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APPLICATION OF PRICING ALGORITHMS AS A CHALLENGE FOR CONTEMPORARY COMPETITION LAW¹

Abstract

In the following paper, the author elaborates on the challenges that today's competition law has to face with regard to the more and more common use of algorithmic technics by the entrepreneurs, particularly in the field of pricing process. After providing a brief definition of the most fundamental terms, a structural analysis is performed of anticompetitive practices that are facilitated by algorithms. Instances investigated by the author have been assigned into three groups, distinguished according to relations between the entities taking part in a particular practice. The described models are of various complexity and pose different threats to the state of competition. The author made an attempt to draw the line between the cases which fall under the scope of currently enforceable competition law provisions and those to which competition agencies do not apply appropriate tools. In the next part of the paper, the author presents a case study of the so called *lex Uber* – an Act of the Polish Parliament intended to regulate the passenger transport market in Poland in the light of the rise of modern transportation services, e.g. provided by Uber or Bolt. In the author's opinion, the enacted provisions may result in inconsistencies with competition law. In the last part of the paper the author suggests

¹ This paper is a translation of an excerpt from the author's Master Thesis entitled *Prohibited agreements restricting competition in the perspective of current challenges in competition law (selected aspects)*, written under supervision of Dr hab. D. Szafrąński at the Faculty of Law and Administration at the University of Warsaw.

possible legal solutions that should safeguard competition on the markets where using algorithmic solutions is still more and more common.

KEYWORDS

competition law, algorithmic pricing, the prohibition on restrictive agreements, algorithmic decision-making, pricing algorithms, tacit collusion, parallel practices, hub-and-spokes arrangements, *lex Uber*, Big Data, law of new technologies

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prawo antymonopolowe, wycena algorytmiczna, zakaz porozumień ograniczających konkurencję, algorytmiczne podejmowanie decyzji, algorytmy cenowe, milcząca zмова, praktyki paralelne, porozumienia *hub-and-spokes*, *lex Uber*, Big Data, prawo nowych technologii

1. INTRODUCTION

Progressing digitisation and computerisation of the economic reality constitutes a process, in which not only entrepreneurs but also consumers seek mutual benefits. However, some currently ongoing phenomena seem to be undermining this paradigm. Is increased market transparency always to consumers' advantage? Could the shift towards algorithm-driven pricing systems threaten competition? Does the dissemination of its application result in new, so far unknown, challenges for competition law? This paper attempts to answer these questions and others related to them. Trying to formulate an answer, the author carried out an analysis of the most crucial cases, in which a breach of competition law provisions or anti-competitive behaviours have been observed, resulting from delegating the pricing process to the algorithms.

2. ALGORITHM-DRIVEN DECISION MAKING

To start with, it is indispensable to discuss the very notion of pricing algorithms and the reasons behind the dynamic development of their application in the contemporary economic reality. From the very beginning of the economy, the pricing process was ruled by the law of supply and demand. While setting

the price, market participants try to determine and predict the demand for the products they offer, performing the analysis of the available information. Its scope increases each year, concurrently with unstoppable technological advances. Nowadays, entrepreneurs have access not only to sales results, but they also know how their image is shaped on the Internet. A vast amount of this information is delivered by the consumers themselves, by means of social media or various forms of electronic communication, which explains the low level of its structuralisation². Due to this characteristic, analysis of that kind of databases, before the end of the 20th century was named Big Data³. Efficient processing of information of that kind has to be highly automated, which is feasible only with the use of appropriate computer programs. Their functioning is based on the application of algorithms, which are mathematical sequences of data processing instructions. These algorithms are able to process data they currently operate on as well to make decisions on the grounds of the achieved results⁴. This way, both the data processing and pricing are being automated. Additionally, the possibilities created by the application of machine learning technology in connection with access to historical data, empower the algorithms to create long-term economic strategies. In the further part of this paper, the author will present different scenarios of anti-competitive practices, which occur as a result of the application of pricing algorithms that demonstrate various degrees of technological complexity.

3. DIFFERENT SCENARIOS OF COLLUSION

Establishing the existence of a cartel is, in practice, very difficult. It is indeed a truism to say that the decisions related to the emerging agreement are taken in full confidentiality, with the lights turned off and off the record. Contrary to the belief of the representatives of the neoclassical economy, cartels are far more stable than it was initially regarded⁵. This state of affairs persists, despite more and more efficient methods of detection used by competition agencies, more severe punishments, and more attractive leniency programs as well.

² A. Gerbrandy, B. Custers, *Algoritmische besluitvorming en het kartelverbod*, „Markt & Mededinging” 2018, No. 3, p. 2.

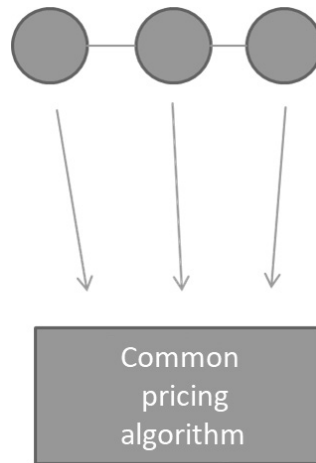
³ M. Cox, D. Ellsworth, *Application-Controlled Demand Paging for Out-of-Core Visualization*, Proceedings of the IEEE 8th conference on Visualization, https://www.evl.uic.edu/cavern/rg/20040525_renambot/Viz/parallel_volviz/paging_outofcore_viz97.pdf (visited 27 September 2019).

⁴ A. Gerbrandy, B. Custers, *Algoritmische besluitvorming...*, p. 5.

⁵ V. Mayer-Schönberger, K. Cukier, *Big Data: A Revolution That Will Transform How We Live, Work, and Think*, London 2013, p. 35.

The reason is very prosaic – from the perspective of the entrepreneur of a certain market position, functioning in the circumstances of stabilised prices is far more advantageous than competing for a customer. The Internet, which seems to be a natural part of modern economic reality, creates so far unknown standards of market transparency, in particular by continually increasing the speed with which information is exchanged. However, it provides also a new means of fostering the price collusion⁶.

