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**The rising role of pricing algorithms: positive and negative effects in  
the framework of EU Competition Law**

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## SUMMARY

Pricing algorithms are gaining a wide application in the market and in this regard are the cause of various challenges in terms of competition law. This work is aimed at studying pricing algorithms, and their positive and negative effects on competition in the market, as well as identifying possible solutions under EU law for current and future challenges with the increasing role of algorithms.

To achieve the goals of this paper, the concepts of algorithms, including pricing algorithms, are discussed. Relying on a conceptual, economic and legal approach, the positive and negative effects of pricing algorithms on competition are studied separately which allows for a deeper analysis of the problems and benefits of using pricing algorithms in the market. An important part of the definition and problem setting is examined from a legal point of view relying on EU legislation, namely Articles 101 and 102, as well as the EU case law, which reflects the issues of possible regulation of the use of pricing algorithms to ensure healthy competition. Due to the complexity of the regulation, a special place is given to unilateral and coordinated effects of competition harm risks from both economic and legal points of view, which allow discussing certain ways for possible coverage within EU legislation.

As a result of these studies, the relationship between the positive and negative effects is established and solutions to problems are identified that can cover the use of pricing algorithms in the framework of competition law. The ability to apply EU competition law to the use of pricing algorithms is currently limited, as EU competition legislation is not sufficient to address some of the harm risks studied. However, this work also provides alternative solutions for the possible regulation of the use of algorithms. Along with the opinions of various legal scholars and practitioners, there are future challenges that are imminently approaching the market with the increasing use of pricing algorithms.

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## ABBREVIATIONS

AG	Advocate General
AI	Artificial Intelligence
CJEU or ECJ	Court of Justice of the European Union
DSE	Demand-side efficiency
EC	European Commission
EU	European Union
GC	General Court
MFC	Most-Favored Customer
ML	Machine Learning
OECD	Organisation for Economic Co-Operation and Development
PCW	Price Comparison Website
SSE	Supply-side efficiency
TEU	Treaty on European Union
TFEU	Treaty on the Functioning of the European Union

## 1. Introduction

### 1.1. Background

In the era of digitalization and the increasing role of AI, pricing algorithms become an important tool in today's digital business world. Companies are increasingly relying on the use of pricing algorithms to make their operations easier and more profitable. This tendency revives the need for a deeper study of pricing algorithms within the framework of competition law in order to prevent consumer harm and identify possible factors that strengthen healthy competition. An important direction to this end is to establish a correlation between these factors and current EU legislation which will allow to recognize important challenges created by pricing algorithms.

Before proceeding to the main goals and direction of the analysis of this work, it is necessary to discuss the general concept of pricing algorithms. Consequently, pricing algorithms are designed to assist businesses in determining optimal pricing in real-time. They weigh aspects including supply and demand, rival price, and delivery time using AI and machine learning.<sup>1</sup> Such a definition provides a general understanding of the concept, and in the next paragraphs, the author analyzes the concept of algorithms and pricing algorithms in order to be able to further analyze the positive and negative effects of pricing algorithms under EU competition law.

Pricing algorithms in the broad sense of the concept can have both a positive and a negative impact on competition, which is expressed with the emergence of more and more cases relating to its impact on economic activities within the market. The application of algorithms relies on many positive trends, including market efficiency, which is to enable sellers to analyze changes in demand and supply in the market.<sup>2</sup> Analyzing the positive effects of pricing algorithms from the perspective of demand-side and supply-side efficiencies opens new opportunities for companies and consumers to be involved in supporting healthy competition in the market. In addition, there are many negative, as well as unanalyzed, effects in terms of competition due to the use of pricing algorithms. The unregulated nature of pricing algorithms in a consolidated form under the EU law

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<sup>1</sup> Le Chen, Alan Mislove and Christo Wilson, 'An Empirical Analysis of Algorithmic Pricing on Amazon Marketplace' In Proceedings of the 25th International Conference on World Wide Web (2016) International World Wide Web Conferences Steering Committee p. 1339

<sup>2</sup> Ingrid Vandenborre and Michael J Frese, 'Pricing Algorithms under EU Competition Law', Skadden, Arps, Slate, Meagher & Flom LLP (07 December 2021) <<https://globalcompetitionreview.com/guide/digital-markets-guide/first-edition/article/pricing-algorithms-under-eu-competition-law>> accessed 11 March 2022

is considered one of the important reasons for anti-competitive effects in the EU market.<sup>3</sup> The European Commission's evaluation of its Guidelines on horizontal cooperation agreements revealed that there is far too little guidance on the use of pricing algorithms. In the lack of guidance, existing Commission guidelines in other related fields are used to understand certain concepts within pricing algorithms.<sup>4</sup>

An important challenge for pricing algorithms is the risk of collusion, which seriously affects healthy competition in the relevant market. The fact that the digital market is covered by a wide scope of various activities and cannot be strictly delineated creates difficulties to differentiate between pro- and anti-competitive experiences.<sup>5</sup> Moreover, pricing algorithms have already drawn the attention of competition authorities throughout the world because they can drastically increase the risk of collusive market outcomes. Analyzing the competition harm risks from the economic and legal perspectives is the most important way of understanding the scope of harm to competition through the collusive and non-collusive practices. This work identifies four competition harm risks as classified into two groups of coordinated and unilateral competition harm risks. Coordinated harm risks include messenger and hub-and-spoke scenarios of competition harm, while unilateral harm risks include predictable agent and digital eye scenarios. By examining these scenarios from economic point of view, it is considered how the provisions of Article 101 and 102 TFEU can be applied to these scenarios, as well as referring to the EU case law on the liability of business entities using pricing algorithms, especially in cases of potential collusion involving self-learning autonomous algorithms in the absence of evidence of an agreement.<sup>6</sup>

An important challenge of the pricing algorithms specifically analyzed under the unilateral competition harm risks is tacit collusion. This work considers predictable agent and digital eye scenarios as the forms of tacit collusion which are quite challenging due to the new technological era around the world. Tacit collusion is a collusion between competitors, which do not explicitly exchange information and achieving an agreement about coordination of conduct.<sup>7</sup> As with the coordinated competition harm risks, tacit collusion raised the issue of considering the notion of an

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<sup>3</sup> Tuwe Löfström, Hilda Ralsmark and Ulf Johansson, 'Collusion in Algorithmic Pricing', Konkurrensverket – Swedish Competition Authority, Commissioned Research (2021) p. 23

<sup>4</sup> Vandendorre and Frese (n 2)

<sup>5</sup> Antonio Capobianco and Anita Nyeso, 'Challenges for Competition Law Enforcement and Policy in the Digital Economy Get access Arrow', *Journal of European Competition Law & Practice*, Volume 9, Issue 1 (2018) p. 4

<sup>6</sup> Oxera, '*When Algorithms Set Prices: Winners and Losers*' (2017), Discussion Paper (19 June 2017) <<https://www.oxera.com/wp-content/uploads/2018/07/When-algorithms-set-prices-winners-and-losers.pdf.pdf>> accessed 17 March 2022

<sup>7</sup> Joseph E. Harrington, '*A Theory of Tacit Collusion*', Department of Economics at Johns Hopkins University (November 2011) p. 3-5



agreement under Article 101(1) TFEU, which is debatable over being open to broader interpretation to cover the concept of tacit collusion. In addition, tacit collusion in the form of predictable agent and digital eye scenarios is analyzed separately under the provisions of Article 102, which provides for the need to establish a collective dominant position of companies in the market. Given that EU competition law develops and gains wide scope through case law, such a provision allows us to assume the need and the possibility of interpreting Articles 101 and 102 TFEU in accordance with the present challenges within the pricing algorithms.

Studying the main challenges of pricing algorithms, the author focuses on the positive and negative effects from the economic and legal perspectives, that is, what is the relationship between various arguments and the final impact of algorithms on the development of the competitiveness of companies in this market.

## 1.2. Purpose

In view of the long discussions and debates over pricing algorithms and algorithmic collusion, which have not yet found their clear reflection in the EU policy and legislation, the author foresees the need to focus on the study of the positive and negative effects of pricing algorithms that have both pro and anti-competitive impacts in the market and identify the need for a regulation of the use of pricing algorithms for the better competition in the market. The purpose of the work is to discuss the positive effects of pricing algorithms by referring to demand-side and supply-side efficiencies, a number of harm risks classified into coordinated and unilateral risks and their impact on competition and competitiveness of companies in the market, to analyze whether they can be addressed by the existing EU legislation and arguing it through different position outlined in the EU case law, as well as to identify future challenges that the pricing algorithms might raise in the market and give some solutions to the current and future possible challenges. Thus, the paper is aimed to analyse the positive and negative effects of pricing algorithms from the economic and legal perspectives, and whether the existing EU competition legislation is sufficient to address the challenges raised by algorithmic pricing.

Therefore, the research question in this study is formulated as follows: *what are the positive and negative effects of the rising role of pricing algorithms in the framework of EU competition law and is the existing EU competition legislation sufficient to address the specific challenges raised*

*by algorithmic pricing, and what are the possible solutions and future challenges within the pricing algorithms?*

### 1.3. Methodology

The main research method used in this thesis is qualitative. To comprehend concepts, views, or experiences, qualitative research entails gathering and evaluating non-numerical data, but not only. It can be used to get an in-depth understanding of a subject or to develop new research ideas.<sup>8</sup> The qualitative approach uses a combination of these three approaches for data collection: direct observations, in-depth interviews, and document analysis.<sup>9</sup> Document analysis are covered in this work as a part of the qualitative research method.

In order to describe important objectives and define concepts of algorithms and pricing algorithms in the context of EU law, the descriptive legal research method will be applied in the second chapter. Descriptive legal research is a research method that describes the characteristics of the pricing algorithms that are studied in this work.<sup>10</sup>

This work also refers to analytical legal research which is a specific type of research that involves critical thinking skills and the evaluation of facts and information relative to the research being conducted.<sup>11</sup> This method considers analyzing the positive and negative effects of pricing algorithms by referring to various sources in order to obtain the most reliable and relevant information.

Chapter five mostly uses applied legal research which is defined as a methodology used to find a solution to a pressing practical problem at hand.<sup>12</sup> This method allows referring to the case law and practical application of pricing algorithms, their risks in the framework of EU competition law and the improvement of existing shortcomings in algorithmic pricing legislation affecting healthy competition.

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<sup>8</sup> Sharan B. Merriam, Elizabeth J. Tisdell, *'Qualitative Research: A Guide to Design and Implementation'*, 4th Edition (August 2015), p. 8

<sup>9</sup> *Ibid* p. 46

<sup>10</sup> Lee Epstein and Andrew D Martin, *'Introduction to Empirical Legal Research Hardcover'*, Oxford University Press (14 August 2014) p. 122

<sup>11</sup> Thomas M.J. Möllers, *'Legal Methods. How to work with legal arguments'*, *Common Market Law Review*, Volume 58, Issue 1 (2021) pp. 231

<sup>12</sup> Karl Riesenhuber, *'European Legal Methodology'*, *Ius Communitatis VII*, 2nd Edition (September 2021) p. 153-154

The material used in this thesis includes primary and secondary sources of EU law. Primary sources in this thesis include the EU legislation, as well as legal instruments concerning EU competition legislation and case law. The hierarchy of the relevant sources of law within EU competition law is mainly aligned with EU law in general. These highest sources are accompanied by general principles of EU law, which have an important role in the interpretation of relevant legal concepts and in analyzing the case law of the CJEU. Books, academic articles, doctrinal works and legal blog sources are used as secondary sources.

#### 1.4. Delimitations

This paper addresses specific questions about pricing algorithms and related challenges in EU competition law. Competition law is taken into account and dealt within the framework of EU law and jurisprudence. Such a consideration of the challenges of pricing algorithms allows us to narrow the range and scope of the issues that will be discussed, specifically by focusing on their positive and negative effects under the current EU competition law.

