but nonetheless come to concerted action using similar software that is based on algorithms that generate the same price or market determinations for all competitors; and whether self-learning algorithms conspire autonomously (without human intervention) and without the knowledge of economic agents. Comparative legal analysis will help identify how countries approach the problem of collusive use of algorithms, which has become possible in a digital economy.

Methods of research used in this article include comparative analysis of legal acts and law enforcement practices in Russia and abroad.

Keywords: collusion, tacit collusion, concerted actions, algorithms, competition

Acknowledgments: the article was written on the basis of the RANEPA state assignment research programme.

For citation: Girich M., Levashenko A. (2024) Algorithmic Collusion: Comparative Legal Analysis of Regulation in Russia and Abroad. *International Organisations Research Journal*, vol. 19, no 3, pp. 138–158 (in English).doi:10.17323/1996-7845-2024-03-08

Introduction

The word "algorithm" comes from the name of the IX century Persian scientist Al-Khorezmi, who proposed the basic principles of algebra in his treatise "The Compendious Book on Calculation by Completion and Balancing". Translators, when translating the treatise into Latin, adapted the scientist's name – Al-Khorezmi – in a Latin form as "Algorithmi" [Knuth, 1997].

Contemporary researchers have proposed a number of approaches to defining the concept of "algorithm". For example, an algorithm can be understood as a sequence of well–defined operations that can be performed in a certain order to solve a certain task, converting input data into output data [OECD, 2017]. This definition was developed within the framework of the works of Wilson and Keil [Wilson, Keil, 1999] and is currently used by the Organization for Economic Cooperation and Development.

The use of algorithms in competition began with the use of pricing algorithms when, in the early 1970s, Thomas Peterffy and Henry Jarecki first applied computer algorithms that took into account various factors related to option pricing. These algorithms analyzed market data and gave

[1] This article was submitted on 24.04.2024.

instructions for buying or selling options to the user, ensuring an advantage in commodity markets [Ballard, Naik, 2017].

Today algorithms are widely used by companies in business practices. According to a survey of 54 large companies in 2021, the Norwegian Competition Authority found that 55% of companies use monitoring algorithms and 20% use pricing algorithms [Norwegian Competition Authority, 2021]. There are different types of algorithms: algorithms that allow you to distribute supply and demand (for example, for selling advertising spaces on ad exchanges or for taxi services through an application), pricing algorithms, information aggregation algorithms (for example, on news aggregators), recommendation algorithms (for example, for analyzing data on consumer behavior), etc. [Li, Xie, Feyler, 2021].

Algorithms have a significant impact on competition. On the other hand, the use of algorithms creates and develops a competitive environment, provides benefits to consumers and companies. For example, algorithmic personalized pricing can increase profits by up to 86% for companies, as well as provide benefits for more than 60% of consumers in lower personalized prices [Dubé, Misra, 2023]. According to a McKinsey study, the use of algorithms by companies to generate personalized offers contributes to sales growth by 10-30%, while 45% of online customers are more likely to make purchases on a web-site that provides personalized offers [McKinsey & Company, 2023].

Generative artificial intelligence automates and optimizes business processes, including customer service. For example, according to a survey, 88% of consumers have used a chatbot at least once, 70% of whom were satisfied with the result generated by artificial intelligence [Fokina, 2024].

On the other hand, when using algorithms (algorithmic pricing strategies), companies can exchange data (for example, among competitors of the same market) and use the same algorithmic software that will generate similar results for competitors, which then creates risks of collusion (including tacit collusion) and other anti-competitive practices. For example, a study of the gasoline market in Germany with two operating large oligopoly companies revealed an increase in average monthly margin[2] by 28% (relative to wholesale prices) if both competitors used algorithms to set prices. At the same time, if only one company used the algorithm, there were no margin changes [Assad S., et. al., 2020]. Algorithms themselves can engage in tacit collusion by equalizing prices instead of competing with each other [Li, Xie, Feyler, 2021]. In addition, algorithms can generate price discrimination, for example, by collecting personal data about consumers and creating pricing schemes based on a person's assumed willingness to pay [Porat, 2023].

All in all, algorithms are a tool that can benefit businesses (for example, by analyzing markets and choosing the best business strategy) and consumers (for example, by saving consumers' money through personalized offers), and, therefore, do not conclude illegal behavior. However, algorithms can also become a tool for anti-competitive practices, including intentional use of algorithms for illegal actions, for example, deception of consumers, setting monopolistic prices, etc.

Firstly, algorithms can be used by businesses within unilateral behavior, e.g., when a platform occupies a dominant position and uses predatory pricing practices or provides advantages to its own products compared to competitors' offers in order to exclude competitors from the market. The well-known case of the EU Commission against Google is indicative of this. In this case Google, abusing its dominant position, promoted its own Google Shopping service on search results pages to compare products to the detriment of competitors' services [European General Court, 2021]. Secondly, business entities can collude, i.e. enter into agreements, carry out coordinated actions or align economic activities using algorithms.

This paper focuses on study and comparison of approaches of foreign countries and Russia in terms of legal regulation of collusion practices using algorithms. It is worth noting that,

[2] In retail gasoline market, margin is a clear indicator of profitability and market power – the ability of stations to mark up retail prices above wholesale prices.

historically, the regulation of algorithms originated from a phenomenon of "conscious parallelism". It is when businesses without any agreement or communication (unilaterally) adopt a common course of behavior with competitors and expect similar behavior on their part, for example, change prices in order to equalize pricing with competitors. This phenomenon has been researched in a number of studies[3].