Big Data and Big Analytics made possible real-time monitoring of constantly changing prices and collusive agreements. New technologies not only simplify collusion but also create new standards of price agreements, which take more and more unstable and vague forms⁷. As a result, we observe the birth of a real challenge for contemporary competition law. Indeed, legal constructions that are currently used seem not to cover real situations, which emerge as a result of the changes and the phenomena that take place in today's economic reality. In the following section of the paper, the author will describe particular collusion scenarios, in which entrepreneurs use pricing algorithms.



3.1. AN ALGORITHM IMPLEMENTING PREVIOUSLY CONCLUDED AGREEMENT BETWEEN COMPETITORS

The most straightforward scenario, in which a pricing algorithm may be used in a price agreement happens when several competing entrepreneurs delegate the

⁶ A. Ezrachi, M. E. Stucke, *Virtual Competition*, Cambridge, Massachusetts 2016, p. 35.

⁷ *Ibidem*.

process of pricing to one algorithm. Entrepreneurs may also empower the algorithm to control whether the parties conform to the agreement or not⁸.

A frequently cited example of the agreement of that kind is the Topkins case, which was held before the United States District Court, Northern District of California, San Francisco Division. David Topkins was the founder and the managing director of the company named Poster Revolution, which dealt with selling posters via the Internet. Together with a couple of competitors, he entered into an agreement, under which the pricing process of particular products sold via Amazon.com was transferred to a properly adjusted algorithm, widely-available on the market. The pricing process was conducted dynamically based on the processed market data⁹. This was in fact a collusion, the direct purpose of which was to determine the price by defining the method of its calculation. The agreement was deemed a breach of Section 1 of Sherman Act¹⁰, constituting regulation parallel to Art. 101 of TFEU¹¹.

In the literature, the described scenario is named Messenger¹². In the alignment of that kind, we, in fact, encounter a typical horizontal price agreement, concluded by undertakings in the offline environment. The role of an algorithm is limited to valuing the good or service and monitoring whether the parties obey what they have agreed upon. In its essence, the usage of an algorithm constitutes nothing more but an extension of human will¹³. Adoption of the qualification presented above makes it possible to include such real situations in the scope of the currently applicable regulations pertaining to cartel prohibition. In an attempt to figure out the reasons behind the attractiveness of using algorithms by the entrepreneurs who try to engage in a conspiracy, the emphasis shall be put on two main fields. The first is connected to the possibilities that dynamic pricing creates. The second pertains to the possibility of incomparably greater control over the cartel. Algorithms are indeed able to detect every single departure of the cartel member from the agreed behaviour¹⁴.

In Europe, a similar case of Daniel William Aston was investigated by the British Competition and Markets Authority (CMA). A company he operated – Trod Ltd. – concluded an agreement with GB eye Ltd. to share an algorithm setting the price of the products they offered via an Internet platform. Just like in Topkins case, the use of an algorithm was a consequence of a previously concluded

⁸ A. Gerbrandy, B. Custers, *Algoritmische besluitvorming...*, p. 4.

⁹ Freshfields Bruckhaus Deringer, *Pricing algorithms: The Digital Collusion Scenarios*, Freshfields Bruckhaus Deringer LLP 2017, <https://www.freshfields.com/globalassets/our-thinking/campaigns/digital/mediainternet/pdf/freshfields-digital---pricing-algorithms---the-digital-collusion-scenarios.pdf>, p. 1 (visited 25 May 2020).

¹⁰ 15 U.S. Code § 1–38.

¹¹ Consolidated version of the Treaty on Functioning of European Union 2012 OJ C 326.

¹² A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 35.

¹³ *Ibidem*, p. 45.

¹⁴ *Ibidem*.

agreement on refraining from price competition¹⁵. Since the company was also present on the US market, its operations were put under scrutiny by the American Department of Justice (DOJ)¹⁶. Both the British and the Americans declared that the companies concluded an agreement restricting competition.

An agreement between five major banking institutions: Citicorp, JPMorgan Chase & Co., Barclays PLC, the Royal Bank of Scotland Plc, and UBS AG, operating in the US, can be another example of using an algorithm in an anti-competitive way. The subject of the agreement was setting the reference rates. As a result of initiated proceedings, all five banks pleaded guilty to participating in a practice aimed at influencing the price of USD and EUR on the foreign currency exchange spot market. It boiled down to agreeing not to buy or sell particular currencies at certain times. This way, the parties protected each other's trading positions by withholding supply or demand for currency and restricting competition in the relevant market¹⁷.

An earlier example of an agreement in which the parties used a computer program to facilitate prohibited coordination was the case of Airline Tariff Publishing. In that case, airlines introduced a computer system with a seemingly pro-competitive aim of providing travel agencies with basic information about the prices offered by operators on particular air routes. However, apart from fulfilling the mentioned function, the system constituted a platform of communication between airlines, enabling them to introduce above-competitive prices for flights and their monitoring. The scope of the agreement covered the first and last minute offers that are immanently associated with the discount of a certain level, which in turn creates the opportunity for price collusion. This example illustrates the difference between the role computer programs used to play in the past, which was mainly limited to facilitating the exchange of information, and the purpose it can serve today, which is to automate and control a previously concluded agreement.

We should also note the psychological aspect of using algorithms for price collusion¹⁸. Research shows that people more often decide to engage in unlawful or unethical behaviour if they can separate their deeds from the resulting

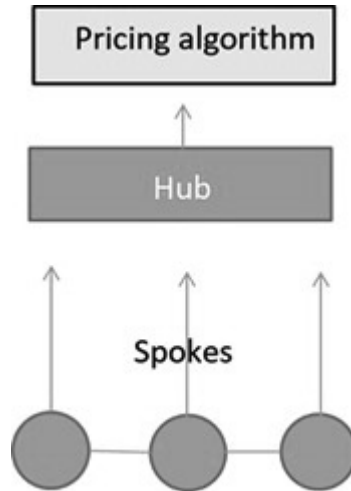
¹⁵ British NCA, *CMA Issues Final Decision in Online Cartel Case*, <https://www.gov.uk/government/news/cma-issues-final-decision-in-online-cartel-case> (visited 2 May 2020).