This work focuses on the extent of pro- and anti-competitive effects of pricing algorithms under EU competition law. This thesis does not discuss algorithmic collusion in a broad sense and does not go beyond the challenges and competition harm scenarios that are mentioned in this paper. Broad sense of algorithmic collusions includes various forms of collusion and its concept from different perspectives and by different legal practitioners. The work does not deeply analyze the explicit collusion and tacit collusion, where the latter is studied only for the purposes of understanding of predictable agent and digital eye scenarios. Therefore, collusion with a significant impact on the market in the area of pricing algorithms is covered only to a limited extent in order to focus attention on other major competition harm scenarios.

#### 1.5. Structure

This paper encompasses six chapters, including an introduction and conclusion.

The introduction provides an overview, discusses the importance of this topic, the main questions and the methodology of the research.

The second chapter refers to the understanding of the concept of pricing algorithms by starting with a general overview of algorithms and their forms. Besides, the rising role of algorithms is discussed in the section by referring to the main features inherent to the algorithms in the EU internal market which is reflected in the primary discussion of the positive and negative effects of algorithms.

The third chapter explores the benefits of algorithmic pricing, specifically analyzing the positive effects of pricing algorithms for competition from the perspective of the demand-side and supply-side efficiencies. Moreover, this section provides a profound analysis of these efficiencies by dividing them into several categories from the perspective of consumers and undertakings involved in the internal market.

The fourth chapter sets out competition harm risks of use of pricing algorithms classifying into two main groups as coordinated and unilateral competition harm risks, whereas deeply analyzing four main competition harm scenarios from the economic perspective.<sup>13</sup> Coordinated harm risks are grouped under the messenger and hub-and-spoke scenarios. This chapter analyzes predictable agent and digital eye scenarios as the forms of tacit collusion, and discusses possible threats from the economic point of view to healthy competition.

Chapter five discusses the application of the existing EU competition law to the competition harm risks of using pricing algorithms that are analyzed and revealed in the fourth chapter. Coordinated harm risks which include messenger and hub-and-spoke harm scenarios consider the notion of undertaking under Article 101(1) TFEU and the section is covered by the numerous case law where these harm scenarios and their connection to Article 101 TFEU were reflected. Both Articles 101 and 102 TFEU are reviewed in the framework of the unilateral competition harm risks. This section also refers to the applicability of Articles 101(1) and 102 TFEU to tacit collusion by emphasizing the possible solutions to the difficulties of their regulation under EU competition law. In addition, this chapter finally considers the solutions for the negative effects and future challenges that might raise pricing algorithms in the internal market.

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<sup>13</sup> Ariel Ezrachi and Maurice E Stucke, 'Virtual Competition: The Promise and Perils of the Algorithm Driven Economy', Harvard University Press (2016) part II

## 2. Pricing algorithms

### 2.1. Introduction

Before proceeding with further analysis of pricing algorithms and their positive and negative effects, it is important to understand the concept of algorithms. This chapter provides a brief insight into the basic concepts behind pricing algorithms, discussing their rising role in the EU market. Analyzing the basics and concepts of algorithms, specifically pricing algorithms, will help to further understand the benefits and pitfalls of algorithmic pricing to competition law.

### 2.2. Overview of algorithms

There is no consensus on the concept of algorithms in the literature; therefore, algorithms do not have a clear formulation, which makes it possible to give a broader concept, as well as the ability to include many processes under various activities within the framework of a generally accepted concept.

According to the Cambridge Dictionary, an algorithm is a set of mathematical instructions that must be followed in a fixed order, and that, especially if given to a computer, will help to calculate an answer to a mathematical problem.<sup>14</sup> Thomas H. Cormen with co-authors in the paper titled “Introduction to Algorithms” conducted an in-depth analysis of the application of algorithms in various fields of activity. According to Cormen’s definition, an algorithm is any well-defined computational procedure that takes some value, or set of values, as input and produces some value, or set of values, as output.<sup>15</sup> Based on Wilson and Keil’s approach<sup>16</sup>, the same definition is provided in the OECD report, which notes that the algorithm is a sequence of rules that should be performed in an exact order to carry out a certain task.<sup>17</sup> Thus, different authors define and characterize the concept of algorithms in different ways, which in general complement each other.

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<sup>14</sup> Cambridge Dictionary editors, ‘Algorithm’, Cambridge University Press

<<https://dictionary.cambridge.org/dictionary/english/algorithm>> accessed 19 March 2022

<sup>15</sup> Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, ‘Introduction to Algorithms’, The Massachusetts Institute of Technology Press Second Edition (2001) pp. 12-17

<sup>16</sup> Wilson, R. A. and F. C. Keil, ‘The MIT Encyclopedia of the Cognitive Sciences’, MIT Press (1999)

<sup>17</sup> OECD, ‘Algorithms and Collusion: Competition Policy in the Digital Age’ (2017) <[www.oecd.org/competition/algorithms-collusion-competition-policy-in-the-digital-age.htm](http://www.oecd.org/competition/algorithms-collusion-competition-policy-in-the-digital-age.htm)> accessed 23 March 2022, p. 8

With changing needs in markets and different fields of activity, algorithms have also undergone a change, which lies in their application to more complex operations. Such algorithmic systems allow complex daily operations that were previously carried out by humans and took a large amount of time to complete any task. Thus, algorithms allow companies to reduce the number of employees and speed up the process of solving repetitive tasks. Recent advances in AI and machine learning have elevated algorithms to a new level, allowing computers to solve complicated issues, make predictions, and make decisions more efficiently than humans, frequently accomplishing desired societal policy goals.<sup>18</sup>

The result of the accelerated development of algorithms and their application has been an increase in influence on the policies of companies in both digital and non-digital markets. That is why the varieties of algorithms have been of interest to various companies and government agencies, each of which aims to ease the workload and enhance the automation process. Business algorithms and government algorithms, relying on the drawbacks of their activities such as delays in the implementation of daily tasks and time-consuming operations, focus on the rapid application of both business decisions and decisions within the framework of government structures. This is due to the fact that regardless of whether it is a business or a government body, they both experience similar problems. As a solution to the problem, these market actors see the use of algorithms, which will greatly affect the strengthening of transparency and speed up the decision-making process. Currently, many companies are at the stage of assimilation of the automation system and the application of algorithms. This outcome suggests that the process will penetrate into all areas of activity.

### 2.3. Pricing algorithms

Algorithm analyzes also cover the very concept of pricing algorithms, however, the latter have a narrower application and are an integral part of the algorithms. The simplest definition of pricing algorithms is the practice of automatically setting the requested price for items for sale, in order to maximize the seller's profits. One can also consider the concept of pricing algorithms in accordance with the definition given by Cormen within the general concept of algorithms. A pricing algorithm is an algorithm that uses prices as an input, and/or uses a computational procedure to determine

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<sup>18</sup> Ibid p. 9

the price as an output.<sup>19</sup> Typically, pricing algorithms are based on statistical information about competitors and potential customers, as well as on a comparative analysis of prices with competitors and technical indicators of the company.

Today, pricing algorithms are mainly used by large companies and businesses, which can allow, from a financial point of view, to establish a new principle of activity in businesses and make important changes in the company's policy within the market. This change in company's policy may result from a reduction in the number of employees, a speeding up of the decision-making process, and thus to the establishment of new requirements in relation to other companies in the market, such as compliance with the regulation of pricing algorithms ensuring free competition. However, many algorithms are focused on performing simple day-to-day tasks in order to recognize competing prices or to balance the pricing strategy in the market. For example, Amazon's "Match Low Price" option allows sellers to match a competitor's lowest price, and they may pick which rivals to match based on a mix of listing conditions, customer feedback rating, and handling time.<sup>20</sup>

Pricing algorithms are classified in various forms. The most common classification of pricing algorithms is into adaptive and learning algorithms. Adaptive pricing algorithms are defined as a set of rules that dictate optimal responses to specific contingencies.<sup>21</sup> Adaptive pricing algorithms are classified into two forms based on their types of activity – estimation, which is aimed at estimating market demand using past volumes and prices and other control variables, and optimization, which chooses the optimal price given the demand estimate and observed past behaviour of rivals.<sup>22</sup> Adaptive algorithms establish a firm's pricing as a function of rivals' prior prices when market conditions are known. On the other hand, adaptive algorithms may only collude if the programmer intends for them to do so.<sup>23</sup> These algorithms given by their creators can become an obstacle only in case of purposeful application, which presumably comes into contact with the automation of the system undertaken by competing companies. The second form under this classification is learning algorithms, which are linked to the fields of AI and machine learning (ML). The process of learning to solve tasks based on experience, and how to produce the

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<sup>19</sup> Competition & Markets Authority (CMA), 'Pricing algorithms: Economic working paper on the use of algorithms to facilitate collusion and personalised pricing', (8 October 2018), p. 9

<sup>20</sup> Ibid p. 10

<sup>21</sup> Mia Monas, 'Interaction between algorithms, AI systems and competition law in the e-commerce sector', European Competition Law and Regulation Master's Thesis, The University of Amsterdam (24 July 2020) p. 7

<sup>22</sup> Ibid p. 8

<sup>23</sup> Ibid p. 12

optimal outcome, is the main idea of ML, which creates an active learning structure for the software.<sup>24</sup> Nonetheless, ML takes too much time for the software to learn from its own experience and is very costly to be supported for such a long time. Learning algorithms provide more advantageous opportunities for the companies in their business planning and price defining due to changing environments. Thus, by having more opportunities for applying pricing algorithms and providing actions with strictly established strategies over a long period of time, ML plays an important role in the era of transition to algorithmic implementation. Strictly established strategies for the application of pricing algorithms may become a reality due to the increase in the number of undertakings using pricing algorithms and accompanying the principle of ensuring healthy competition in the market.

Another categorization of pricing algorithms is based on their subject. The first type is pricing algorithms, which are developed by businesses to set the prices for products which they produce and sell to consumers.<sup>25</sup> The second type under this categorization is pricing algorithms, which are developed by specialist algorithm development firms.<sup>26</sup> Such a distinction subsequently makes it possible to establish the subject of the creator of the algorithms, the main goals and directions of these algorithms and their distribution to other companies.

Based on the analysis of Oxera<sup>27</sup> and relevant academic sources, the other classification of pricing algorithms that should be discussed includes four main approaches: heuristic, analytical, autonomous and auctions. The heuristic approach considers pricing software that uses basic rules-based techniques based on the current condition of pricing in the whole market.<sup>28</sup> The analysis under this approach is supplemented with the available information the algorithm holds at a specific period. The analytical approach is also based on the current condition in the whole market, however, it considers that the pricing rule uses statistical analysis of previous data and remains static due to all the collected data.<sup>29</sup> In the autonomous approach, pricing is set depending on current events happening in the market, having an underlying algorithm that may be set up with

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<sup>24</sup> Ibid p. 13

<sup>25</sup> CMA (n 19) p. 11

<sup>26</sup> Ibid p. 11

<sup>27</sup> Oxera is an economics and finance consultancy that inspires better decisions, helping business solve complex challenges and build stronger strategies.

<sup>28</sup> Oxera (n 6) p. 6

<sup>29</sup> Ibid p. 6



previous data but continually assesses and adjusts itself based on actual results.<sup>30</sup> The auctions approach is used in the sale of online advertising and on retail auction sites.<sup>31</sup>

Despite having this classification, these approaches are applied and used together. The general application of all approaches allows obtaining a certain result within the framework of the system of pricing algorithms. This approach also allows the successful implementation and control of algorithms that sometimes need human correction due to the impossibility of automatic information processing.

Pricing algorithms have wide scope within the framework of activities, including those carried out both in digital and non-digital markets. However, it is important to note that their application in the online market makes up the majority of pricing algorithms due to the ease of collecting information from sellers and competitors. Manual collection of information, which subsequently forms the basis for the functioning of algorithms, is time-consuming. In addition, at present, the digitalization of offline markets in most cases has a connection with online markets, that is, although pricing algorithms are found in offline markets, they somehow adapt their activities through the online platforms of those offline forms of activity. For example, according to a number of news stories and academic research, retail petrol providers deployed pricing algorithms to promote tacit coordination and increase profit margins. Although retail petrol is not an ‘online’ market, there are internet websites or services that monitor gasoline prices and individual sites can modify their pricing fast and cheaply.<sup>32</sup> This example is a clear indication of the growing role of the digital market and the gradual shift towards dependence on online platforms that have more accessible applications for the functioning of pricing algorithms.