The relevance of this study is due to the emerging trend of tightening antitrust regulation on the use of algorithms in business practices in some jurisdictions, most notably – amendment of Article 14.32 of the Russian Code of Administrative Offences in 2023, which recognized the use of automated computer programs for making decisions or committing actions leading to an administrative violation in automatic mode (without human intervention) as an aggravating circumstance (including the use of algorithms).

At the same time, China's antitrust regulation of algorithmic strategies has been adopted in 2021, when the Antitrust Law was supplemented with a ban on using algorithms and other technologies for anti-competitive practices (Article 9) [Antitrust Law of the People's Republic of China, 2022]. In 2023, EU published a guide "On the applicability of Article 101 to horizontal cooperation agreements" [European Commission, 2023], in which "collusion by code" was recognized as a cartel by law. In January 2024, bills have been put forward in United States to prevent collusion using pricing algorithms and prohibit companies from sharing information when jointly using pricing algorithms.

In this article, the approaches of the USA, the EU, China and Russia on legal qualification of actions of economic entities related to the use of algorithms will be classified from the point of view of collusion risks.

1. Algorithms and Harm

In order to understand the negative impact algorithms can have on competition, the academic and expert community have developed "theories of harm", i.e. harm that can be caused by algorithms in business practices. The concept was based on harm theories developed by OECD (report "Algorithms and Collusion" 2017 [OECD, 2017]) and scientists Ezrachi and Stucke [Ezrachi, Stucke, 2016]. Theories of harm are used by regulators of countries (for example, competition authorities of Germany and France) [Autorité de la concurrence, 2019].

The OECD approach is based primarily on the analysis of pricing algorithms, so the harm caused by algorithms is classified into three types:

1) the use of algorithms to implement explicit collusion agreements, e.g. conclusion of price fixing agreements. In these cases, algorithms analyze pricing data, identify deviations and establish a fixed price, as well as track the application of prices by competitors. Another example can be using algorithms for manipulation at auction, etc. Ezrachi and Stucke identify a similar type of damage – the "messenger" algorithm.

2) collusion using algorithms based on the "hub-and-spoke" model, i.e. when businesses do not directly interact, but use the same software or digital product based on algorithms provided by a third party (supplier) to determine prices or market conditions (a similar type of collusion is distinguished by Ezrachi and Stucke). First, separate vertical agreements are concluded between the software provider and competing businesses, then competitors without a horizontal agreement with each other actually come to coordinated actions since they use services of the same provider. Ezrachi and Stucke even declare the possibility of collusion in the secondary market in such case, if, for example, the same external company develops algorithms for several software vendors used by business entities.

It is important to emphasize that, in these types of collusion, algorithms can be used not only in terms of pricing, but also in the formation of any other market conditions. Algorithms can be used to divide the commodity market between suppliers, for example, algorithms can send offers to consumers only within the geographical boundaries assigned to a specific participant of

[3] See, for example, W.Bentley Macleod, Hans-Theo Normann, Michal Gal, etc.

collusion agreement, or restrict the supply of goods or services to certain types of suppliers or consumers (create an artificial restriction (containment) of the supply of goods despite presence of demand), imposing unfavorable conditions on individual contractors, etc. Or, in other instances, algorithms can be used to analyze common databases with information that are formed jointly by the participants of the conspiracy to develop a unified strategy of behavior, etc.

3) tacit collusion of self-learning autonomous algorithms that can independently decide on collusion practices while economic entities themselves do not exchange information and do not enter into explicit coordination. Ezrachi and Stucke, highlighting a similar type of collusion (called "digital eye"), note that algorithms can be developed or used by business entities unilaterally without agreements with competitors. However, due to the fact that self-learning algorithms are programmed to achieve a certain goal as efficiently as possible (e.g. to maximize profits), the risk of autonomous collusion of algorithms is set up. That is, collusion may not always be caused by misconduct of market actors themselves using an algorithmic tool, because algorithms may collude at the level of technological interaction.

It is worth noting that Ezrachi and Stucke highlight another type of harm (unlike OECD) – when business entities unilaterally intentionally create similar self-learning algorithms without any communication with each other, while determining in advance the limits of learning algorithms so that the algorithms can enter into tacit collusion in the future.

Taking the listed types of harm as a basis, let's compare the approaches to regulation and the practice of countries in applying competition law.

2. Using Algorithms in Explicit Collusion

The first type of anti–competitive practice is the use of algorithms in explicit collusion with existing agreements between business entities. It is when there is an agreement (written or spoken) between business entities which is implemented using algorithms. If we look at countries' regulatory practice, general rules of competition law apply to such agreements.

One of the very first cases in this area was the Topkins case in the United States in 2015, when several sellers colluded to set prices for posters on Amazon. In order to do this, sellers conspired to use a single software with pricing algorithms: the algorithm identified the lowest price among all sellers (who, among others, did not participate in the conspiracy), and then set the price slightly lower, guiding the rest of the sellers [United States District Court, 2015]. The Court found a violation of Section 1 of the Sherman Act (15 U.S.C.), a prohibition on agreements restricting competition, including those aimed at setting a fixed or minimum price. A similar case was heard in the UK against Trod Ltd and GB Eye Ltd in 2016 [Competition and Markets Authority, 2016].