¹⁶ U.S. Department of Justice, *E- Commerce Exec and Online Retailer Charged with Price Fixing Wall Posters*, <http://www.justice.gov/opa/pr/e-commerce-exec-and-online-retailer-charged-price-fixing-wall-posters> (visited 4 December 2015).

¹⁷ U.S. Department of Justice, *Five Major Banks Agree to Parent-Level Guilty Pleas: Citicorp, JPMorgan Chase & Co., Barclays PLC, the Royal Bank of Scotland PLC Agree to Plead Guilty in Connection with the Foreign Exchange Market and Agree to Pay More than \$2.5 Billion in Criminal Fines*, <http://www.justice.gov/opa/pr/five-major-banks-agree-parent-level-guilty-pleas> (visited 20 May 2015).

¹⁸ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 42.

outcomes¹⁹. In the example described above, it is the pricing algorithm, in which plays the part of an intermediary. For the members of a cartel it is much easier to accept the fact of outsourcing the pricing process to the algorithm, rather than fix directly the prices of goods and services.



3.2. AN ALGORITHM AGGREGATING DATA FROM THE ENTITIES PARTICIPATING IN THE AGREEMENT

Algorithm decision-making programmes are especially beneficial when applied in hub-and-spokes relations²⁰. It assumes the existence of a central hub linked to several spokes²¹. The term has previously been used in logistics in reference to a transport or warehousing model based on the existence of a central point (the hub) and radially orientated transport or supply lines (spokes)²². The described model, transferred to the field of competition law, involves several direct competitors independently concluding vertical agreements with an entity that functions as the hub. The resulting market consequences are similar to those observed in horizontal agreements between competing businesses, but with no

¹⁹ M. C. Levenstein, V. Y. Suslow, *Breaking Up Is Hard to Do: Determinants of Cartel Duration*, “Ross School of Business Paper” No. 1150, September 2010, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1676968 (visited 3 December 2019).

²⁰ A. Jurkowska-Gomułka, *Komentarz do art. 6 (Commentary do the article 6)*, (in:) T. Skoczny (ed.), *Ustawa o ochronie konkurencji i konsumentów. Komentarz (The act on aw on competition and consumer protection. Legal Commentary)*, Warsaw 2014, pp. 271–272.

²¹ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 46.

²² A. Markusen, *Sticky Places in Slippery Space: A Typology of Industrial Districts*, “Economic Geography” 1996, Vol. 72, No. 3, pp. 293–313.

direct links among them. An important element of the described scenario in its conventional version is every participant's awareness that their competitors are also engaged in the practice.

Application of the described collusion scenario happened even before the digital age. In the Interstate Circuit case, for example, an unlawful agreement has been reached between the cinema owner (the hub) and eight film distributors (spokes)²³. The cinema owner concluded vertical agreements with each of the distributors, informing them that similar agreements were going to be concluded with their competitors. Distributors had also been made aware that this practice was going to be beneficial for them, as long as they stuck to what had been arranged. Both the cinema owner and the distributors were held liable for infringing the cartel prohibition. Similar proceedings were pending before the European Commission in the case of LIBOR interest rate manipulation²⁴. An ICAP broker headquartered in the United Kingdom played the role of a hub for traders from Citigroup and RBS, thereby engaging in prohibited practices. Another example, based on the above described collusion scenario, was the case of United States vs. Apple Inc., in which the agreement resembled the one concluded in Interstate Circuit. In this case, however, Apple, acting as a platform, entered into agreements with five big book publishers. The parties intended to increase the prices of new releases and "New York Times" bestsellers²⁵.

Worth mentioning are two decisions of the Polish NCA, in which hub-and-spokes agreements were found out. The first one pertained to an agreement concluded on the TV transmission market for the matches of the Polish national men's football team. It concerned fixing the minimum resale price of the pay-per-view transmissions among a couple of distributors (spokes) via the entrepreneur entitled to a particular transmission (the hub)²⁶. The subject matter of the second case also revolved around a minimum resale price arrangement. In this case, the agreement was concluded between an enterprise distributing particular brands of wristwatches and a couple of distribution points²⁷.

The case of the Carrefour Marinopoulos²⁸ supermarket chain exemplifies an anti-competitive arrangement based on the hub-and-spokes model, in which an automated algorithmic pricing system was used. This violation of law revolved

²³ 306 U.S. 208 *Interstate Circuit v. United States* (1939).

²⁴ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 47.

²⁵ *Ibidem*.

²⁶ Decision of the President of UOKIK of 21.08.2013, No. DOK-2/2013, *Sportfive sp. z o.o. with its seat in Warsaw and others*, www.decyzje.uokik.gov.pl (visited 15 June 2020).

²⁷ Decision of the President of UOKIK of 08.12.2015, No. DOK-4/2015, *The Swatch Group (Polska) sp. z o.o. and others*, www.decyzje.uokik.gov.pl (visited 15 June 2020).

²⁸ Hellenic Competition Commission, *Decision Concerning Infringements of Articles 1 of Law 703 / 77 and Article 101 TFEU by the Retailer Carrefour Marinopoulos S.A. in Connection with the Franchise Network for the Operation of "5 Marinopoulos" Retail Stores*, http://www.epant.gr/img/x2/news/news2701_1279200461.pdf (visited 15 June 2020).

around shaping resale price maintenance by means of a specially designed algorithm, which constituted an integral part of the franchise system. Pursuant to the agreement concluded with the chain operator, supermarket owners were also prohibited from performing cross-supplies. Compliance with the aforementioned obligations was secured by a system of sanctions. In practice, even making amendments above the price floor of certain products was significantly constricted.

Similar cases, in which algorithmic pricing systems were used in the distribution chains of certain electronic equipment manufacturers, were the subject of four investigations by the European Commission²⁹. Just as in the case of the franchise network described above, the parties concluded agreements on the subject of resale prices. Technological solutions were introduced to enable monitoring of the undertakings' behaviour in order to react quickly to any price cuts. If a breach of agreement were to be detected, the disobedient party would meet numerous sanctions, including cutting off supplies³⁰. In each of the recalled investigations, the Commission concluded that the practice constituted an infringement of Art. 101 of TFEU.