## 2.4. Conclusion

This chapter provides a short overview of algorithms from various authors’ perspectives in order to understand the scope of algorithms. When studying the concept of algorithms from different perspectives, their role in commercial activities and in ensuring the enhanced implementation of tasks that are demanding and time-consuming has become obvious. In addition, the role of algorithms in online and offline markets consists of their mutual complementarity in various fields

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<sup>30</sup> Ibid p. 7

<sup>31</sup> Ibid p. 7

<sup>32</sup> CMA (n 19) p. 19

of activity. As noted, algorithms have some important benefits, which consist in accelerating the process of a certain activity. Competition authorities are concerned about the ever-innovating features of algorithms, which, due to their independent operation, threaten the transparency of the assigned tasks to be performed. This approach shows that algorithms in general have their benefits and negative effects on the rising businesses in the market.

The second part of this chapter discusses in detail the concept of pricing algorithms. Applying a similar approach as to algorithms, the concept of pricing algorithms is revealed from the point of view of various authors. In addition, noting the characteristic features of pricing algorithms, such as collecting information, analyzing prices in the market, and ensuring the implementation of daily functions, a general idea of the concept of pricing algorithms appears. Along with the multiple forms of pricing algorithms, their common classification as adaptive and learning pricing algorithms and their categorization from the point of view of the subject are discussed. This categorization shows particular importance in the establishment of the difference in the process of using pricing algorithms.

Currently, algorithms are becoming more significant in businesses and are being used by more and more large companies. This tendency generates further questions and discussion of the positive and negative effects of pricing algorithms on competition in the market.

### 3. Benefits of algorithmic pricing to competition

#### 3.1. Introduction

Pricing algorithms have positive and negative impacts on competition within the EU market. This section provides an analysis of the positive effects of pricing algorithms on competition and consumers. By relying on the OECD report and other academic approaches, it is possible to reveal the pro-competitive effects of algorithms, specifically pricing algorithms. Moreover, this section discusses the effects of pricing algorithms on markets if to increase demand-side and supply-side efficiencies.

#### 3.2. Pro-competitive effects

The OECD report refers to applications of algorithms to businesses and governments, where some beneficial sides of an algorithmic process to the market are thoroughly discussed. Optimization of business processes is one form of applications of algorithms, which positively affects competition in the market.

In the era of Big Data, companies using pricing algorithms can replace or provide support to employees, which will help accelerate the process of product development, increase production in the market through appropriate and accurate calculations. Pricing algorithms enable humans to monitor, acquire, and analyze massive volumes of both historical and real-time data, discover the effects of those algorithms, and make predictions at speeds and scales that were unachievable for humans before. The speed with which computers work enables companies to develop dynamic pricing strategies, better target their consumers through varying degrees of price discrimination or respond quickly to rival behaviour or cost changes.<sup>33</sup> In addition, the robust nature of decision-making algorithms within the framework of pricing allows one to lean towards the use of such algorithms. Sustainability lies in the fact that decisions are made by technologies that provide for a systemic and unchanging nature without any interference with the process. In this case, some

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<sup>33</sup> Agnieszka Bartłomiejczyk, 'Algorithmic pricing under EU competition law', European Competition Law and Regulation Master's Thesis, The University of Amsterdam (27 July 2018) pp. 8-9

authors<sup>34</sup> wonder about possible interventions in the process of algorithmic pricing, which affects the transparency of the decisions made. However, this question is of a hypothetical nature and does not have serious grounds for further study.

The above features are the most common positive features of the algorithms, which can be extended given the increasingly frequent use of pricing algorithms. On the other hand, for a more detailed study of the positive effects of pricing algorithms not only on the market as a whole but also specifically under competition regulations, it is necessary to provide analysis from two aspects: demand-side and supply-side efficiencies. However, it is not quite clear if profits are dispersed fairly across the relevant market. Many positive and negative effects may arise due to being more beneficial to the demand side than the supply side, and vice versa, when using pricing algorithms depending on ongoing pricing fluctuations in the market. As a result, thorough consideration of both benefits and drawbacks from the economic and legal points of view is required before deciding whether to embrace pricing algorithms without reservation.<sup>35</sup>

### 3.2.1. Demand-side efficiencies

As an economic term, demand-side efficiency (DSE) is important in determining the need on the part of customers in the market and involves setting the price of a product depending on the need and quality of goods in the market. Consequently, demand-side economics considers that the higher the price of a good, the fewer people would desire it if all other things stay constant. The amount of a good that customers purchase at a higher price is less because the opportunity cost of buying that item rises as the price of that good rises. As a result, consumers will naturally avoid purchasing a product that requires them to forego consumption of something they value more.<sup>36</sup> Similarly, the OECD reports that in addition to optimizing business processes, pricing algorithms play an important role in reaching profitable solutions for customers and facilitating appropriate profitable market positions for them that entail demand-side efficiencies.<sup>37</sup>

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<sup>34</sup> Samuel Dobrin, 'Algorithms and Collusion: Competition Law Challenges of Pricing Algorithms', European Business Law Master's Thesis, Lund University, (autumn 2019) pp. 9-10

<sup>35</sup> Ibid p. 10

<sup>36</sup> Jason Fernando, Law of Supply and Demand, Investopedia (November 07, 2021) <<https://www.investopedia.com/terms/l/law-of-supply-demand.asp>> accessed 11 April 2022

<sup>37</sup> OECD (n 17) p. 11

To establish beneficial points of pricing algorithms within the demand side, three important aspects can be envisaged that strengthen the market and contribute to the long-term maintenance of healthy competition in the market.

First, it is necessary to note the ability of pricing algorithms to promote cost reduction, which allows companies to determine the appropriate price of goods in the market and the ability for buyers to purchase goods in accordance with the need and rationale price, comparing them with various platforms. Under this DSE category, three different aspects of cost reduction and beneficial effects on buyers are considered. As noted before, algorithms speed up decision-making and execution of set tasks, which contribute to the possibility to compare prices and quality of different products on different platforms, to determine the possible price changes in the market and strengthen the role of a particular product. These functions allow companies to reduce costs, and due to the decrease in the role of employees in the process of performing tasks, help to reduce the company's internal costs.

The reduction in search and transaction costs is most often provided with the help of websites that have the nature of a comparative analysis of the activities of various companies - price comparison websites (PCW). “Skyscanner”<sup>38</sup>, the famous metasearch engine and travel agency, is a prime example of lowering prices through pricing algorithms. This platform allows customers to see the best deals of various airlines through a single platform by automatically generating relevant itinerary information. In this way, customers get the opportunity to see many choices that contribute to making better decisions. Such a system contributes to the adoption of a rational decision, which also allows the strengthening of the role of customers in the market. These choices push companies to increase production and performance, thereby promoting healthy competition in the market. A rational decision provides for a twofold approach, which consists in deciding on the actions of the company to achieve this goal, and the decision of customers, in view of which they provide the necessary information and set the automated mechanism of pricing algorithms. Therefore, each side establishes personal benefits on its own way, which greatly affects the preservation of a healthy competitive market.

Another aspect in terms of costs is the position of large companies that operate in the production of various goods. Such a company can sometimes fail to set prices in a market that can be very competitive. In this case, the algorithms allow those companies to set different prices at different

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<sup>38</sup> Skyscanner is a metasearch engine and travel agency based in Edinburgh, Scotland.

time intervals, thereby ultimately setting the optimal price for the product on the market. This outcome occurs due to the automated functioning of algorithms, which, depending on the information collected, have the ability to access various markets in the world.

With the help of pricing algorithms, it becomes possible for companies to enter a new market in which these companies do not have any experience at all. Consequently, by acquiring information from various sources, companies are increasingly able to enter a new market. For example, the pricing and design of clothing require a thorough knowledge of the society and market in which customers purchase such products, as each market may differ depending on the material of the clothing and other cultural values. In this regard, there is a need to collect reliable information about the market, analyze this information with an automated system and set different prices for goods in order to understand the limits or minimum costs for these goods in the market. This capacity to join new markets while being directed by self-generated data analytics might help level the playing field between new and existing enterprises. Existing merchants may also find it simpler to expand their product offerings and include things in which they have less experience.<sup>39</sup>

Another demand-side benefit is the “digital butler”, which combines the features of the previously noted forms, but has some significant differences. As part of the digital butler, pricing algorithms create an opportunity for consumers to get the best deals to buy. A distinctive feature of this new phenomenon is its spontaneous provision of various offers based on various actions of the consumer in different periods of time. That is, the algorithms, having collected the entire history of the consumer's choices, provide ready-made choices. Consumers who are unable to look for deals on their own may opt to delegate their purchase choice to an algorithm, which responds quickly based on a vast quantity of relevant market data.<sup>40</sup> This will contribute to rational decision-making on the part of the customer, relying on the result provided by pricing algorithms. Naturally, the concept of a digital butler that acts rationally and impartially is appealing, but it begs the question of whether it is genuinely impartial. However, it is important to note that pricing algorithms, like all other forms of algorithms, are only as impartial as the data it uses, and if the data is partial in any way, it will undoubtedly influence the purchase decision.<sup>41</sup> Thus, this outcome leads to the conclusion that competition authorities may have a broad power of investigating the

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<sup>39</sup> Oxera (n 6) p. 10

<sup>40</sup> Samuel Dobrin (n 34) p. 11

<sup>41</sup> Ibid p. 11

information provided by algorithms in order to protect the rights of consumers and maintain healthy competition.

### 3.2.2. Supply-side efficiencies

Another economic term that should be discussed when analyzing pricing algorithms is the law of supply. Supply-side efficiency (SSE) shows how many units were sold at a given price, hence, the higher the price, the greater the amount available. From the seller's standpoint, the opportunity cost of each extra unit tends to rise. The higher selling price justifies the greater opportunity cost of each extra unit sold, thus producers provide more at a higher price.<sup>42</sup> Thus, SSE enables businesses to reduce their manufacturing costs by better allocating resources which are reflected in decreased consumer pricing.<sup>43</sup>

Based on the OECD report, setting prices, finding data for making optimal and rational decisions, and optimizing the business from the supply side is time-consuming. Price setting is carried out in connection with the collected data. The complexity of collecting data from various sources, as well as the sometimes inaccuracy of the acquired data had a strong influence on the establishment of the appropriate functioning algorithmic pricing. This whole process, in addition to taking the company's profits and time, also negatively affected the company's successful pricing policy. Pricing algorithms handle these tasks in a fraction of a second, which leads to a faster process of finding the appropriate data and, henceforth, has an impact on the development of areas such as trade, logistics, organizing and planning. These processes of acceleration and automation show a positive impact on competition in the market in terms of supply side.

To establish beneficial points of pricing algorithms within the supply-side, four important aspects can be envisaged that strengthen the market and contribute to the long-term maintenance of healthy competition in the market.

It is important to note the increase in the role of AI, which has a significant impact on the labour market. AI has become the main reason for reducing the role of workers in the labour process by replacing workers with an automated mechanism, while also reducing labour costs. AI here refers to work-based pricing algorithms, such as performing day-to-day pricing calculations based on

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<sup>42</sup> Jason Fernando (n 36)

<sup>43</sup> OECD (n 17) p. 15

company policy, as applied by such automated systems. However, AIs only perform operations of a daily and typical nature without being able to perform functions requiring intuition, abstract thinking, or complex physical movements.<sup>44</sup> Despite the implementation of regular daily tasks, AI is considered an important effective tool to accelerate the process of performing functions leading to SSE within the framework of labour relations. Acceleration is manifested in the reduction of the role of workers and the revival of a new era of the use of machines that provide a fast and automated process.