Other well-known cases are investigations against Asus, Denon & Marantz, Philips and Pioneer for establishment of fixed or minimum resale prices – these companies were fined a total of 111 million euros. The companies tracked through algorithms for monitoring and comparing prices for household appliances and electronics products set by contracting online stores (independent distributors). If online stores set their own retail prices below the recommended resale price, they were threatened with sanctions. The European Commission has recognized a violation of Article 101 (1) of the Treaty on the Functioning of the EU (TFEU) banning on vertical agreements with establishment of a minimum resale price.

In Russia, the use of algorithms is most often found in investigations of collusion at auctions. According to the Federal Antimonopoly Service (FAS), 85% of cases of anti–competitive actions are collusion at auctions (cartel agreements and collusion with the organizer of tenders) [Teslenko, 2020]. For example, in 2023, the FAS [Federal Antimonopoly Service of Russia, 2023] conducted an investigation into the participation of MTS, Megafon and Rostelecom in an agreement to maintain prices in tenders for the supply of internet access services. To implement the collusion, MTS used auction robots that overestimated or underestimated the cost of services when requesting price offers. In the purchase, where MTS was supposed to win by agreement, the robot was configured in such a way that the offer for the cost of services could sink by 99% of the initial maximum contract price, and if Rostelecom or Megafon were to win, MTS set up robots

with a cost drawdown of 1.5-5.5% from the initial maximum contract price, or no auction robots were used at all.

In another FAS investigation in 2018 [Federal Antimonopoly Service of Russia, 2018b], collusion was revealed between the companies Valyria LLC and Egamed LLC at the procurement site of Sberbank-AST CJSC where each participant could optionally set up an auction robot in his personal account. The companies have set up the same price reduction limit for the auction robot – 0.5% in 0.5% increments, submitting the same price offers. As a result, the winner was Valyria LLC, whose contract price offer was received 0.003 seconds earlier. At the same time, collusion between companies was revealed – submission of bids in the auction and creation of robots for both companies were carried out using the same IP address.

As in cases in the USA and EU, the FAS recognized a violation of the general prohibition on collusion between companies, which in Russia is regulated by Article 11 of Federal Law No. 135-FZ dated 07/26/2006 "On Protection of Competition" (the Competition Law)[4].

Thus, algorithms can be used to implement classic collusion agreements that are expressly prohibited in antitrust law. At the same time, countries began to adopt special rules on the use of technologies, including algorithms, for collusion.

The very first country to adopt special regulation was China – back in 2021, amendments were made to the Antitrust Law prohibiting the use of algorithms and other technologies for anti-competitive practices (Article 9) [Antitrust Law of the People's Republic of China, 2022]. At the moment, in Chinese practice, there are no identified cases of collusion for which algorithms were used.

In EU, collusion is regulated in accordance with Article 101 of the TFEU. At the same time, in 2023, an updated Guide was published "On the applicability of Article 101 to horizontal cooperation agreements" [European Commission, 2023], which recognized that algorithms facilitate collusion – "collusion by code". Such collusion is recognized as a cartel and is regulated by general rules on prohibition of anti-competitive agreements and concerted actions.

In 2023, a special regulation was adopted in Russia – amendments were made to Article 14.32 of the Administrative Code, which recognized as an aggravating circumstance the use of a computer program in the execution of an anti-competitive agreement that allows decision-making or performing actions in automatic mode (without human participation), which includes algorithms and other possible technologies which may underlie computer programs (blockchain, smart contracts, quantum technologies, etc.). It is important to note that the use of algorithms will be taken into account for cartels, price maintenance agreements at auctions and other anti-competitive agreements between organizers and bidders.

In Russia and China, special clarifications were also adopted on use of algorithms and technologies in the market – the FAS Recommendations on practices using information technology in trade, including price algorithms in 2019 [Recommendations of the Expert Council of the Federal Antitrust Service of Russia, 2019] and the Regulation on the Prohibition of Monopoly Agreements in China in 2023 [State Administration for Market Regulation, 2023], which lay down similar provisions. It should be noted right away that the FAS Recommendations cover the use of algorithms in the market of trade in non-food products, such as computer equipment, household appliances and electronics, and excludes the use of algorithms in the provision of services, for example, taxi platforms, advertising or software providers. In China, the Regulation of 2023 applies to all types of goods (services).

Russia's approach is dispositive: FAS allows economic entities to develop price algorithms for their own use and for transfer to other economic entities; in itself, the use of algorithms is not illegal. A list of acceptable practices is determined using algorithms, for example, monitoring compliance with conditions on the maximum resale price of goods or the recommended price level for goods, monitoring prices to determine demand and cost recovery, etc. However, if the use of algorithms in agreements, leads to, for example, price fixing within vertical agreements, including

[4] Similar to Article 101(1) of the Treaty on the Functioning of the EU and Article 1 of the US Sherman Act.

the practice of automated application of sanctions in case of violation of the established price level, such practice is considered anti-competitive. For example, in 2019, the FAS investigated the case of companies using the Z-Price price algorithm to monitor changes in prices for goods and dumping of their counterparties reselling products in real time [Federal Antimonopoly Service of Russia, 2020]. The companies exchanged information, set recommended prices for contractors using algorithms and imposed sanctions for non-compliance (suspension of shipments, cancellation of discounts, increase in purchase prices). The FAS has identified signs of a cartel aimed at setting or maintaining prices.