At this juncture, it is necessary to point out that although the construction of the cases presented in the last two paragraphs corresponds to the typical hub-and-spokes scenario, in the literature they are qualified as examples of the messenger scenario, which has been described in the previous section³¹. It results from the fact that, while introducing doctrinal divisions, researchers focus on the role that an algorithm plays within a particular practice and perceive its construction as less significant. Thus, it is essential to note that in the discussed examples the role of the algorithm was limited to facilitating the performance of the previously concluded agreement and increasing its effectiveness. Nonetheless, in the author's opinion, it is more appropriate to group cases based on the construction of the agreement, bearing in mind the differences that result from the purpose of the algorithm in a particular case. Firstly, this approach is easier to construe by the reader, since the introduced divisions correspond with the relations between the parties involved in a certain practice. Secondly, it is more coherent with the NCAs and Commission's approach to this problem.

It is noteworthy that researchers very often emphasize that from the perspective of competition investigation the usage of pricing algorithms in hub-and-spokes relations weakens the significance of the initial awareness of the participation of

²⁹ Commission Decision of 24.07.2018, AT.40465 *Asus* OJEU 2018 C 338/13, Commission Decision from 24.07.2018, AT.40469 *Denon & Marantz*, OJEC 2018 C 335/4, Commission Decision of 24.07.2018, AT.40181, *Philips*, OJEU 2018 C 4773, Commission Decision of 24.07.2018, AT.40182, *Pioneer*, OJEU 2018 C 4790.

³⁰ M. K. Derdak, *Czy androidy śnią o zмовach cenowych? Algorytmy cenowe, sztuczna inteligencja i prawo konkurencji*, „Internetowy Kwartalnik Antymonopolowy i Regulacyjny” 2018, No. 8(7), ikar.wz.uw.edu.pl (visited 5 May 2020).

³¹ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 40.

other competitors in a particular practice³². As a consequence, participation in a practice based on a hub-and-spokes model that makes use of a pricing algorithm, creates a possibility of anti-competitive results, which do not stem from an arrangement in the subject matter of price coordination. The benefits that come with the use of a better pricing technology, which allow the maximization of profits, are usually the main reason behind the decision to outsource the pricing process to a third party.

Researchers, who follow presented narration relate the phenomenon of agreements based on a hub-and-spokes scenario using pricing algorithms to the practices, in which the role of an algorithm is not simply limited to executing or facilitating previously concluded agreement. Distortion of competition occurs when several competitors start using the same software based on one algorithm. Usually, this occurs within the sharing economy³³ and collusion is observed between an Internet platform, acting as a broker (hub) that may also value the goods or services³⁴, and the entities that offer their products via the platform (spokes).

A situation precisely of that kind took place in the Eturas case that was tried by the CJEU³⁵. It concerned a Lithuanian Internet platform, through which travel agencies could offer their products – trips abroad. The system operated in a way similar to a popular website Booking.com. In 2009 the platform decided to introduce a maximal rate of rebate (0-3%) that particular travel agencies may have offered for their products. Had a travel agency imposed a higher rate, it would have been automatically reduced to a maximal level – 3%. The companies were informed about this new solution by e-mail, within the framework of the internal communication system. The declared objective of the regulation was the pursuit of normalising competition³⁶. In 2010 the Lithuanian competition agency initiated a procedure in the case concerned, assuming that, as a result of introducing the system and tacit arrangement between the companies, an agreement restricting competition had in fact been concluded. According to the agency, the observed behaviour on the relevant market should be deemed a prohibited concerted practice³⁷. At that point, it had also been established that although Eturas did not operate on the relevant market since it was not a direct competitor of the agencies, it played a significant role in the creation of the practice³⁸.

CJEU confirmed that the breach of the competition law could have happened. The Tribunal established that the legal constructions of the competition law that is

³² *Ibidem*.

³³ A. Gerbrandy, B. Custers, *Algoritmische besluitvorming...*, p. 4.

³⁴ Boomerang Commerce, *Our Story*, <http://www.boomerangcommerce.com/about/> (visited 19 May 2019).

³⁵ C-74/14 *Eturas and others* [2016] ECLI:EU:C:2016:42, paras 5–25.

³⁶ *Ibidem*, para 10.

³⁷ *Ibidem*, para 13.

³⁸ *Ibidem*, para 15.

currently enforceable allow declaring the behaviour of the agencies as a breach of cartel prohibition. CJEU has also indicated to the national court, which initiated the procedure, relevant criteria that shall be applied to the assessment of facts, that make it possible to establish whether a breach of cartel prohibition has indeed happened or not. In the case concerned, many questions that arose had a purely evidentiary character and corresponded well to the established presumptions in the Tribunal's jurisprudence³⁹.

For the purpose of this paper, the relevant legal issue in the case concerned was whether atypical interdependence between the travel agencies and the platform is covered by currently enforceable provisions of competition law. What was significant here, the Tribunal once again recalled, was that every undertaking shall independently determine its economic strategy⁴⁰ according to which it is willing to act on the common market⁴¹. Bearing this in mind, one may draw a clear conclusion that the classification of the form of mutual dependence is a matter of secondary significance. It shall be noted that the division between vertical and horizontal agreements does not have a strictly dichotomous character. The competition courts case law has already faced the problem of atypical agreements in which relations between particular businesses would instead display a triangular character.

The examples above involve situations in which the breach of cartel prohibition occurs as a result of cooperation between the suppliers and an intermediary. In the literature, it is frequently stressed that the hub-and-spokes scenario can also pertain to situations, in which the role of an intermediary is restricted to valuing a particular good or service. One can find many examples of active undertakings, such as Boomerang Commerce, which offer the service of price determination as part of their economic activity⁴². Thus, we deliberate upon a situation, in which a few competing businesses outsource the pricing process to a single agent, who in turn applies an identical or similar algorithm in every case. In delegating the process of pricing to the agent, the businesses take into account the necessity of revealing sensitive market data. The goal of the agent is by no means reaching the competitive level of prices, but rather establishing them on the level that maximizes the profits of its customers. Application of an algorithm programmed in this way will then lead to results that soften competition, something that the entrepreneurs in questions should be, and most likely are, aware of⁴³. We therefore speak of a hub-and-spokes scenario when few competitors decide to outsource their pricing process to a third party, which applies the same or a very similar pricing algorithm in each case.