Pricing algorithms, along with other forms of algorithms, within SSE can offer quality effects, which play an important role in increasing the reliability of products, attracting more customers and establishing a brand due to increasing product quality. Quality effects within pricing algorithms are provided in most cases through online platforms such as search engines, transportation platforms, and accommodation booking platforms. These platforms, using the data of their users, are able to provide a wider range of services that may be of interest to the user they already have. Search engines can find the most relevant results for a given query by learning from user search queries and clicks, and they may also utilize the data to deliver extra "value-added" services to consumers. Some e-commerce companies generate customized purchasing suggestions based on prior purchases and browsing activity.<sup>45</sup>

Another factor that has a positive impact on the supply side market is the increasing role of dynamic pricing. Consumers and suppliers alike can observe and act on rapidly changing rates in a variety of business categories, including taxi charges, sports tickets, and hotel rooms. This automated process is covered by the concept of dynamic pricing. To establish patterns of price changes, pricing algorithms analyze all kinds of operations carried out by users. Such a more hands-on process sets the optimal price for users and finds more opportunities for new forms of transactions due to increased user interest. Pricing algorithms learn via trial and error and by identifying patterns in a large amount of data, resulting in optimal pricing.<sup>46</sup> Pricing becomes increasingly dynamic, unique, and personalized as organizations acquire more consumer data and algorithms have more opportunity to experiment.<sup>47</sup>

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<sup>44</sup> CMA (n 19) p. 12

<sup>45</sup> OECD (n 17) p. 16

<sup>46</sup> OECD (n 17) p. 17

<sup>47</sup> Weiss, R. M. and Mehrotra A. K., 'Online Dynamic Pricing: Efficiency, Equity and the Future of E-commerce', Virginia Journal of Law and Technology, Vol. 6, No. 11 (2001), p. 65



So long as prices are set 'just right', well-functioning markets are strong engines for distributing limited resources. There will be too few customers eager to purchase if prices are too high, and there will be too few producers wanting to sell if prices are too low. By enhancing the entire price discovery process, pricing algorithms can help competitive markets run better.<sup>48</sup> Pricing algorithms play an important role in motivating companies to the more active involvement in competitive price determination in the internal market. The price determination process is carried out through data analytics, as a result of which companies, through the functioning of pricing algorithms, will be able to determine these prices even in markets with frequently changing market conditions. This will not only assist the market in finding a balance between buyers and sellers, but it will also indicate where entrepreneurs should spend their resources and efforts in order to produce the items that customers value the most.<sup>49</sup>

### 3.3. Conclusion

This chapter has shown the main positive effects that may arise by pricing algorithms. As a result of such a comprehensive analysis of the positive effects of pricing algorithms, a general picture of the positive impact of algorithms on competition and on market development is established, namely process automation, increased accuracy in activities, more companies utilizing pricing algorithms, the growth of the role of automated task execution and the ability of businesses to enter into unknown to those business markets. Examining the importance of pricing algorithms in terms of demand-side and supply-side efficiency makes it possible to distinguish between the impact of algorithms on consumers and businesses. Henceforth, under the DSE, such main features as promotion of cost reduction, price comparison websites, the entrance of companies into a new market and the “digital butler” are discussed. Under SSE, the role of AI within the development of pricing algorithms, quality effects influencing the attraction of more buyers and brand establishment, the increasing role of dynamic pricing and the enhancement of the entire price discovery process are analyzed. All these aspects of both demand side and supply side are based on data collected from users, random visitors to these platforms, and similar businesses in the market. This collected data is the driving force for expanding the functions of pricing algorithms.

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<sup>48</sup> Oxera (n 6) p. 12

<sup>49</sup> Schumpeter J., 'Flexible figures', *The Economist*, (2016) <<http://www.economist.com/news/business/21689541-growing-number-companies-are-using-dynamic-pricingflexible-figures>> accessed 14 April 2022

In this regard, it can be concluded that pricing algorithms have a fairly large and significant range of positive effects on the market, including healthy competition in the market, while being completely dependent on the data collected from market participants.

## 4. Competition risks of use of pricing algorithms

### 4.1. Introduction

Over time, the increasing role of pricing algorithms revives, in addition to positive effects, also negative effects on the market, especially influencing healthy competition. Competition authorities have begun to monitor the outcome of events more closely due to the use of pricing algorithms by more and more companies. In addition, the European Commission is actively discussing the application of pricing algorithms, focusing on various projects to inform market participants about their possible positive and negative effects.<sup>50</sup> This section provides an overview of the anti-competitive effects of pricing algorithms. This approach is helpful for seeing the situation from the initial step before going into the deeper analysis in regards to algorithmic pricing. Moreover, competition harm risks are considered from two main positions as coordinated and unilateral risks of harm. Coordinated and unilateral risks of harm come from the general classification of the four harm scenarios established by Ezrachi and Stucke<sup>51</sup>, where coordinated harm risks include messenger and hub-and-spoke scenarios, and unilateral harm risks – predictable agent and digital eye scenarios. This work presents a new form of classification, providing for the study of these scenarios not from the classical point of view, but within the framework of the classification according to the subject of harm risks. It should be noted that this chapter touches upon the economic and conceptual aspects of competition harm risks.

### 4.2. Anti-competitive effects

Information is an important part of ensuring the operation of pricing algorithms. The increase in information developed for automation and used for pricing purposes is an important step leading to an increase in the role of algorithms. The primary issues in using algorithms are the greater frequency with which pricing information is transmitted, the more accurate quality of this

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<sup>50</sup> Oxera, '*Algorithmic competition*', prepared for European Commission's conference on 'Shaping competition policy in the era of digitisation', (30 September 2018) p. 8

<sup>51</sup> Ezrachi and Stucke (n 13)

information, and the stabilizing influence this may have on markets when coordination is possible.<sup>52</sup>

As it becomes simpler for corporations to develop and sustain collusion without any formal agreement or human interaction, widespread usage of algorithms may raise worries about possible anticompetitive effects and behaviour.<sup>53</sup> In addition to concerns about possible anti-competitive effects, an important risk is the role of algorithms in facilitating the emergence of new forms of coordination due to the functioning of algorithms as a facilitator for collusion. One of the primary concerns of algorithms is that they widen the gap between illegal explicit collusion and legal tacit collusion, making it easier for businesses to maintain profits above the competitive level without having to engage in a contract.<sup>54</sup> Such a process is possible through indirect collusion, which can lead to certain agreements regarding further actions in the market. The process of automation coming from the pricing algorithms provides for possible schemes for a tacit agreement without the need for the parties to discuss any issues. Such a process has an impact on monitoring the activities of businesses without the need to involve people. However, it is important to note that the tasks for the algorithms are set by their founders, who contribute to the transfer of relevant information and steps for the possibility of automation. This whole chain of functions involved in pricing algorithms has a strong impact on the market, namely the digital market due to the greater activity of automation in the activities of companies in the digital market. This process, in turn, also affects the increase in independence between companies in making decisions about major changes in the market in their favour, which leads to anti-competitive effects in the market. Thus, the risk of tacit collusion is increasing and gaining wide scope due to the complexity of its recognition, as well as influencing the pricing in the market, that is, the outcome of which, from an economic point of view, is an increase in prices. These functions of algorithms are compared to actual questions emanating from the problems of oligopoly, which has a rather subtle but important line of demarcation.<sup>55</sup>

The capacity of pricing algorithms to discriminate between customers based on a variety of predetermined characteristics might have significant implications for the broad use of economic competition instruments in markets where providers employ pricing algorithms to generate

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<sup>52</sup> The Norwegian Competition Authority, 'What effect can algorithms have on competition?', (2021) pp. 5-6

<sup>53</sup> Capobianco and Nyeso (n 5) p. 6

<sup>54</sup> Ibid p. 6

<sup>55</sup> Oxera (n 6)

personalized prices.<sup>56</sup> Individualized prices can lead to discrimination and create certain challenges for enforcers. It is the actions of enforcers regarding market analysis and pricing that play an important role in the further pricing policy of companies. These analyses are important for establishing healthy competition, so the role of enforcers in the application of process automation is undeniable and important. In many antitrust cases, determining whether the supplier has the intention and ability to raise prices over a competitive level is critical. In the process of defining the market, also the digital market, a key question arises about assessing the opportunities for the development of the company, the role of the business and its impact on the market or the impact of a merger taking place in the market. This usually necessitates a comparison of the current market price of the conduct under consideration with a hypothetical competitive market price.<sup>57</sup>

The use of personalized pricing raises long-term challenges toward algorithmic pricing. The use of personalized pricing involves the collection of personal information about market participants, including different customers at different times within different transactions relying on an automated process within pricing algorithms. Depending on the role and tasks performed by pricing algorithms, the use of personalized pricing, as a rule, leads to discrimination between market entities. Existing regulations on the abuse of dominance (collective dominance) under Article 102 TFEU may include such actions, for example, when they amount to illegal price discrimination or exorbitant pricing, but only if the corporation has market power.<sup>58</sup>

As a result, the anti-competitive effects of pricing algorithms are also subject to change. Anti-competitive effects are a challenge for competition authorities in connection with the adoption of concrete steps towards limiting possible violations or negative impacts on competition. Thus, the number of anti-competitive effects is not limited, and with changes in the technological world, all significant effects of healthy competition arise.

#### 4.3. Coordinated competition harm risks

Coordinated competition harm risks refer to a potential or possible illegal agreement between representatives of different companies or rivals regarding anti-competitive actions or process

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<sup>56</sup> Capobianco and Nyeso (n 5) p. 7

<sup>57</sup> Ibid p. 7

<sup>58</sup> Stephen Wisking and Molly Herron, 'Algorithmic pricing - the new competition law frontier?', *Digital Business Lawyer* (2017) p. 2

automation within pricing algorithms. This approach partially allows classifying this risk of harm as explicit collusion, but there are certain theoretical differences between these concepts. While the coordinated action of rivals is considered only from the point of view of the subjects of the relations that have arisen, the explicit collusion has a wider application and meaning, focusing not only on the subjects of these relations but also on the very process of communication. Explicit collusion occurs when a group of companies communicates directly with one another, generally with the goal of coordinating and monitoring their actions in order to increase profits above competitive levels.<sup>59</sup>

Two competition harm scenarios according to the classification by Ezrachi and Stucke – messenger and hub-and-spoke – are included in this group, which are classified in the coordinated competition harm risks group in relation to the role of humans in the implementation of these scenarios. Such a classification differs from the generally accepted forms of classification and is considered only in order to be able to deeply analyze these risks for a competition where humans play an important role in the process of automation and giving tasks to perform to pricing algorithms.

#### 4.3.1. Messenger

One form of anticompetitive harm scenario is messenger, under which “*humans are the masters who agree to collude and map out the cartel*”.<sup>60</sup> The other consideration of the messenger scenario is that “*humans agree to collude and machines execute the collusion, acting as mere intermediaries or messengers*”.<sup>61</sup> This scenario is also defined under the category of algorithms used to implement pre-existing explicit collusion.<sup>62</sup> In this form of manifestation of harm, collusion between competitors which subsequently proceeds to implementation plays an important role. The messenger scenario may be considered the most basic kind of algorithmic collusion, in which humans decide to collude, for example, through a cartel agreement, and algorithms are utilized as a helpful tool to make this collusion happen.

Authors often compare and analyze together the classic cartel and this harm scenario, which have a set distinction. In cartels, representatives of companies have a secret agreement on the settlement

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<sup>59</sup> Luke Garrod and Matthew Olczak, 'Explicit vs tacit collusion: The effects of firm numbers and asymmetries', *International Journal of Industrial Organization*, Volume 56, (January 2018) pp. 3-4

<sup>60</sup> Ezrachi and Stucke (n 13) p. 39

<sup>61</sup> Freshfields Bruckhaus Deringer LLP, 'Pricing algorithms: the digital collusion scenarios', (2017) p. 2

<sup>62</sup> Bartłomiejczyk (n 33) pp. 11

of prices in the market, the division of the market into spheres of influence, or other factors that affect healthy competition. Subsequently, pricing algorithms monitor and enforce the terms of an illegal agreement that was secretly entered into between company representatives. This category serves as a reminder that price-fixing cartels are unlawful, regardless of the methods used to implement or operate them.<sup>63</sup> Within the framework of the theory of this scenario, humans themselves play a special role in the automation process, where “*technological extension of human will*”<sup>64</sup>, but not the process of implementation itself, plays an important role.