China's approach is more imperative – a general ban is established for competing economic entities to conclude antitrust agreements any coordinated actions to set prices using the same algorithms for calculating prices (Article 8 of the Regulation).

In Russia, business entities have the right to communicate with counterparties based on results of price monitoring, including providing recommendations on pricing policy, e.g. setting maximum resale prices. According to results of monitoring, business entity also has the right to change the prices of goods (including discounts or allowances). In China, there is a ban on setting resale prices in anti-competitive agreements using algorithms (Article 15).

Thus, the FAS adheres to a dispositive position – everything that is not prohibited by the Competition Law is allowed. In China, the approach is imperative – it is forbidden to use algorithms in any kind of agreements that may be recognized as anti-competitive.

An interesting question is the approach of countries (China, Russia and the United States) regarding restrictions on the use of algorithms and technologies in the exchange of confidential information or coordinated behavior.

Federal Antimonopoly Service recognizes that information exchange is permissible even using price algorithms if it meets the requirements of the Federal Law on Protection of Competition[5]. However, it is prohibited to reach agreements mediating interdependent pricing, including using price algorithms. In China, the exchange of confidential information for anti-competitive agreements that are implemented using algorithms is prohibited (Article 13).

At the same time, in January 2024, United States had an even stricter approach than in Russia and China – to establish a complete ban on the use of pricing algorithms that utilize (e.g. generate solutions) or are trained on the basis of a set of closed (non-public) data collected as part of information exchange from competitors in the same or related market (Bill S. 3686). A presumption of collusion is established if an economic entity (for example, a developer) has transferred a pricing algorithm to two or more competing entities with the intention of setting or recommending prices or commercial terms in the same or a related market. It will also be considered collusion if two or more competitors independently developed and used the same pricing algorithm to set prices or commercial terms. Collusion will occur only if business entities applying the algorithm knew or could have known that competitors' private data was being used.

All in all, in China and Russia information exchange between business entities is allowed unless it is aimed at collusion. The EU supports a similar approach. Paragraph 368 of the Manual "On the applicability of Article 101 to horizontal cooperation agreements" [European Commission, 2023] recognizes exchange of information that is objectively necessary for the implementation of the cooperation agreement and is proportionate to its objectives, including if algorithms are used.

The United States actually proposes to ban any information exchange where algorithms can analyze the collected data of competitors and issue common solutions, regardless of whether such information exchange leads to real collusion and violation of competition law. Therefore, the U.S. bill S. 3686 may be criticized, because information exchange may not necessarily lead to illegal use of algorithms, if, for example, a company does not begin to follow or implement solutions proposed by algorithms.

[5] It is noted that, when using price algorithms, it is permissible to use any indicators (including data on product prices published by a competitor in the public domain, information about the recommended price level or the established level of the maximum resale price).

So, can Uber taxi drivers (platform-independent entrepreneurs) collude if they agree to carry out transportation at inflated prices offered by Uber algorithms, for example, when there is a shortage of vehicles or weather conditions change? After all, Uber exchanges information with taxi drivers (e.g. about supply and demand), and if the demand for rides has increased or the number of drivers has decreased (supply has decreased), then taxi prices are rising, as explicitly stated on the Uber website [Uber, 2024]. At the same time, Uber generates fixed prices which are mandatory and cannot be changed by drivers. A similar case of collusion between Uber and drivers in connection with Uber's price fixing has already been considered in the United States, but the Court has not ruled whether Uber's price fixing is a prohibited vertical agreement [United States District Court, 2016].

Thus, business entities can use algorithms and any other technologies to implement anti-competitive agreements (in written or oral form) or coordinated actions. The conclusion of agreements restricting competition can be confirmed by correspondence, telephone conversations between representatives of companies, and algorithms are used to facilitate the implementation of such agreements, for example, running algorithms from one computer. In this case, there are no controversial issues about the need to apply competition law, since there are direct intentional agreements between the parties to commit anti-competitive practices using algorithms.

In 2021-2024, countries began to propose additional rules to close on the legal risks associated with the use of algorithms. In China and the EU, a general ban on the use of algorithms in collusion was established, whereas in Russia the use of algorithms is recognized as an aggravating circumstance. In the United States, there is an attempt to prohibit information exchange between competitors who use common algorithms that generate solutions or learn from non-public data provided by competitors – that is, among the countries studied in the United States, there is a stricter approach to regulating the use of algorithms in agreements of business entities.

Nevertheless, from the point of view of law enforcement, antitrust authorities have issues investigating cases when business entities do not enter into a direct agreement with each other, but unilaterally use algorithms that generate similar solutions without any communication, or if the algorithms themselves enter into tacit collusion without human intervention. Let's look at these two issues further.

2. Collusion Without Communication by Using One Algorithm

The second type of anti–competitive practices is when business entities do not directly interact with each other to collude, but through the use of the same algorithms provided by a third party (e.g. a software developer) they can achieve collusion, in particular, perform coordinated actions.