³⁹ C-74/14 *Eturas and others...*, paras 22–24.

⁴⁰ C-8/08 *T-Mobile Netherlands and others* [2009] ECLI:EU:C:2009:343, paras 32–33 and cited therein case law.

⁴¹ C-74/14 *Eturas and others...*, para 27.

⁴² Boomerang Commerce, *Our Story...*

⁴³ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 49.

An actual situation of that kind took place in the case of Accenture and several car manufacturers, who used identical pricing software bought from the same consulting firm. The programme, called Partneo, allowed the car manufacturers to determine the prices of particular spare parts. The algorithm processed data concerning the spare parts and their prices. The parts were divided into groups and prices within a group were increased up to the level of the most expensive part. As a result, a significant increase in the aggregate price level has been observed. It is not known, though, if the manufacturers were aware that the algorithm used data that originated with all users of the software, rather than only in-house one. However, the situation is highly questionable, especially since all the competitors were present during a meeting in which the abovementioned software had been presented⁴⁴.

An even more atypical arrangement has been observed in the case of two petrol stations, operating in Rotterdam, the Netherlands. Their owners were using a Danish pricing algorithm offered by a2i Systems. In the author's opinion, the assessment of the described case depends primarily on whether the algorithm processed the data from the competing petrol stations. If it was the case, the previously presented hub-and-spokes scenario was realised here. Otherwise it should also be determined whether the application of the same pricing tool constitutes the realisation of a previously concluded price-fixing agreement. If it does, the described practice shall be qualified as an agreement based on the first model⁴⁵.

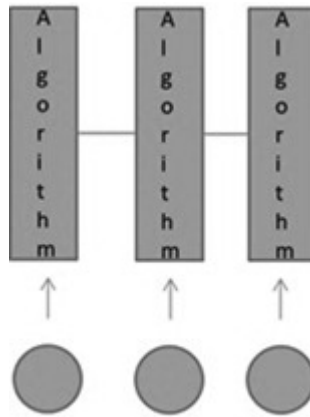
From the perspective of competition investigation a more complex situation would occur if the role of the algorithm supplier would be restricted to the provision of a program, the use of which would not involve any direct or indirect exchange of information between the competitors. The petrol station owners would then introduce the algorithms independently from each other. The news reports suggest that such a situation occurred in the case concerned⁴⁶.

The factual situation of that kind would inevitably provoke many serious doubts. Is it reasonable to require the entrepreneurs to be aware of the pricing methods applied by their competitors? Is it possible to limit their access to an algorithm already used by their competitor if the only reason for a potential purchase would have been the fact that a particular program is the best one on the market? If the circumstances of a particular case resemble the ones described above, in the author's opinion they shall no longer be referred to as a hub-and-spokes scenario but as the one presented in the following section.

⁴⁴ A. Gerbrandy, B. Custers, *Algoritmische besluitvorming...*, p. 5.

⁴⁵ *Ibidem*, p. 5–6.

⁴⁶ S. Schechner, *Why Do Gas Station Prices Constantly Change? Blame the Algorithm*, "The Wall Street Journal" 8 May 2017, www.smallbusinessfrontiers.com/2017/05/10/why-do-gas-station-prices-constantly-change-blame-the-algorithm (visited 3 May 2020).



3.3. TACIT COLLUSION OF INDEPENDENT ALGORITHMS

Although contemporary regulations pertaining to competition law seem to be sufficient in cases that occur in the previously described scenarios, they do not regulate factual situations that will be presented below⁴⁷.

The first one is recognised in the literature as the Predictable agent. It involves several entrepreneurs who, independently from each other, introduce a profit-maximizing price algorithms. The main task of an algorithm is to analyse the prices offered by the competing entities and to respond promptly to any price alteration. Algorithms are also programmed to follow steady price increases so that no entrepreneur could benefit from keeping their prices on a lower level⁴⁸. Effectiveness of the programs increases with the amount of data that the entrepreneurs are able to gather and store in order to feed it to the algorithm. It could be data relating to the concluded transactions, as well as the factors that have impacted them, such as store coverage, products' layout or information about the clients and their preferences. It is also common for businesses to buy access to certain databases, which record their competitors' range of products and their availability, as well as their prices.

As has already been mentioned, it is possible that the described scenario occurred in the case of the petrol stations in Rotterdam that were using the same pricing algorithm provided by a2i Systems. The circumstances of the case seem to indicate that the owners introduced it independently from each other. Particular algorithms used by the competitors, in turn, were not exchanging any information

⁴⁷ V. D. Gómez Tagle Galindo, *Pricing Algorithms and Computational Price Theory: The Building Blocks of Computational Finance and IT Business Applications*, Joensuu 2017, p. 24.

⁴⁸ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 61.

between them. According to the a2i Systems representatives, the working of the algorithm consists of creating a model of consumer behaviour and matching prices of certain products to the resulting predictions⁴⁹. The whole process is based on the market data provided to the algorithm. A comparative analysis of information that relates to prices at both petrol stations has led to divergent results. It revealed both periods, in which the prices set by an algorithm were independent from each other, and periods, in which the price level was the same. In the latter periods, the price was lower in the morning, and tended to increase during the day. The changes occurred almost at the same time.

At this point, it is necessary to stress that in the opinion of certain authors, e.g. Ezrachi and Stucke, the described scenario constitutes an example of an agreement based on the hub-and-spokes model, because the competitors purchased the algorithm from the same company⁵⁰. This fact makes it possible to single out the central point (the hub) in the form of a shared tool – the purchased algorithm. In conclusion, the presented circumstances shall be deemed an example of hub-and-spokes collusion⁵¹. Such reasoning is a result of the previously described approach that is orientated at the characteristics of the used algorithm, not on the construction of the investigated agreement. A contrary assessment would require the competitors to develop similar algorithms independently from each other. Nonetheless, the author of this paper decided to group described cases with regard to the construction of the agreements and interdependencies between the parties. In the author's opinion, the issue of whether an algorithm has been developed independently or purchased is a matter of secondary importance. From the perspective of the described constructions and their competition assessment, the significant issue is whether the whole pricing process is being carried out outside of the undertaking's structures, on the basis of aggregated data originating from its competitors or whether it takes place within the undertaking's structures, on the basis of its own data set. A similar approach is presented in the Dutch literature, in which it has been observed that the practice concerning the use of a2i Systems algorithm does not constitute a typical form of hub-and-spokes scenario⁵².