Pricing algorithms are the driving force in the implementation of the provisions of the agreement made between humans under this scenario. The agreement under this scenario is envisaged under the general characteristics of Article 101 TFEU and covers both horizontal and vertical agreement. In view of the possibility of covering both a horizontal and a vertical agreement, it is necessary to note the effects of pricing algorithms that arise in connection with the conclusion of such agreements.

Horizontal agreements have the following effects. The use of algorithms may make price-fixing agreements easier to implement by boosting market transparency and enabling information flow.<sup>65</sup> It may restrict the incentives for cartel members to stray from the fixed price by enabling the monitoring of variations and enhancing the speed of reprisal for deviations, making cartels more stable.<sup>66</sup>

Algorithms make it possible to facilitate the process of implementing vertical agreements, namely the restrictions associated with retail price maintenance. In this case, within the framework of pricing algorithms, monitoring algorithms are also considered, which have a significant role in setting prices in more efficient ways. This is achieved by manufacturers detecting retailer deviations from a predetermined or minimum resale price. Recommended prices set by suppliers are not a hardcore restriction of Article 101(1) TFEU under EU competition law, as long as they do not amount to a fixed or minimum sale price as a result of pressure from, or incentives offered by, any of the parties, and are within the set market share thresholds.<sup>67</sup> Monitoring algorithms contribute to the change of recommended prices to fixed prices, which is also noted by the Commission, while focusing on the role of algorithms in the process of change.

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<sup>63</sup> Freshfields Bruckhaus Deringer LLP (n 61) p. 3

<sup>64</sup> Ezrachi and Stucke (n 13) p. 41

<sup>65</sup> Bartłomiejczyk (n 33) p. 12

<sup>66</sup> *Ibid* p. 13

<sup>67</sup> *Ibid* p. 13

#### 4.3.2. Hub-and-spoke

The hub-and-spoke scenario considers “*the use of a single pricing algorithm to determine the market price charged by numerous users*”.<sup>68</sup> Without intending to participate in a cartel, online businesses that use third-party provider's algorithms may find themselves facing cartel claims. Various companies employ the same third-party provider's pricing algorithm to calculate market price and respond to market changes in this situation.<sup>69</sup> The third party in the process of these operations is called the “hub”, which plays a key role in the collusion process. The companies also have collusion that is coordinated by a third party provider in a form that would not affect the recognition of direct collusion between these companies. In this case, the initial horizontal agreement between companies is important, which subsequently aim at entering into vertical agreements with retailers to determine prices in the market or divide the market into spheres of influence. However, companies can also use the same automation process and resort to the same pricing algorithms without first entering into a horizontal agreement. This case makes it difficult for competition authorities to determine whether there is an initial horizontal agreement between companies. Stabilization of prices in the market, division of the market into spheres of influence, or other use of pricing in this way greatly affects the competition in the market, weakening its general foundations.

The hub-and-spoke scenario has special differences from the messenger scenario. Although the latter provides the computer as a tool for an already existing illegal agreement between humans, hub-and-spoke, as already reflected above, does not have the primary goal of enforcing humans' decisions, but is reflected by applying the same pricing algorithms. The computer in an algorithm-driven hub and spoke does not just execute the orders of humans; rather, it is the competitors' use of the same pricing algorithm that stabilizes prices and dampens competition.<sup>70</sup>

The Uber case is the clearest example to understand how the hub-and-spoke scenario works, where Uber Technologies Inc., the online platform, is the ‘hub’ and the Uber drivers are its ‘spokes’.<sup>71</sup> The online platform decides a market price that will be charged to clients based on a single

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<sup>68</sup> Ezrachi and Stucke (n 13) p. 46

<sup>69</sup> Freshfields Bruckhaus Deringer LLP (n 61) p. 3

<sup>70</sup> Ezrachi and Stucke (n 13) p. 48

<sup>71</sup> HubSpot Marketing, 'What is Dynamic Pricing? How does Uber set its prices?', [Video], YouTube <[https://www.youtube.com/watch?v=nqWeiVyzlaQ&ab\\_channel=HubSpotMarketing](https://www.youtube.com/watch?v=nqWeiVyzlaQ&ab_channel=HubSpotMarketing)> accessed 25 April 2022



automated pricing-setting algorithm. The platform's price is not genuinely competitive when considering factors such as customer demand in a certain place or the availability of a sufficient quantity of accessible Uber drivers. In actuality, the pricing algorithm is depending on its “algorithmic monopoly” scenario rather than establishing the true market price. The corporation does actually take advantage of the fact that customers often have little option but to pay a hefty fee to return home, since the company is the only one to offer vehicle services at specific times or in specific areas.<sup>72</sup> This scenario leading to monopolization is very dangerous for the duration of free-market relations and greatly weakens competition in the market, also having a negative impact on consumers.

This process is one of the manifestations of tacit collusion, which is facilitated for a number of reasons. First, it is important to note that the manifestation of tacit collusion is possible if balanced or similar pricing algorithms are used. This provision, regardless of the initial presence of direct collusion between companies, reduces the possibility of the same decision-making in case of risks in the market, such as changes in prices, costs or demand. However, in this case, it is important to have a certain agreement between the rivals, which will develop in a strictly established manner. It is not always possible to determine the short-term concurrence of the interests of rivals as the outcome of tacit collusion, which quite likely occurs due to the use of the same pricing algorithms. Another factor in the manifestation of tacit collusion is the closely related issue of collecting the same information during the development of pricing algorithms. In this case, the rather important question arises about the ability of rivals to know about the use of the same information in the automation process. Businesses would be better able to forecast their competitors' responses to price adjustments if competitors are aware or can infer that they are employing the same or comparable pricing algorithms. This might also assist firms in better understanding the reasoning or intention underlying competitors' price-setting behaviour.<sup>73</sup>

#### 4.4. Unilateral competition harm risks

Unilateral competition harm risks within this work can be defined as the absence of any agreement or communication between rivals who act unilaterally and at the same time ensure that prices rise

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<sup>72</sup> Anne-Sophie Thoby, 'Pricing Algorithms & Competition Law: How to think optimally the European competition law framework for pricing algorithms?', Competition Forum, (2020) p. 8

<sup>73</sup> CMA (n 19) p. 25

above the competition level in the market. Henceforth, an important risk under this classification is tacit collusion, which can be analyzed through harm scenarios due to the operation of pricing algorithms. Even when each business uses the pricing algorithm to make unilateral pricing choices, this section explores theories of harm under which pricing algorithms could lead to coordinated results.<sup>74</sup>

Tacit collusion occurs when rivals are “*able to engage in a parallel behaviour and receive benefits from their collective market power without, or without necessarily, engaging into an agreement or coordinated practice in the meaning of Article 101 TFEU*” when specific market conditions exist.<sup>75</sup> While there is evidence of collusive behaviour between companies in coordinated activities, such as information exchange, in the instance of tacit collusion, there is simply no agreement or other evidence that would show coordination between undertakings.<sup>76</sup> The widespread use of pricing algorithms might result in improved market transparency, rapidity of price adjustments, and computation of optimal prices, all of which can lead to collusion.<sup>77</sup> A market in which all businesses unilaterally adopt their own pricing algorithm, access their rivals' real-time pricing, and change to each other's prices within seconds or even in real time might spawn tacit collusion.<sup>78</sup> In the event of a possible change or increase in prices by one company, the automated process of other companies will instantly reveal this fact and implement a price balancing mechanism with other competing companies in the market. Otherwise, the price reduction by one company, that is, the offer of discounts for its customers, will also result in price balancing by other competing companies, which, even if not expediently, then procedurally and mechanically accept this automated process. This outcome leads to a gradual decrease in competitiveness in the market and, as a result, weakens the basic principles of healthy competition in the market. The negative effects of tacit collusion on competition are thus wide-ranging. Therefore, tacit collusion is considered a grey area outside of the categories of explicit collusion and concerted practices.<sup>79</sup> This part discusses two harm scenarios – predictable agent and digital eye – that generate tacit collusion through pricing algorithms. Within the framework of this work, the main classification provides for the belonging of these scenarios to unilateral competition harm risks. In the literature,

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<sup>74</sup> Ibid p. 25

<sup>75</sup> Bartłomiejczyk (n 33) p. 17

<sup>76</sup> Dobrin (n 34) p. 28

<sup>77</sup> Freshfields Bruckhaus Deringer LLP (n 61) p. 4

<sup>78</sup> Ibid p. 4

<sup>79</sup> Dobrin (n 34) p. 29

these scenarios are considered the classic form of tacit collusion, which is discussed below in detail.

#### 4.4.1. Predictable agent

Under the predictable agent scenario, each corporation might adopt an algorithm that tracks the behaviour of its competitors, punishes deviations from the collusive pricing, or otherwise fosters tacit coordination.<sup>80</sup> This scenario is also referred to as algorithm-enhanced tacit collusion. The main goal of companies within the theory of this scenario is to maximize profits using pricing algorithms. As noted in previous chapters, pricing algorithms are aimed at balancing companies' pricing policies and ensuring free trade relations that open new gates for better competition. However, due to the growing number of companies using pricing algorithms, it is becoming clear that most of them, having no idea about other companies in the overall account, apply the same methods and function in the same way. Companies also understand the pattern of pricing algorithms used by their competitors, as well as the emergence of tacit collusion due to the widespread use of pricing algorithms. These unavoidable factors contribute to the rise in prices in the market and the gradual impact on healthy competition. There is no formal agreement between the competitors, but there is evidence of anti-competitive intent to enhance profits excessively through the use of pricing algorithms. It may be claimed that the projects are merely attempting to comprehend how these profit-maximizing pricing algorithms work.<sup>81</sup> If the price-setting algorithms enable enterprises to adopt highly basic, transparent, and predictable pricing behaviour, which can be recognized by other firms, tacit coordination looks to be more likely to be a worry in the absence of explicit communication.<sup>82</sup>

Thus, predictable agent considers that competitors use a distinct profit-maximizing pricing algorithm, which is built to track price changes, respond instantly to any competitor's price drop, and adjust its own price accordingly.<sup>83</sup> Such a definition of the scenario makes it necessary to note the role of competition. Due to the absence of direct or indirect expression of collusion between rivals or third parties, competition law fails to reveal and limit these anti-competitive actions. In

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<sup>80</sup> Oxera (n 6) p. 17

<sup>81</sup> Dobrin (n 34) p. 28

<sup>82</sup> CMA (n 19) pp. 27-28

<sup>83</sup> Thoby (n 72) p. 11

this case, the fact that the competitors were aware of all anti-competitive actions and could assume the possibility of collusion within the pricing algorithms plays an important role. This scenario includes an anti-competitive purpose, as each business is aware that industry-wide usage of algorithmic pricing might promote tacit collusion.<sup>84</sup>

#### 4.4.2. Digital eye

The digital eye scenario, very similar to the predictable agent scenario, is complex and relies on the practical application of pricing algorithms, thereby gradually improving them. This scenario also involves profit maximization through various optimal paths by gathering information quickly and automating it through pricing algorithms. The main difference from the predictable agent scenario is the application of AI in this scenario, which implies the absence of humans in the development of plans, decision-making and pricing in the market. Therefore, in this scenario, the pricing algorithms perform the entire process on their own while improving their system over time due to the collected practice and the extraction of committed systematic errors. Ultimately, without the influence of representatives of companies or any humans, the algorithms independently achieve the goal of maximizing profits, which sometimes creates difficulties in the concept of using the mechanism on the part of AI. Within this scenario, it is important to note two aspects that have a strong impact on process improvement, where the first is the ability to collect a huge amount of information in a very short time, and the second is, the development of the role of AI in the world, the use of its functions within the framework of pricing algorithms. The increasing role of pricing algorithms in collecting data is described as a “*God-like view of the marketplace*”<sup>85</sup>, meaning that each company will have a God-like view of the market, either because no company could survive without it, or because companies would share this technology knowing that it will eventually lead to tacit cooperation.<sup>86</sup> Another important feature of this scenario is that if company representatives somehow try to apply their own mechanism of algorithms, pricing algorithms are able to update their functions for initial and main tasks while focusing on pricing decisions. Thus, the decision-making process is an intact part of the algorithms and plays a key role in providing transparency in the functioning of these algorithms. When just a few companies in the relevant industry utilize

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<sup>84</sup> Ezrachi and Stucke (n 13) p. 61

<sup>85</sup> Ezrachi and Stucke (n 13) p. 71

<sup>86</sup> Bartłomiejczyk (n 33) p. 20

self-learning pricing algorithms, this fact may put tremendous pressure on other companies to adopt these new algorithms. As a result, widespread adoption of self-learning pricing algorithms may not be so far-fetched.<sup>87</sup>

#### 4.4. Conclusion

Having considered economic aspects of competition harm caused by pricing algorithms, a general picture of the anti-competitive effects of pricing algorithms is displayed. The result of the primary analysis can be considered an increase in the use of pricing algorithms, which in turn, gaining a wide scope becomes the basis for new anti-competitive challenges. To this end, the division into unilateral and coordinating competition harm risks and studying them from a new point of view made it possible to realize the subjective side of the implementation of harm scenarios. In addition, focusing on the basic principles of classification of scenarios, unilateral and coordinating risks give a certain meaning to the concept of the danger of risks in the respective groups. At the same time, classification in terms of explicit and tacit collusion, which are reflected and grouped differently in these scenarios, also plays an important role.