In this scenario, as noted by the German Federal Office for Combating Cartels (Bundeskartellamt), the parties may coordinate actions at the algorithm level (algorithm code structure) when a third party (developer) provides some algorithms or some methodology for some common purpose of competing business entities (e.g. for uniform price calculation). Coordination of competitors' actions can also occur at data level, when the algorithm collects data provided by different business entities and generates solutions analyzing the common data set of all competitors.

In this case, it is unclear whether it is possible to recognize the parties who used the same algorithms as colluding if the parties horizontally did not enter into any agreements on the use of the same algorithms or exchange of information for its subsequent analysis by algorithms, but only used the services of one supplier. Examining experience of countries, it can be concluded that parallel behavior in itself, as a result of which competitors use the same algorithms, is not an anti-competitive practice. However, if there is some coordination in the actions of competitors, or the parties can reasonably assume that coordination can occur due to algorithms, then such use of algorithms can lead to coordinated actions. Let's look at the approaches of the countries in more detail.

One of the first cases was considered in the EU in 2015, when Lithuanian travel agents integrated the Eturas online booking system on their websites [Advocate General Szpunar, 2015]. It was revealed that Eturas sent a message to 30 travel agencies with a proposal to reduce the maximum allowable discount on online bookings to 3% (previously it was possible to get a discount of up to 4%). Further, Eturas introduced the technical possibility to set discounts of no more than 3%. The travel agencies did not object and agreed to apply a reduced discount. As a result, the EU Court revealed presence of coordinated actions. The travel agencies did not directly agree to the reduction of discounts and did not inform each other about their plans to reduce the discount, however, they actually made such a reduction reasonably assuming that all other competitors, after receiving an offer to reduce the discount, would also reduce it to 3%. Thus, travel agencies, by implicit or tacit approval, have expressed their consent to similar behavior in the relevant market.

This case is not an example of coordinated actions using algorithms, however, it clearly shows that the involvement of third-party software (Eturas systems) as a single decision-making center can lead to coordinated actions. In the same way, third parties can coordinate the use of common algorithms by competitors in the market. This is clearly shown by the case that is currently being considered in the United States.

The Department of Justice and the Federal Trade Commission (hereinafter referred to as the FTC) In March 2024, the United States issued a statement on combating algorithmic collusion in the rental housing market [United States District Court, 2024]. According to the FTC, prices in the US real estate rental market have increased by 20% since 2020 [McKenna Duffy v Yardi Systems, 2024] largely due to the use of algorithms by landlords for pricing companies RealPage and Yardi systems – prices were formed for more than 10 million apartments, so an investigation began.

A complaint was filed with the court – landlords used RealPage's pricing algorithms to artificially inflate prices of apartment buildings and student housing by colluding (violation of §1 of the Sherman Act (15 U.S.C.). RealPage obliged landlords to share in real time their non-public data on the cost of rent, housing occupancy and data on transactions. Based on the data, the RealPage algorithm generated predictive pricing recommendations for all landlords using the program. US regulators have recognized that such behavior represents a joint tacit delegation of competitive decision-making to a third party (RealPage algorithms), which becomes a single decision-making center capable of influencing competition even in the absence of any additional agreement or coordination between landlords directly.

At the same time, landlords were united by economic interests using algorithms, as RealPage advertised itself as an application that would help increase revenues by analyzing competitors' prices, allowing landlords to set more favorable prices. Almost 85-90% of landlords used prices generated by RealPage. RealPage, offering to use its algorithms, actually invited landlords to commit coordinated actions and created coordination between landlords.

Thus, landlords, by providing their competitively confidential pricing data to the algorithm they rely on when making pricing decisions, expect similar actions from competitors, which leads to joint coordinated actions regardless of whether competing landlords have communicated such behavior horizontally with each other. Regulators have recognized the existence of horizontal tacit pricing collusion by competing landlords (even with the participation of a vertically linked organization – RealPage), giving that any price fixing is illegal.

It is worth noting that another similar case is being considered in the United States – Gibson v. MGM, in which a lawsuit was filed against hotels in Las Vegas that used a Rainmaker algorithm for artificially inflating prices (the algorithm makes recommendations based on competitors' prices, forecasts demand, including for group bookings) [United States District Court, 2023]. However, the Court dismissed the claim, as the plaintiffs could not prove that there was an agreement between the hotels to use the same pricing algorithm or even the same software product. However, at the end of March 2024, the FTC expressed the opposite position to the Court, stating that algorithmic pricing is collusion within the meaning of Section 1 of the Sherman Act, since the

parties tacitly agree to use common algorithms knowing that competitors use the same algorithms, platform or software to set prices.

In connection with a series of cases, in January 2024, Bill S.3692 [Preventing the Algorithmic Facilitation of Rental Housing Cartels Act, 2024] was proposed in the United States to ban the use of algorithms for artificially inflating prices for rental housing. It was proposed to consolidate the concept of "conscious coordination of parallel pricing", i.e. a tacit agreement between two or more landlords to raise, lower, maintain or manipulate prices using algorithms. In this case, "coordination" means collecting information on prices, housing offers, dates of termination and extension of lease agreements from landlords, analyzing such information using algorithms, including for their training, as well as providing recommendations to landlords on prices, rental conditions, housing occupancy. The person who provides the program with the algorithm is recognized as a "coordinator". If a landlord uses the services of a coordinator, then the landlord's collusion in violation of section 1 of the Sherman Act is recognized.