The popularisation of this kind of algorithm among direct competitors would undoubtedly lead to an increase in market transparency – more market data is going to be digitalised. This phenomenon would not generate greater competition though, but above all enable the algorithms to create expanded market forecasts that would, in turn, make it possible for the entrepreneurs to react more promptly

⁴⁹ S. Schechner, *Why Do Gas Station Prices...*

⁵⁰ A. Ezrachi, M. E. Stucke, *Artificial Intelligence & Collusion: When Computers Inhibit Competition*, "University of Illinois Law Review" 2017, Vol. 2017, pp. 1787–1789.

⁵¹ A. Ezrachi, M. E. Stucke, *Sustainable and Unchallenged Algorithmic Tacit Collusion*, "Northwestern Journal of Technology & Intellectual Property" 2020, Vol. 17, No. 2, p. 247.

⁵² A. Gerbrandy, B. Custers, *Algoritmische besluitvorming...*, p. 5.

to changes that occur on the market⁵³. The critical factor that pre-empts the success of the described model is the speed of information exchange. In the past, pricing decisions had been taken based on physical price lists determined by the competing entities. This kind of information becomes out-of-date quickly. Therefore, it was almost impossible to follow the price changes of the competing entities in real-time. Computerisation and algorithmization of this process brought a significant change in this field.

As a result of applying real-time pricing algorithms, the most basic method of competing for a customer – discounting – becomes useless. If a discount had been granted by one of the competitors, the other participants of the market would have immediately adjusted their prices to the new, lower level. The time between granting a rebate and adaptation of the competitors is so short that the former has no impact on customers' decisions. From the entrepreneur's perspective, discounting becomes a practice that generates no real benefits, since it hardly results in any migration of the customers. As a result, we encounter the phenomenon of price stabilisation. Algorithms that pursue price maximization may also be programmed to increase the prices gradually. That, in turn, would translate into a general increase in market prices, since the competing entities would adjust to the new, higher price level.

A question arises whether competition law should be concerned with factual situations, in which the entrepreneurs take admittedly independent actions that can have a substantial effect on the degree of competition. The impossibility of isolating the element of cooperation between the entities making use of algorithms may constitute an obstacle to answering this question in the affirmative. This is because individual behaviour does not fall within the scope of the application of Art. 101 of TFEU⁵⁴. Application of Art. 101 of TFEU to the predictable agent scenario would require accepting a wide interpretation of the scope of this provision. This kind of standpoint is more than controversial, however. It assumes that the scope of the cartel prohibition from Art. 101 of TFEU also pertains to the phenomenon of tacit collusion, which can be described, in other words, as conscious parallelism. Nonetheless, in the to-date practice of European NCAs, unlike in case of their American counterpart, a doctrine that perceives certain cases of parallel practises as an infringement of competition law, has not been established yet⁵⁵. Nevertheless, this approach is highly problematic from a practical point of view. Firstly, if the entrepreneurs introduce the algorithms independently from each other, it is difficult to declare that the company, which started the practice on

⁵³ R. Moore-Colyer, *Predictive Analytics Are the Future of Big Data V3*, <http://www.v3.co.uk/v3-uk/analysis/2429494/predictive-analytics-are-the-future-of-big-data> (visited 9 October 2015).

⁵⁴ C. Barnard, S. Peers, *European Union Law*, 2nd ed., Oxford 2017, p. 521.

⁵⁵ M. van Roozendaal, *Algorithms: Teenage Troublemakers of EU Competition Law. A Closer Look at Algorithms as the New Price-Fixing Tool in EU Competition Law*, European Law Institute 2018, p. 10.

a particular market, intended to take part in price collusion. Secondly, one should not assume in advance that other entrepreneurs had such an intention when they decided to use pricing algorithms. The decision of that kind lies within their economically justified interest, part of which is the necessity to remain responsive to the price changes on the market⁵⁶.

The second model within the described group is defined in the literature as the Digital eye. Contrary to the previous scenarios, the algorithm is not programmed to follow a specific strategy for action⁵⁷. In the Predictable agent model, the algorithm strived to maximize the profit by stabilisation of prices and their systematic increase. In the Digital eye scenario, the program acts independently, observing the phenomena that occur on the market and identifying the optimal way of achieving a certain aim – in this setting, usually the one of profit maximization. In other words, this model is based on the application of machine learning techniques thanks to which the programme chooses on its own the most appropriate means to fulfil its goals.

For the time being, any deliberations on the described model have a mostly hypothetical dimension. Its introduction requires providing the programme with access to a database containing complete market information in a totally digitalised form, also known as the God's view. Database of that kind is now being created by the Uber platform, operating in the transport services market. Uber can follow every ride that is currently taking place, while at the same time profiling its clients. It processes information about the most frequent routes, knows where and how much time a client spends at a given location. A programme that possesses such information, together with the data that relates to the prices offered by the competing entities, can autonomously formulate a market strategy.

Competition may be particularly threatened in situations where a significant number of competitors would have access to previously mentioned God's view technology. In such an environment, by analysing the available information, the computers are able to foresee and react to the competitors' actions, even before the change in prices takes place. Taking any competitive action, not only with respect to price but also aimed at increasing product quality or attracting competitors' customers, becomes pointless.

Self-learning algorithms would assume that other entities operating on the market are making use of similarly thinking algorithms, which would be aware that pro-competitive actions, in particular with regard to prices, are not beneficial. As a result, tit for tat actions would be restricted to those situations in which pro-competitive behaviours would have a clearly intentional character, which would be aimed at attracting new, potential clients.

⁵⁶ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 69.

⁵⁷ *Ibidem*, p. 78.