Messenger and hub-and-spoke, being under the same classification of unilateral harm risks, have different forms of danger in the further implementation of pricing algorithms. The messenger is easily recognizable and does not pose a big threat in the market. On the other hand, hub-and-spoke has a rather complex application system and is considered one of the most dangerous among other harm scenarios. While the messenger is explicit collusion, the hub-and-spoke can be referred to as tacit collusion, but in the literature, the approach to this issue varies greatly. The Uber case is a prime example of hub-and-spoke, which also reflects the complexity of the system for recognizing this scenario and detecting anti-competitive actions in the market. Even if price-fixing is frequently viewed as a damaging anti-competitive practice by the object in line with article 101(1) TFEU, it is not always evident whether the anti-competitive impacts outweigh the advantages.<sup>88</sup>

Other scenarios under the classification of coordinating harm risks – predictable agent and digital eye – are of an uncertain nature and fall under the concept of tacit collusion being one of its forms. From an economic point of view, these scenarios may become quite widespread in the near future

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<sup>87</sup> Dobrin (n 34) p. 31

<sup>88</sup> Ibid p. 38

due to their focus on AI and new technologies, as well as on the accelerated process of automating the data collected for the operation of pricing algorithms. This approach is justified by the growing role of the digital market and AI in the new world, which directly requires new and accelerated approaches to complete tasks and set prices in the market. On the other hand, the improvement of these scenarios will lead to serious economic changes and a complete change in the pricing policy in the market, which, in the absence of strict regulations, can deal a serious blow to healthy competition.

## 5. Applying the current competition rules

### 5.1. Introduction

This part covers the study of coordinated and unilateral competition harm risks from the perspective of EU legislation and case law, covering general legal approaches to the application of scenarios classified under named risks of harm. The study of the economic aspects of these scenarios allowed us to get an overall picture of their practical application and theoretical significance. Referring to the EU case law, the scenarios reveal the main complexities of regulation by legislators and enforcement by companies. An important part of these analyzes is driven by the role of pricing algorithms and their relationship to competition law. The legal analysis then relies on Articles 101 and 102 TFEU, which play an important role in determining the role of pricing algorithms from a competition law perspective.

In addition to coordinated and unilateral competition harm risks, this part covers future possible risks and challenges facing pricing algorithms in order to ensure healthy competition. Several possible ways to resolve the use of pricing algorithms are noted, and the approaches of various legal practitioners in relation to the possible regulation of pricing algorithms are discussed.

### 5.2. How are coordinated competition harm risks addressed by EU Competition Law?

Coordinated competition harm risks, which include two competition harm scenarios, involve agreements between rivals that affect the normal sequence of events. It is important to note that under the messenger scenario, pricing algorithms do not provide for the conclusion of new agreements that are anti-competitive in nature. Pricing algorithms merely replace or complement the old techniques of carrying out the anticompetitive agreements that are already known to and regulated by EU competition law.<sup>89</sup> This form of automation of algorithms is provided by communication and monitoring of the provisions of competition law.

Both scenarios of harm are covered by the provisions of Article 101 TFEU which are discussed in the previous chapter from the economic point of view. These scenarios cover both vertical and

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<sup>89</sup> Bartłomiejczyk (n 33) p. 22

horizontal agreements which open the way for a broader examination of these scenarios from a legal point of view and makes it easy to recognize illegal actions of companies under concluded agreements that led to anti-competitive consequences. Given the consistency of the provisions of Article 101 TFEU with these scenarios, the execution of such agreements is considered along with the involvement of pricing algorithms.

### 5.2.1. Messenger

The application of the law and the common networking system leading to anti-competitive actions in the messenger scenario suggests that this scenario is not complex and is easily recognizable and quite widely covered by EU legislation. Within the framework of the messenger scenario, a significant difficulty is the recognition of illegal actions on the part of humans as part of the conclusion of an agreement and subsequently the use of pricing algorithms.

Analyzing the illegality from two perspectives – horizontal and vertical agreements – leads to different approaches within the same scenario. The illegality of horizontal agreement depends on the ability to establish a "concurrence of wills" or deliberate activity. Once collusive behaviour is uncovered, the present legal framework appears to be sufficient to sanction it.<sup>90</sup> This process quite clearly reflects the situation with horizontal agreements, which is quite different from the framework of vertical agreements. Vertical agreements can contribute to limiting the implementation of RPM agreements. In fact, the conclusion of the RPM agreements is subsequently ensured by the use of pricing algorithms in order to monitor and apply the terms of the agreement accordingly. Problems with these agreements usually arise due to the particular amplification impact of algorithm usage at a horizontal level on RPM that enforcement difficulties may develop.<sup>91</sup> Due to emerging issues, the EC has taken a closer look at RPM agreements and in this regard, there are significant cases such as *Asus*<sup>92</sup>, *Denon and Marantz*<sup>93</sup>, *Philips, Pioneer*<sup>94</sup>, and *Guess*<sup>95</sup> that have significantly influenced the conclusions on problems arising from vertical

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<sup>90</sup> Martyn Dobbin, *Pricing algorithms and competition: what competitive concerns do pricing algorithms raise?*, University of Strathclyde Law School for the module "Competition and the Digital Economy", (December 2020)

<<https://www.lexxion.eu/en/coreblogpost/what-competitive-concerns-do-pricing-algorithms-raise/>> accessed 7 May 2022

<sup>91</sup> *Ibid*

<sup>92</sup> *Asus* (Case AT.40465) Summary of Commission Decision C/2018/4773 [2018] OJ C 338/08. See also *ASUS* (Case AT.40465) Commission Decision C(2018) 4773 final [2018]

<sup>93</sup> *Denon & Marantz* (vertical restraints) (Case AT.40469) Summary of Commission Decision C/2018/4774 [2018] OJ C 335/05

<sup>94</sup> *Pioneer* (vertical restraints) (Case AT.40182) Summary of Commission Decision C/2018/4790 [2018] OJ C 338/11

<sup>95</sup> *Guess* (Case AT 40428), Commission decision of 17 December 2018



restraints. The unifying side of these cases is the conclusion of the EC that manufacturers enforced minimal or fixed pricing directly or indirectly, restricting distributors and merchants from freely establishing product prices.<sup>96</sup> This means that manufacturers have been able to control online stores by limiting freedoms in decision-making and setting their own prices in the market.<sup>97</sup> In such a case, the aim of the competing companies is to support the over-competitive price set by these competitors in view of the achieved collusion. Companies using pricing algorithms monitor the process of pricing by retailers in the market and the fluctuation of prices in the market which allows them to see price changes in the market in the shortest time. With a possible change in the course on the part of retailers, manufacturers offer price balancing with the general price on the market or otherwise threaten to restrict activity, for example by not providing goods for sale. Retailers usually accept the conditions for balancing prices, which leads to a violation of the foundations of healthy competition in the market.

Philips<sup>98</sup>, an electronic products manufacturing company registered in the Netherlands, has been investigated by the Commission as a result of finding inconsistent information in the e-commerce sector inquiry.<sup>99</sup> The Commission found that Philips engaged in fixed or minimum RPM by limiting the capacity of its online sellers to determine their own retail pricing for commonly used consumer electronics items such as laptops.<sup>100</sup> According to Philips case, the price-matching processes of algorithmic pricing software may allow price rises to spread more widely throughout the market to parties not participating in RPM. However, because of the covert nature of these latter price hikes, they may escape the notice of regulators, exposing a flaw in the present structure.<sup>101</sup>

Using technology and automated systems to implement cartel's tasks does not change the "human" prism.<sup>102</sup> The activities of humans contributing to the anti-competitive effects and the same functions performed by the pricing algorithms are interchangeable and do not affect humans who give the algorithms a role of being liable for these actions. Nevertheless, process automation provides a basis for offenders to abuse the transition to pricing algorithms in various ways, but the

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<sup>96</sup> Vuk Lekovic, 'Vertical Restraints in the Sights of the Commission for Protection of Competition', (March 2021) <<https://geci.claw.com/vertical-restraints-in-the-sights-of-the-commission-for-protection-of-competition/>> accessed 8 May 2022

<sup>97</sup> Dobrin (n 34) p. 32

<sup>98</sup> *Philips* (vertical restraints) (Case AT.40181) Summary of Commission Decision C/2018/4797 [2018] OJ C 340/07

<sup>99</sup> LexisNexis, *Philips* (vertical restraints)(AT.40181) <<https://www.lexisnexis.co.uk/legal/guidance/philips-vertical-restraints-at-40181-archived>> accessed 10 May 2022

<sup>100</sup> *Ibid*

<sup>101</sup> Dobbin (n 90)

<sup>102</sup> Ezrachi and Stucke (n 13) p. 42

tasks performed by the algorithms are easily recognizable by competition authorities. Some authors believe that the difficulty in recognizing illegal actions according to the messenger scenario lies in the leading role of pricing algorithms, the agreements for automating which can be hidden.<sup>103</sup> However, competition authorities have the opportunity to analyze the process of automating pricing algorithms and thereby obtain accurate information about the tasks assigned to these algorithms, that is, the program given to the algorithms for their operation. When the final goal and intention of its operators are collusion, algorithms may facilitate it, hence, they are considered “a technical extension of the human will”.<sup>104</sup> If anti-competitive goals are identified with the established task for the functioning of the algorithms, competition authorities will be able to quite easily hold humans accountable for the actions that undermine free competition in the market.

With the discussion of illegal actions of humans after the conclusion of agreements, the practice of establishing responsibility arises. The positive side of establishing liability is its coverage by competition law and the existence of case law in connection with the application of the general conditions of this scenario. As noted in the OECD report, while identifying and establishing the existence of an infringement may still be difficult due to the inclusion of an algorithm, competition authorities can still rely on existing anti-competitive agreements and coordinated practices.<sup>105</sup> Thus, an important role in the application of law in this scenario is played by Article 101 TFEU, which is applicable in view of the interpretation of its provisions in the EU case law. Article 101 TFEU states that any agreements between undertakings, decisions made by associations of undertakings, or concerted practices affecting trade between EU countries which could prevent, restrict or distort competition are prohibited.<sup>106</sup> Since the provisions of Article 101 TFEU do not clearly indicate the implementation of those agreements or collusions falling within the meaning of this Article, it is important to note that the application of the provisions of this Article does not depend on the implementation of the terms of the agreement, hence, the mere existence of this agreement, which may lead to anti-competitive actions is sufficient.

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<sup>103</sup> Joseph E Harrington Jr, *Developing Competition Law for Collusion by Autonomous Price-Setting Agents*, University of Pennsylvania (August 22, 2017) p. 37

<sup>104</sup> Ezrachi and Stucke (n 13) p. 45

<sup>105</sup> OECD (n 17) p. 35

<sup>106</sup> Article 101, consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union [2016] OJ C202/1 (TFEU)

Considering the role of horizontal and vertical agreements in the application of pricing algorithms and the applicability of the provisions of Article 101(1) TFEU to these agreements, as well as the existence of various case laws under the use of pricing algorithms, it can be noted that messenger scenario considers the liability of conspiring humans under the concluded agreements. Thus, pricing algorithms act as a tool for fulfilling the terms of an agreement concluded between humans and perform only the functions given to them by humans on the basis of agreements.