Thus, the United States is developing a more rigorous approach compared to other countries, in which the use of third-party technical means for the exchange of information, which is then used for training or generating solutions by algorithms, can be recognized as collusion.

It is interesting to note that the only country that has implemented rules on algorithmic collusion is China. The Recommendations on Countering Monopoly in the Platform Economy of 2021 [Antitrust Commission of the State Council, 2021] explicitly state that coordinated actions can be carried out using algorithms, even if the economic entities ("operators") have not explicitly concluded any agreements or made any joint decisions, unless such actions conclude economically conditioned parallel behavior, for example, price tracking (art. 5). It turns out that China partially supports the US position, that is, even if the parties did not directly agree on any coordinated behavior, but use algorithms that can obviously lead to coordinated behavior, then this can be considered a tacit collusion of economic entities.

A similar practice has not yet been formed in Russia, but the FAS investigation [Federal Antimonopoly Service of Russia, 2022] of collusion at auction is interesting. KK Pchelka LLC complained that it could not make an offer due to the use of TD Yug-Em Export LLC and Stroy-Group LLC auction robots that interrupted each other's offers for 1-5 seconds. The company repeatedly tried to submit a price offer which was not accepted, since, by the time it was sent, the auction robots were already playing at a lower price. Since the functionality of the trading platform did not allow setting the time interval of the next step for the auction robot, TD Yug-Em Export LLC and Stroy-Group LLC, using auction robots, gained an advantage over other participants.

In this case, the FAS found no signs of collusion or other violation of the law by TD Yug-Em Export LLC and Stroy-Group LLC – the use of auction robots is not a violation, since, in accordance with paragraph 12 of the Resolution of the Plenum of the Supreme Court of the Russian Federation dated 03/04/2021 No. 2, the similarity of the behavior of several business entities is not a basis for concluding that there is a competition-limiting agreement between them. It is necessary to take into account the reasons for such behavior, for example, whether the behavior corresponds to the conditions of activity formed in the market or is due to the same assessment of the market situation by business entities.

It is worth noting that the amendments to Article 14.32 of the Administrative Code of 2023 on the recognition of the use of algorithms as an aggravating circumstance apply, among other things, to bidding agreements, but do not apply to coordinated actions. This means that performing coordinated actions using algorithms (including achieving tacit collusion) does not fall under Article 14.32 of the Administrative Code, unlike in the United States, where practice and proposed bills cover cases of tacit collusion as a result of parallel behavior.

Analyzing the considered type of collusion, the following conclusions can be drawn. The strictest approach to regulation is taking shape in the United States – an attempt to ban the use of algorithms to set prices or market conditions if competitors exchange information at the same time. In China and the EU, the approach is less strict – tacit collusion using algorithms is allowed, but there is no direct ban on the use of an algorithm (similar to the United States), since the use of the

same algorithms by competitors is not in itself an anti-competitive practice as long as there is no coordination in the actions of competitors. That is, business entities involved in illegal pricing practices cannot avoid liability on the grounds that their prices were determined by algorithms. In Russia, although in the practice of the FAS [Federal Antitrust Service of Russia, 2011] there are cases of recognition of tacit collusion in the market, nevertheless, the most dispositive approach is pursued – everything that is not prohibited by the Competition Law is allowed, which is also confirmed by the FAS Recommendations on Practices using information technology in trade, including price algorithms of 2019.

However, the risks of collusion are reduced if competitors do not know and cannot foresee coordination built using algorithms, do not have intentions to collude (e.g. if they do not exchange information for this purpose). For example, the CIAN platform recommends housing prices using a mathematical algorithm – apartments with similar characteristics are analyzed from more than 9 million ads [CIAN, 2024]. If sellers or landlords use CIAN recommendations, can they collude? On the other hand, CIAN users can rely on the recommendations of algorithms, setting recommended prices and expecting other users to also set the prices offered by the service. On the other hand, CIAN does not exert pressure on users (users are not required to set recommended prices), and also does not seek to coordinate users by setting restrictions on discounts or prices, that is, it does not act as a "coordinating" center. Perhaps if CIAN exerted pressure on users in terms of mandatory use of recommended prices (as in the RealPage case in the USA), which would mean setting or maintaining prices, and users themselves therefore expected uniform pricing by all competitors, then such behavior could be regarded as coordination of CIAN's economic activities. At the same time, for example, the FAS has previously considered cases where the use of price algorithms was recognized as a circumstance that contributed to the commission of illegal coordination of economic activities (for example, the investigation against LG in 2018 [Federal Antimonopoly Service of Russia, 2018a]).

Thus, the position is being formed in the world that collusion can arise without concluding agreements, i.e. solely from the joint actions of competitors who can rely on a single decision-making center (as in the RealPage case in the USA) being aware of the use of algorithms by competitors and obviously expecting uniform behavior as a result of using algorithms. In fact, this leads to conscious coordination (or coincidence of wills) by competitors of their actions through a third party (algorithms).