Thus, from the entrepreneurs' perspective, the Digital eye scenario is more beneficial than previously described Predictable agent model. It allows better comprehension of which of the competitors' actions signal the beginning of a price war and which do not. As a result, algorithms may create more complex market strategies, assuring the entrepreneurs higher profits. Those who suffer in this set of circumstances are the consumers, for whom tit for tat actions are usually linked with lower prices and better offers from the entrepreneurs⁵⁸. Decision-making of real people, who are led to a greater or a lesser extent by emotions, is, after all, always done under uncertainty about other competitors' behaviour. This uncertainty, however, constitutes an indispensable element of the free market⁵⁹.

Addressing the matter of the level of complexity of strategies that may be created by the programmes, the literature points out to the possibility of reaching a state virtually identical with a market share agreement, without any actual cooperation between the undertakings. By means of profiling, algorithms identify the key customers of each of the competing entities and refrain from action, such as discounting, aimed at that group. The aforementioned strategy undoubtedly leads to the phenomenon of price stabilisation⁶⁰. The described problem remains in line with the general game theory, according to which the better the players know each other and the more occasions did they have to observe their behaviour, the more likely they are to cooperate.

4. CASE STUDY – *LEX UBER* AND COMPETITION PROTECTION

On the 3 of October 2019, a draft of a bill amending the Act on road transport was submitted to the Polish Parliament and registered as Parliament paper number 3368. The draft was dubbed "*lex Uber*" in the Polish media, as the main reason behind it was the necessity of regulating transport services offered via Internet platforms like Uber⁶¹. The stated aim of the regulation was "determining the uniform requirements and conditions for equal competition between entities conducting economic activity connected with intermediation in transport of persons with private cars and taxis, which shall foster fair competition between the transporters and ensure security for passengers as well as more effective control of the correctness of the way the economic activity is conducted by the intermediaries

⁵⁸ A. Dixit, B. Nalebuff, *Thinking Strategically: The Competitive Edge in Business, Politics, and Everyday Life*, Norton 1991, p. 111.

⁵⁹ F. A. Hayek, *The Use of Knowledge in Society*, "American Economic Review" 1945, Vol. 35, No. 4, pp. 519–530.

⁶⁰ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 76.

⁶¹ 8th Term of the Polish Parliament – the Sejm, <https://sejm.gov.pl/sejm8.nsf/home.xsp> (visited 19 June 2019).

and control of associated entities (...)⁶². Despite striving to ensure fair competition on the market, the legislator decided to introduce a regulation that, in light of the deliberations presented previously, may result in impeding competition in the long run.

According to the Art. 5d of the amended Act, an entrepreneur, who acts as an intermediary in the transport of persons, is permitted to transmit orders only to other entrepreneurs, who possess appropriate licence. In the light of the presented regulation, both the platform (e.g. Uber) and the driver shall possess the status of an entrepreneur. Therefore, this resembles the factual situation described in the Eturas case, which constituted an example of hub-and-spokes collusion scenario. In this case, the element of price arrangement is even more evident. The platform does not just set the maximum discount rates, but directly the price of the complete transportation service. What is more, the driver has scarcely any impact on the rate they are charging for a particular ride. The amendment in question was proclaimed on 26 June 2019 and its *vacatio legis* elapsed on 31 December 2019⁶³.

In the Dutch literature, it has already been pointed out that the way Uber and other platforms operate on the market may be regarded as a breach of competition law provisions⁶⁴. The aforementioned statement should be deemed well-founded, especially considering the CJEU's ruling in the Eturas case. What turns out to be decisive is the qualification of entities like Uber and their drivers in the legislation of a given jurisdiction. The qualification of Uber by CJEU as a transportation company, rather than as an Internet platform of e-commerce, seems to be beyond any doubts⁶⁵. More problematic, though, remains the qualification of the drivers. In Poland, the legislator, by way of statutory intervention, determined their status as entrepreneurs. On the other hand, British courts declared them to be workers⁶⁶.

Declaring Uber's business concept as a breach of competition law, would lead to more far-reaching consequences than in the case of classic price agreements. If it eliminated the elements infringing competition, the platform would not be able to provide services on the existing conditions. Thus, a question emerges: in what way would entities like Uber evolve? One of the possible scenarios for them is to approach the form of the French BlaBlaCar platform. It shares information

⁶² Governmental Draft of the Bill on the Amendment of the Act on Road Transport and Some Other Acts, <http://www.sejm.gov.pl/sejm8.nsf/PrzebiegProc.xsp?id=FC07720881A-0EA07C12583D700427FD1> (visited 19 May 2019).

⁶³ Dz. U. 2019, poz. 1180, Act from 16th 2019 on the Amendment of the Act of Road Transport and Some Other Acts, <http://prawo.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20190001180> (visited 27 September 2019).

⁶⁴ A. Gerbrandy, B. Custers, *Algoritmische besluitvorming...*, pp. 4–5.

⁶⁵ L. Risack, *Hof van Justitie: UBER is niet louter een bemiddelaar*, Rechtenkrant.be, <http://rechtenkrant.be/hof-van-justitie-uber-niet-louter-een-bemiddelaar/> (visited 13 June 2018).

⁶⁶ M. Anderson, M. Huffman, *The Sharing Economy Meets the Sherman Act: Is Uber a Firm, A Cartel, or Something in Between?*, "Columbia Business Law Review" 2017, Vol. 2017, pp. 859–933.

about free seats in private cars travelling on certain routes, which are offered in exchange for sharing the travel costs⁶⁷. Such a transition would imply a question of an economical and psychological rather than legal nature. Would the clients equally eagerly use the services of a platform like Uber, if, after entering a destination, the driver would not be automatically selected? The consumer would instead get a list of vehicles available in the neighbourhood, offering different rates, with user ratings and predicted arrival times displayed next to them. If the answer to that question turned out to be negative, we would observe a real paradox – the provisions of competition law, the purpose of which in the end is ensuring consumer welfare, would result in changes negatively perceived by this group.

5. PROPOSALS OF POSSIBLE REGULATIONS

As one can see in the example of *lex Uber*, the topic of this paper goes beyond theoretic legal deliberations and relates to questions that competition law in Polish and European dimension will have to deal with in the nearest future. Since the currently enforceable provisions seem not to regulate all the factual situations presented above, foreign literature has already produced *de lege ferenda* postulates related to the issues being discussed.