### 5.2.2. Hub-and-spoke

Unlike messenger, the hub-and-spoke scenario does not involve a concrete agreement. An important part of this scenario is information exchange between rivals which covers the concept of collusive actions. The application of the provisions of Article 101(1) TFEU can only be covered in terms of an exchange of information that leads to certain collusion between the parties. In this case, there is a need to define a concerted practice that is covered by the Horizontal Guidelines. According to Horizontal Guidelines, *the concept of a concerted practice refers to a form of coordination between undertakings by which, without it having reached the stage where an agreement properly so-called has been concluded, practical cooperation between them is knowingly substituted for the risks of competition.*<sup>107</sup> This provision does not restrict undertakings from balancing their activities with rivals but covers direct or indirect communication or contacts between competitors, the lasting or ultimate effect of which is a mismatch with the fundamental conditions of competition in the market. An important role in establishing contacts or communication is played by the information exchange necessary to influence the process of automation and balancing prices. If the exchanged data is strategic, it might be considered a concerted practice since it eliminates strategic uncertainty in the market and so facilitates collusion.<sup>108</sup> A key factor in this process is the strategic information exchanged by competitors. The Horizontal Guidelines define two situations for indirect data exchanges: one when the hub is a third party or common agency, and another where the hub is an upstream supplier or downstream customer.<sup>109</sup> Such a classification within the Horizontal Guidelines makes it easier for the

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<sup>107</sup> Commission, 'Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements' (2011/C 11/01) (Horizontal Guidelines) para. 60

<sup>108</sup> Ibid para. 35

<sup>109</sup> Ibid para. 55

competition authorities to identify illegal actions of companies as part of the performance of tasks by pricing algorithms. The nature of the information exchange and the legal and economic context in which the information communication takes place determine whether a hub-and-spoke arrangement is a limitation by object or by effect.<sup>110</sup> Hub-and-spoke does not directly depend on whether a third party is the main person involved in the collusion process. The classification of the Horizontal Guidelines into two forms of indirect data exchange only plays a significant role in the process of recognizing the liable party, but not the violation of competition law itself. Thus, evaluating the provisions of the Horizontal Guidelines and analyzing the possibility of compliance with the practice of collusion, it can be concluded that in the framework of the hub-and-spoke scenario both the hub and the spoke can be liable in the event of collusion consisting in the exchange of strategic information that led to anti-competitive consequences.

The application of the provisions of Article 101(1) TFEU to collusion in this scenario is clearly reflected in the EC Guidelines, as well as EU case law, which has played an important role in strengthening the EU legal framework for hub-and-spoke arrangements. Within the framework of case law, it is necessary to separately consider the liability of the hub and the liability of the spoke, which are quite diversely covered by the EU legislation.

The AC-Treuhand case had a strong impact on the definition of the role of direct and indirect communication in the context of anti-competitive collusion. AC-Treuhand is a consulting company that provides services to professional associations such as market data collecting and analysis and market statistics presentation.<sup>111</sup> AC-Treuhand and several heat-stabilizer providers were found liable for participating in a cartel. The Court justified this approach by the fact that the company was engaged in facilitating and providing all kinds of support for the implementation of operations, namely, providing communication, contacts, horizontal coordination and information exchange between the parties. To hold the hub liable, it would have to show that it was aware of the downstream coordination or at the very least, that it could have reasonably predicted the possibility, and that its activities led to the conduct's realization.<sup>112</sup> At the same time, the fact that

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<sup>110</sup> Directorate for Financial and Enterprise Affairs Competition Committee (Competition Commission), '*Hub-and-spoke arrangements*', contribution from the European Union submitted for Item 7 of the 132nd Competition Committee meeting, (December 2019) p. 4

<sup>111</sup> Victoria Canu, '*EU's highest court confirms liability of cartel facilitators*', Kluwer Competition Law Blog, (October 2015) <<http://competitionlawblog.kluwercompetitionlaw.com/2015/10/29/eus-highest-court-confirms-liability-of-cartel-facilitators/#~:text=AC%2DTreuhand%20lodged%20an%20appeal,EC%20when%20acting%20as%20facilitator.>> accessed 13 May 2022

<sup>112</sup> Competition Commission (n 110) p. 4

the company is in another market and the fact that the company is not related to this market does not play a role if the company acts as a facilitator.

Another case is Icap, which has a very similar conclusion to the AC-Treuhand case. The Commission found Icap, an interdealer broker and supplier of post-trade services, responsible as a facilitator of the cartel.<sup>113</sup> In arguments regarding holding the company liable, two factors stand out in particular. First, the facilitator's role was to contribute to the common goals sought by all participants by its own actions, and secondly, the facilitator was aware of the actual activity planned or carried out by other parties seeking the same goals, or could reasonably have predicted such behaviour, and was willing to accept the risk.<sup>114</sup> These two principles have become the basis for further practice of reviewing the courts and strengthening the EU legal framework. The Court determined that the mere “presence of an undertaking at meetings at which anti-competitive agreements were signed, without that undertaking openly opposing them” indicates collusion since it “encourages the continuance of the infringement and undermines its detection”.<sup>115</sup>

Spoke's liability has also been reflected in several cases such as E-turas, VM Remonts and E-books. Being an online travel booking system E-turas sent out notifications to its travel agents via the system, indicating technical limitations to its pricing algorithm, which capped discounts.<sup>116</sup> The CJEU found that unless the travel agencies using the platform took efforts to remove themselves from the substance of the administrator messages that may have led to anti-competitive collusion, they might be presumed to have engaged in the agreement.<sup>117</sup> In the CJEU's decision, again, the presence of any signs of communication or contacts is important, as well as the ability of agencies to be aware of what is happening and not try to move away from operations or interfere with them. The main purpose of the CJEU, in this case, is to determine the existence of collusion under the provisions of Article 101(1) TFEU. A contrasting thought about collusion's inconsistency with the hub-and-spoke scenario is noted by Advocate General A. Szpunar. Szpunar justifies this position by the fact that the “*message ... was conveyed simultaneously to all*

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<sup>113</sup> Shearman and Sterling, 'ICAP v. Commission: General Court upholds cartel liability of facilitators, but attempts to rein in Commission's approach in settlements', (November 2017) <<https://www.shearman.com/perspectives/2017/11/icap-v-commission-general-court-upholds-cartel>> accessed 14 May 2022

<sup>114</sup> Ibid

<sup>115</sup> Bartłomiejczyk (n 33) p. 29

<sup>116</sup> Antonina Yaholnyk and Anastasia Zeleniuk, 'Antitrust Implications of Using Pricing Algorithms', Chambers and Partners, (March 2020) <<https://chambers.com/articles/antitrust-implications-of-using-pricing-algorithms>> accessed 14 May 2022

<sup>117</sup> Sophie Lawrance and Marc Linsner, 'Eturas: Any conclusions on platform collusion..?', Kluwer Competition Law Blog (January 2017) <<http://competitionlawblog.kluwercompetitionlaw.com/2017/01/19/eturas-conclusions-platform-collusion/>> accessed 15 May 2022

*undertakings concerned by their common trading partner*”. Where the sender of the information is not a rival company, the recipients' understanding that the information originated from or is relayed to a competitor is expected to establish horizontal collusion.<sup>118</sup> Thus, the CJEU, in its decision, fully adhered to the position and arguments of the Advocate General.

Another important case that greatly influenced the concept of hub and spoke is the case of VM Remonts. VM Remonts and others were involved in a big project in Latvia regarding the tender process. As part of this tender process, VM Remonts has engaged independent experts in the development of plans to assist in the development of tender plans for other companies in the market that are competitors to VM Remonts.<sup>119</sup> In addition, the VM Remonts provided the experts with a draft version of the tender project that was prepared by the VM Remonts. Experts without informing the VM Remonts representatives also developed a tender project using this draft. This process was perceived by the competition authorities as collusion with anti-competitive implications. According to the CJEU, an undertaking can be held accountable for a concerted practice if an independent service provider operates in two ways. The first situation is if the enterprise was aware of its rivals' and service providers' anti-competitive goals and sought to contribute to them via its own actions.<sup>120</sup> The second situation is if the enterprise could reasonably have predicted anticompetitive behaviour by its rivals and service provider and was willing to take the risk.<sup>121</sup>

The case of E-books is also significant for consideration, which affects the issue of concerted practice. In this case, Amazon was selling e-books in a wholesale strategy before Apple entered the US e-book market. Following that, Apple got into an agency agreement with five big publishers. Maximum retail pricing, a set amount of compensation for the agent, and a Most-Favored Customer (MFC) provision were among the key agency terms finally agreed to by all publishers.<sup>122</sup> If Amazon remained on the wholesale model, the MFC exposed the publishers to minimum wholesale rates, thereby functioning as a commitment mechanism to drive Amazon to transition to the agency as well.<sup>123</sup> The Commission held at the preliminary judgment that the five

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<sup>118</sup> Bartłomiejczyk (n 33) p. 29

<sup>119</sup> Conor Talbot, 'The ECJ's decision in VM Remonts and the extension of liability for the anticompetitive conduct of service providers under article 101(1) TFEU', *Commercial Law Practitioner*, (2016) p. 1

<sup>120</sup> SIA 'VM Remonts' (formerly SIA 'DIV un KO') and Others v Konkurences padome, (Case C-542/14) request for a preliminary ruling from the Augstākā tiesa, EU:C:2016:578, para. 27

<sup>121</sup> *Ibid* para 33

<sup>122</sup> Giulio Federico, 'A brief introduction to the e-books case', annual ACE Conference, (December 2013) p. 4

<sup>123</sup> *Ibid* p. 4

publishers' coordinated transition to an agency model with the same key price parameters constituted a concerted practice within the meaning of Article 101(1) TFEU.<sup>124</sup> The collusive scheme's major implementation mechanism is vertical constraints specified in the agreements. The MFC clause functions as a shared commitment mechanism, allowing publishers to transfer the Apple agency agreement to the rest of the industry.<sup>125</sup> Resale Price Maintenance permits publishers to remove pricing discretion from retailers, allowing them to raise prices.<sup>126</sup> Thus, this mutual benefit mechanism was recognized as a conspiracy within the meaning of Article 101(1) TFEU. Such activities of companies in the market contributed to the restriction of e-book retail, a sharp increase in prices in this market and balancing on the part of the leading participants in the market. The presence of indirect communication has not been followed by recognition within the hub-and-spoke system.<sup>127</sup> This was caused by direct communication between agents, which is contrary to the theory of this scenario.

In addition to the case law discussed above and which had a strong influence on enriching the practice of applying and recognizing collusion in the framework of the application of pricing algorithms, it is also necessary to note the peculiar role of companies in online platforms, which is gaining wide scope. At present, competition authorities do not have much concern about online platforms due to the fact that all the rules apply to the activities of companies on online platforms. In such a case, Article 101 TFEU also becomes an important driving force for capturing collusive issues within the online market.<sup>128</sup> More importantly, in view of digitalization and successful control of online markets, it becomes easier to recognize facilitators who undermine competition in the market.

### 5.3. How are unilateral competition harm risks addressed by EU Competition Law?

Unilateral competition harm risks are more complex in the application of the law due to the fact that they have not yet been sufficiently analyzed and have not been reflected clearly in the EU legislation. Considering practical issues of a legal nature and linking these issues with the

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<sup>124</sup> E-books, Case COMP/AT.39847, 12/12/2012 (addressed to Hachette, Harper Collins, Georg von Holtzbrinck, Simon & Schuster and Apple - OJ C 73, 13.3.2013, p. 17–20) and 25/07/2013 (addressed to Penguin Random House - OJ C 378, 24.12.2013, p. 25–28)

<sup>125</sup> Federico (n 122) p. 5

<sup>126</sup> Ibid p. 5

<sup>127</sup> Competition Commission (n 110) p. 5

<sup>128</sup> Ibid p. 5

economic aspects explored in the previous chapter, some conclusions can be drawn about the current reflection of unilateral competition harm risks and possible future regulatory methods under EU legislation and case law.