3. Tacit Algorithmic Collusion

It is important to note that two types of algorithms are distinguished [Caforio, 2023]. The first is "adaptive", when the algorithm works according to a predetermined set of rules that establishes the optimal price response to changing circumstances [Calvano, 2018]. Adaptive algorithms follow the computational rules laid down by the programmer without deviation, so the result generated by the algorithm is most often predictable. Practices using adaptive algorithms will be subject to the general rules of competition law, as described above – when business entities manage pricing algorithms to implement collusion or carry out coordinated actions using the same third-party software.

The second type is "learning" algorithms. Such algorithms do not have pre-defined action instructions and are programmed to learn how to make the best decision, for example, to maximize profits [Klein, 2021]. Algorithms unilaterally send price signals by communicating their pricing strategies to other algorithms [Faden, 2022]. As a result, algorithms can choose a collusion strategy as the most optimal to achieve maximum results, e.g. setting a price that they consider optimal for everyone. At the same time, the solutions generated by the algorithm may be difficult for a human to foresee.

Therefore, the third type of anti–competitive practices is the collusion of self-learning algorithms interacting with each other, while competing business entities do not have any direct agreements or intentions to enter into a "tacit collusion" [Autorité de la concurrence, 2016]. In this

case, a number of legal problems arise related to the possibility of regulating algorithm collusion within the framework of competition law.

Firstly, algorithms do not have legal capacity as business entities do (organizations or individuals engaged in commercial activities). Algorithmic collusion does not require any human involvement, algorithms make decisions autonomously. At the same time, algorithms are not a subject of law, since they act as a technical means, therefore they cannot fall under the rules on collusion of economic entities and cannot be responsible for collusion.

Secondly, there is a problem of determining the person responsible for collusion, which is complicated by the fact that business entities do not directly instruct algorithms to collude and software vendors do not program algorithms for collusion.

Thirdly, collusion is an agreement or concerted action based on some kind of agreement between the parties or expressed intentions, as defined in Part 1 of Article 11 or paragraph 2 of Part 1 of Article 8 of the Russian Competition Law, as well as in paragraph 1 of Article 101 of the TFEU or paragraph 1 of the Sherman Act. It means that, in order to collude, business entities must communicate with each other, which does not happen when two self-learning algorithms enter into collusion and are not controlled by business entities.

At the moment, in the practice of antitrust authorities of Russia and foreign countries, there are no cases of detection of collusion of algorithms, however, there are precedents for recognizing tacit collusion. For example, the FAS considered a case when, in 2011, gasoline suppliers changed prices by the same amount without written or oral agreement, i.e. by tacit agreement [Federal Antimonopoly Service of Russia, 2011]. The FAS noted that actions of the participants were known in advance to each of the business entities, as there is a repetition of actions to increase retail prices both simultaneously and sequentially with companies easily tracking each other's prices. The actions of the companies were recognized as coordinated actions (according to paragraph 1 of Part 1 of Article 11 of the Competition Law). A similar situation was considered by the court when prices for buckwheat increased in 2016 [Abitration Court of the Volga Region, 2017]. Given the technical complexity of self-learning algorithms, it is difficult to similarly identify behavioral deviations and apply the criteria used by the FAS to algorithms, for example, to evaluate the sequence of their actions, how algorithms monitor and influence each other's actions, what input data they use, what decisions they make and whether such decisions are made jointly.

In general, we can note the problem of qualifying tacit collusion: foreign countries most often do not recognize tacit collusion as a violation of law. For example, the U.S. Supreme Court [United States Supreme Court, 1993] determined that tacit collusion, sometimes called "oligopolistic price coordination or conscious parallelism", is not illegal and allows business entities to share monopoly power by setting their prices at a profit. That is, in fact, the common economic interest of business entities and their interdependence in relation to decisions on prices or terms of trade which leads to tacit collusion, but does not lead to a violation of competition law. In the EU, the updated Guidance on the Applicability of Article 101 to Horizontal Cooperation Agreements [European Commission, 2023] also notes that tacit collusion does not fall within the scope of article 101 of the TFEU, although sometimes such collusion may constitute an abuse of collective dominance in accordance with article 102 of the TFEU.

In China, the Recommendation on Countering Monopoly in the Platform Economy of 2021 [Antitrust Commission of the State Council, 2021] recognizes that performing coordinated actions using algorithms, even if economic entities have not concluded agreements or made joint decisions, may be a violation (Article 5). On the one hand, the article can be interpreted widely – any use of algorithms creates a risk of tacit collusion. On the other hand, the article excludes cases of parallel behavior, for example, price tracking using algorithms (art. 5), which makes it possible to use algorithms if the parties do not plan to collude.

There is a debate about how to regulate risks of tacit collusion of algorithms. For example, it is proposed to expand the concept of collusion, based mainly on forms of communication between business entities, to include forms in which there is no direct communication of such

entities [Kaplow, 2013]; to enable antitrust authorities to appoint only one algorithm service provider who will recommend lower potentially competitive prices, reducing the risks of price coordination between business entities and others [Gal, 2022].

Countries are currently trying to develop tools that can help identify collusion by ensuring the transparency of algorithms. For example, in the United States, Bill S. 3686 of 2024 proposes a system for auditing pricing algorithms used by companies. At the request of the Attorney General or the FTC, companies will have to submit reports within 30 days, indicating who develops the pricing algorithms (the company itself or another company), explaining the rules for generating recommendations, the types of data used, including data used to train the algorithm, data collection sources and processes, as well as whether the decision algorithm is autonomous and whether such decisions are verified by humans.