The first postulate is increasing the control of users over the scope of personal data they share on the Internet⁶⁸. The literature often points out that a system of protection based on accepting in advance to have one's data processed is no longer sufficient⁶⁹. The users most often do not familiarise themselves with the scope of data for the processing of which they express their consent by checking a box. Instead, it is suggested that informing and reminding the users about the particular type of personal data being processed in a given moment should be made mandatory.

The second recommendation is to implement a system of public subsidies for companies that create algorithms with the aim of safeguarding competition at the designing stage. The subsidies would encourage the companies to develop the idea of compliance by design – taking pro-competitive aspects into consideration while writing an algorithm. Another effective solution may be grass-root actions of consumers – enterprises or cooperatives engaging in collective purchasing that redistribute supra-competitive profit in the form of discounts, granted due to the size of the purchase (e.g. CrowdZap, Big Switch). Group buying platforms

⁶⁷ *Blablacar: Nasza Społeczność*, <https://blog.blablacar.pl/blablalife/nasza-spolecznośc> (visited 19 May 2019).

⁶⁸ A. Gerbrandy, B. Custers, *Algoritmische besluitvorming...*, p. 226.

⁶⁹ More on this subject: E. Stucke, P. Grunes, *Big Data and Competition Policy*, Oxford 2016.

(e.g. Groupon, Wowcher, Living Social) also constitute a similar solution⁷⁰. In the literature one may also encounter an often criticised solution of subsidising independent companies that enter the market (mavericks) and are above all focused on gaining a certain market share by offering competitive prices. It is, however, pointed out that actions of that kind are doomed to fail since self-learning algorithms would strive to eliminate those entrepreneurs from the market or otherwise force them to maintain prices on a similar level. These results should be achieved promptly as long as the algorithms have sufficient market power and an ample access to information about the market⁷¹.

The next proposal is to support solutions aimed at decreasing market transparency with respect to prices. Firstly, it can be achieved by offering rebate cards that are detached from any information about the consumer, or by so-called reversed auctions, in which many buyers compete for a single seller. Another recommendation would be to decrease the allowed frequency of changes in the prices of products, especially concerning increasing the prices. However, the literature points out that actions of this kind could encounter harsh criticism from business organisations, such as lobby groups and chambers of commerce, accusing the legislative of enacting laws that limit discounting possibilities⁷². This way, the entrepreneurs would hide their pursuit of economic interest behind a pretence of consumer protection.

What seems to be the most significant voice in the ongoing debate, are the postulates of the organisational unit of the OECD Secretariat – the Directorate for Financial and Enterprise Affairs. In his official note, Avigdor Gal summarizes the deliberations of the roundtable on algorithms and price-fixing, which took place between the 21 and 23 June 2017⁷³. He presents a concept of subjecting the algorithms to regulatory scrutiny, with an option to prohibit analysing certain kinds of information. Competition agencies would also be authorised to interfere in the source code of an algorithm.

Concerning the control of algorithms, the document suggests conducting it *ex-ante* in a form known as a sanity check, looking at both the data they use and the way they function. The control of functioning could take place in two forms: black box – restricted to the outcomes and white box – including access to the code of the algorithm. The second option may raise objections from the entrepreneurs on the grounds of protecting trade secrets and intellectual property. After conducting a control, a competition agency would be able to determine

⁷⁰ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 228.

⁷¹ *Ibidem*, p. 229.

⁷² *Ibidem*, p. 230.

⁷³ A. Gal, *It's a Feature, not a Bug: On Learning Algorithms and What They Teach Us: Roundtable on Algorithms and Collusion*, 7 June 2017, [https://one.oecd.org/document/DAF/COMP/WD\(2017\)50/en/pdf](https://one.oecd.org/document/DAF/COMP/WD(2017)50/en/pdf) (visited 30 September 2019).

if the observed phenomenon of price stabilisation was the result of processing data, which could have been a subject of price collusion between humans.

Summary of proposals presented by Avigdor Gal comprises totally new solutions in the field of competition law. Nonetheless, the aforementioned note ignores the problem of anti-competitive behaviours described in the third and fourth scenarios of collusion presented in this paper. Thus, its suggestions constitute primarily an answer to the problems of evidentiary nature, which emerge in the event of price collusion between the entities that make use of pricing algorithms.

Still, widening the scope of competition agencies' powers may form a first step towards regulating issues that emerge in those particular models of concerted practice. Another task that a legislator would have to face would be the redefinition of price-fixing or introducing new legal terms that pertain to situations in which there is no collusion *per se*, yet the negative competitive effect is equivalent.

6. SUMMARY

The issues presented in this paper constitute the most recent challenges of the contemporary competition law. Their scale is so great that the necessity of changes has started to diffuse into the minds of experts, which is reflected by their appearance in the *de lege ferenda* postulates of the jurisprudence and legal commentaries. That many steps are still to be taken is indicated by the ineffectiveness of legal instruments available to the US Federal Trade Commission, which are, after all, based on more expansive legal terms than Art. 101 of TFEU⁷⁴. The complex character of the issue goes beyond the matter of constructing a more effective system of competition protection and touches the very essence of competition law. It is clearly visible in the example of *lex Uber*. Applying the rules of competition law would most likely encounter resistance from the consumers, who in fact are intended to be the ultimate beneficiaries of this branch of law⁷⁵. The diagnosis that F.A. Hayek made in the middle of the 20th century still seems to be accurate. According to his thesis, the effectiveness of the capitalist economy is based on the complete inability to foresee the results of the decisions that were made. As a consequence, a gap emerges, which is filled by the invisible hand of the free market⁷⁶. The wide application of the pricing algorithms that have access

⁷⁴ A. Ezrachi, M. E. Stucke, *Virtual Competition...*, p. 68.

⁷⁵ C. Barnard, S. Peers, *European Union...*, p. 509.

⁷⁶ F. A. Hayek, *Competition as a Discovery Procedure*, "Quarterly Journal of Austrian Economics" 2002, Vol. 5, No. 3, <https://mises.org/sites/default/files/qjae533.pdf>, p. 9 (visited 1 September 2019).

to almost complete information about the market seems to bind its movements more and more effectively.

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