Similar requirements for the disclosure of information about algorithms are proposed by the EU in the draft Law on Artificial Intelligence [Artificial Intelligence Act, 2024]. At the same time, Regulation 2022/1925 of September 14, 2022 "Law on Digital Markets", aimed at preventing anti-competitive practices of large platforms [European Union, 2022], has already established the right of the Commission to request access to any data and algorithms from platforms as part of investigations, as well as to require explanations on them (v. 21).

Similar regulation has not yet been implemented in Russia and China.

Thus, the collusion of self-learning algorithms goes beyond the scope of antitrust legislation – such collusion occurs in the absence of communication between business entities. At the same time, the algorithms themselves can communicate, but the algorithms do not have legal subjectivity – they cannot be sanctioned the way economic entities can. Moreover, at the moment, foreign countries recognize that tacit collusion does not violate the law, as it represents parallel behavior.

Nevertheless, countries are increasing oversight of the use of algorithms, including self-learning ones, through reporting requirements and disclosure of information about the operation of algorithms, which in the future may help antitrust authorities to curb illegal behavior. For example, in January 2024, the US FTC sent letters to 5 companies (Alphabet, Amazon, Anthropic, Microsoft and OpenAI) to investigate the operation of algorithms and their impact on competition [Federal Trade Commission, 2024].

Conclusions

In digital economy, competing business entities in the market collect information about each other using algorithms and, guided by decisions generated by algorithms, change their behavior, which can lead to collusion, including tacit collusion. The behavior that leads to such collusion can be divided into two types.

The first type is behavior involving humans. Business entities can enter into agreements or perform coordinated actions by communicating with each other, while algorithms are used as a tool for collusion. In this case, the algorithms are under the guidance or control of business entities who are aware or can reasonably foresee that the use of algorithms creates risks of anti-competitive behavior, while expecting other business entities to behave similarly, and are willing to take risks using algorithms.

In addition, business entities may find themselves in a situation of collusion if they use the same software or the services of the same suppliers. In this case, there is no direct communication, meaning there is not a horizontal exchange of information between competitors, but competitors vertically provide information to one algorithm or provider of an algorithm that generates solutions that are common or similar to all competitors. Although there may not be explicit collusion in this case, competitors may collude tacitly, exchanging information and expecting each competitor to use solutions generated by algorithms based on shared information.

As we can see from the practice of countries, countries apply general antitrust regulation to agreements (written or spoken) in which algorithms are used to implement collusion. Concerted actions are more difficult to detect, especially in the context of tacit collusion. At the same time,

the approach to regulation varies from country to country. The strictest approach in the USA is an attempt to prohibit the use of algorithms if competitors exchange data and algorithms generate the same solutions for all from the totality of the data provided. However, this approach raises a number of questions, like whether collusion can occur if data exchange and generation of solutions based on such data are not actually intended to implement anti-competitive actions. In the EU and China, the approach is softer – there is a general ban on the use of algorithms in coordinated actions, i.e., unlike in the United States, a violation occurs only if such use of algorithms leads to illegal behavior or has collusion purposes. In Russia, the use of algorithms to commit an offense is recognized as an aggravating circumstance only if business entities conclude an agreement, whereas coordinated actions are excluded from the rule. That is, at the moment, in Russia, unlike other countries considered, the mildest and more dispositive approach to regulating the use of algorithms in agreements of business entities that allows everything that is not prohibited (i.e. which does not lead to collusion).

The second type of behavior is a fully automated tacit collusion of self-learning algorithms without the involvement of business entities or any human intervention at all. Such collusion is the most difficult to cover under competition law, and given the technical complexity of the algorithms, it is difficult to detect. At the same time, such collusion is most often not intentional, but is the result of "innocent use of algorithms or behavior" or of "unpredictable self-learning of algorithms". That is why, even if tacit collusion is discovered, countries most often do not recognize this type of collusion as anti-competitive behavior.

In addition, interdependent behavior (including pricing) resulting from the use of algorithms is not always anticompetitive, for example, if such behavior does not violate the interests of consumers and does not harm other business entities creating unequal market conditions.

Talking about how to develop further regulation, or how and who should qualify the use of algorithms as "illegal collusion" (court, antimonopoly authorities, etc.), in our opinion, at this stage of understanding by regulators of the processes of algorithms, it is important not to make any changes to competition law (for example, in terms of imposing restrictions on the use of algorithms), and the development of general requirements for algorithms (including artificial intelligence) in terms of transparency and traceability of the use of such technologies, including understanding the sources and types of data that are used for decision generation and learning, the processes of generating or making decisions by algorithms and their implementation, etc.

In Russia, regulation should begin with ensuring the explicability of algorithms by establishing requirements for software vendors containing artificial intelligence algorithms to compile and keep up-to-date technical documentation, including the processes of learning and testing algorithms and evaluation results, to analyze known and reasonably foreseeable risks that algorithms may pose when functioning for the economy, the market and the adoption of appropriate measures to manage such risks, for example, by providing human supervision over the functioning of algorithms (control in terms of generation or decision-making), etc.

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