In this section, analyzing unilateral competition harm risks - predictable agent and digital eye scenarios – a special place is given to the possibility of application of Article 101(1) TFEU. This issue has been reflected in many cases of the CJEU, which both have a significant impact on the analysis of the concept of an agreement within the framework of Article 101 TFEU and provide for the possibility of expanding the concept of agreement to comply with the general characterization of tacit collusion. As is known from the literature, tacit collusion in most cases can become the basis for a collective dominant position. In these predictable agent and digital eye scenarios, the application of Article 102 TFEU is important as it can be used by competition authorities to hold companies liable. Thus, considering the different forms of tacit collusion from the perspective of the application of Articles 101 and 102 TFEU is important in order to characterize the most complex and unregulated scenarios from a legal point of view.

### 5.3.1. Tacit collusion: predictable agent and digital eye

Despite the lack of an established concept of tacit collusion and the consideration of various economic concepts that reveal this concept, it covers the scenarios of predictable agent and digital eye quite clearly. To this end, consideration of these scenarios, due to their unclear nature in the legislation, is possible only through a general characterization of tacit collusion.

Tacit collusion provides for special conditions in the market in which it can apply and remain continuous. First, there is a need to coordinate and monitor the companies that are the subject of these relations. This coordination must be implemented to a sufficient degree. Further, it is important to have a certain mechanism to deter companies from anti-competitive behaviour. This mechanism can be achieved by establishing disciplines that will be applied throughout the market and in relation to all market actors. The role of third parties in the process of possible coordination should be excluded. In this case, third parties are understood to be outsiders, rival companies, current and potential competitors and consumers.<sup>129</sup>

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<sup>129</sup> Bartłomiejczyk (n 33) p. 36



The role of these scenarios within the framework of the concept of tacit collusion is primarily considered from the point of view of Article 101 TFEU, which also covers collusion in the form of information exchange. Since tacit collusion scenarios do not provide for the existence of any agreements or decisions taken by representatives of undertakings, Article 101 TFEU provides only for the application of concerted practice, the definition of which is reflected in the previous section. To examine the role of concerted practice within these forms of tacit collusion, it is necessary to examine the case of ICI v. Commission and the Suiker Unie case, which cover the connection between tacit collusion and concerted practice.

In the ICI case, dyestuff producers and wholesalers had all raised their prices in various years. During the latest meeting, one of the representatives stated that they intended to raise prices, while two others stated that they were considering doing so as well. The meeting was followed by a general uniform increase in the price of the goods.<sup>130</sup> These companies were fined in connection with the violation of Article 101(1) TFEU, where the Court held that there was clear collusion between the representatives. However, an important part of this case lies in the analysis of parallel behaviour implying tacit collusion. The court concluded that “*although parallel behaviour may not by itself be identified with a concerted practice, it may however amount to strong evidence of such a practice if it leads to conditions of competition which do not correspond to the normal conditions of the market, having regard to the nature of the products, the size and number of the undertakings, and the volume of the said market*”.<sup>131</sup> In the Suiker Unie case, 16 sugar producers were found liable for concerted practice under Article 101(1) TFEU. In this regard, the Court notes “*each economic operator must determine independently the policy which he intends to adopt on the common market including the choice of the persons and undertakings to which he makes offers or sells*”.<sup>132</sup> Thus, the use of concerted practice itself does not always consist of tacit collusion, and it can even be noted that they have different characteristics and are not mutually complementary concepts.

Some legal practitioners are of the opinion to use the provisions of Article 101(1) TFEU in the framework of actions covering tacit collusion while expanding the applicability and concept of

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<sup>130</sup> Simple Studying, 'Case 48-69 Imperial Chemical Industries Ltd. v Commission of the European Communities (Dye-stuff case)' <<https://simplestudying.com/case-48-69-imperial-chemical-industries-ltd-v-commission-of-the-european-communities-dye-stuff-case/>> accessed 17 May

<sup>131</sup> Imperial Chemical Industries Limited (ICI) v Commission, Case 48/69 (1972), EU:C:1972:70, para. 66

<sup>132</sup> Joined cases 40 to 48, 50, 54 to 56, 111, 113 and 114-73, Coperaatieve Vereniging "Suiker Unie" UA and others v Commission of the European Communities (1974) para. 173

this article. However, facilitation may not always be generated by communication between companies, which can sometimes be achieved without any initial agreements or contacts. This process can only occur in the process of functioning pricing algorithms, which, given the needs of the market, can lead to the same pricing policies in competing companies without being informed about each other. However, legal practitioners provide for the possibility of Article 101(1) TFEU to cover not the tacit collusion itself, but the result of its application by companies, that is, the process of achieving balanced pricing in the market-leading to anti-competitive consequences by a particular company. As also noted in the ICI case, while parallel conduct does not amount to concerted practice, it can lead to such a result or consequences influencing healthy competition in the market.<sup>133</sup> Here it is necessary to note the role of competition authorities, which may fail in the investigation process since the actual involvement of companies in the collusive process will be difficult to prove.

Having previously studied this scenario from an economic point of view, it was determined the essence of the predictable agent scenario as an algorithm-enhanced tacit collusion, that is, providing this scenario as an integral part of tacit collusion. In such a narrow understanding of tacit collusion, it is necessary to consider the issue primarily from the position of applying Article 101 TFEU.

Under this scenario, companies acting unilaterally ensure the automation of pricing algorithms, which, after analyzing the state of the market, apply almost the same information. Given the unilateral nature of the actions of companies, carried out by pricing algorithms, the possibility of applying Article 101(1) TFEU is no longer possible, which in no way can characterize the process of possible collusion in the absence of any agreements or communication. Although there is no proof of an unlawful agreement, the competition authority does have evidence of anticompetitive intent.<sup>134</sup> At present, accepting intention as a basis for prosecution cannot be considered part of Article 101. Therefore, this question of a more practical approach to offences arising from algorithm-enhanced tacit collusion is still open and may be covered later by the EU case law. However, the legal aspect of algorithm-enhanced tacit collusion covers not only anti-competitive consequences, but also positively impacts transparency in the market due to digitalization and automation processes.<sup>135</sup> Although there are difficulties in determining the intentions of companies

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<sup>133</sup> ICI (n 131) para. 66

<sup>134</sup> Ezrachi and Stucke (n 13) p. 56

<sup>135</sup> Dobrin (n 34) p. 36-37

in the process of algorithm-enhanced tacit collusion, they have a serious positive impact on the transformation of the market by accelerating the process of completing tasks, increasing the number of products and establishing more competitive prices, as well as setting price transparency. Another reflection of tacit collusion is the digital eye scenario, which raises current and unresolved questions in today's society about the role of AI in the engagement of algorithmic pricing and consistent collusion among competitors. This scenario clearly implies algorithmic tacit collusion, where the only behaviour that may be construed as having the effect or object reaching or facilitating tacit collusion.<sup>136</sup> Once an anticompetitive consequence has been recognized, it is extremely difficult for competition agencies to find proof of any anticompetitive agreement since they cannot depend on the idea of purpose.<sup>137</sup> Therefore, the application of Article 101(1) TFEU in this scenario does not have a valid basis for further study. However, as provided by Ezrachi and Stucke, this technique is intended to intentionally alter market circumstances in order to increase market transparency, and hence might be considered a facilitating activity under Article 101(1) TFEU.<sup>138</sup> Algorithmic tacit collusion has more risks of a negative impact on the market which are quite difficult to recognize and conduct a legal assessment of the actions of certain companies due to the complete control over the mechanism by the automated products of AI.

### 5.3.2. Applicability of Article 102 TFEU: collective dominance

Tacit collusion may lead to the dominance of several undertakings, which is covered by Article 102 TFEU. To this end, the consideration of this article precisely within the framework of a collective dominant position is very important as part of a comprehensive study of the anti-competitive actions of companies in the market. Article 102 TFEU considers that any abuse by one or more undertakings of a dominant position within the internal market or in a substantial part of it shall be prohibited as incompatible with the internal market as far as it may affect trade between the Member States.<sup>139</sup> Based on this article, the expression "*one or more undertakings*" reflects the embracing of a collective dominant position. The manifestation of the link between dominance and tacit collusion has been characterized and argued in EU case law.

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<sup>136</sup> Bartłomiejczyk (n 33) p. 38

<sup>137</sup> Thoby (n 72) p. 24

<sup>138</sup> Ezrachi and Stucke (n 13) p. 73

<sup>139</sup> Article 102, consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union [2016] OJ C202/1 (TFEU)

Before proceeding to the analysis of the abuse of collective dominant position, it is necessary to briefly consider the concept of collective dominance, which, although noted in Article 102 TFEU, has undergone a certain analytical approach in the decisions of the CJEU. In the *Almelo* case, the court emphasizes that “*in order for such a collective dominant position to exist, the undertakings in the group must be linked in such a way that they adopt the same conduct on the market*”.<sup>140</sup> In *Bertelsmann AG/Sony v. Impala* case, the CJEU, giving a slightly different meaning to collective dominance, noted that the establishment of such a position can be influenced and determined by many different factors. One such factor noted by the Court is “*the relationship of interdependence existing between the parties to a tight oligopoly*”.<sup>141</sup> The same approach was confirmed by the CJEU in the *Laurent Piau* case, where it is noted that the presence of a collective dominant position directly depends on the companies that carry out their activities as collective legal entities.<sup>142</sup>

In *Airtours* case, the CJEU confirmed three elements that must be completed in order to achieve collective dominance without the need for an element of the agreement.<sup>143</sup> First, interacting companies in the market should be informed about each other’s activities, which can be carried out in the form of mutual monitoring and control of the application of the same policy. Secondly, the duration of the tacit collusion between the parties is important. It should be sustainable and include long-term collusion between competitors on common market policies. Finally, the outcomes of the common policy should not be jeopardized by the acts of the potential and current competition, as well as by customers.<sup>144</sup>

One of the first cases in which the Commission considered the issue of collective dominance in connection with tacit collusion is the *Nestlé/Perrier* case. On the facts of this case, the companies provided mutual control and monitoring of actions where the Commission emphasized that “*companies have developed instruments allowing to control and monitor each other's behaviour*”.<sup>145</sup> The purpose of this peer review and monitoring was to ensure transparency, but at the same time, it opened opportunities for tacit collusion due to the ongoing monitoring of the

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<sup>140</sup> *Almelo and Others v NV Energiebedrijf Ijsselmij*, C-393/92 (Judgment of 27 April 1994) EU:C:1994:171 para 42-3

<sup>141</sup> *Bertelsmann AG and Sony Corporation of America v. Independent Music Publishers and Labels Association (Impala)*, Case C-413/06 P, (Judgment of the Grand Chamber of 10 July 2008) para. 121

<sup>142</sup> *Laurent Piau v Commission of the European Communities*, Case T-193/02, European Court Reports 2008 I-04951 EU:T:2005:22 (Judgment of the Court of First Instance (Fourth Chamber) of 26 January 2005) para. 110

<sup>143</sup> Dobrin (n 34) p. 43

<sup>144</sup> *Ibid* p. 44

<sup>145</sup> Commission Decision of 22 July 1992 relating to a proceeding under Council Regulation (EEC) No 4064/89 (Case No IV/M.190 - Nestlé/Perrier) para 122

actions of the other company.<sup>146</sup> The Commission demonstrated that the market structure created by the concentration would result in a double-pole dominant position, which would have a significant impact on competitive circumstances.<sup>147</sup> In the Italian Flat Glass case, the Commission took a similar position, but with more attention to the level of market concentration of companies. This was significantly characterized by the possibility of tacit collusion. The case of *Compagnie Maritime Belge* is taken into account the importance of establishing the role of agreement between companies and collective dominance. The CJEU ruled that enterprises might be in a collective dominant position even though no agreement or other legal ties exist between them.<sup>148</sup>

The existence of the above cases is due only to the establishment of a link between collective dominance and tacit collusion. In the practice of the CJEU, there are no cases of abuse of a collective dominant position by companies that have entered into a tacit agreement. Such an outcome contributes to the emergence of uncertainty about the parallel behaviour of companies that, by exercising a collective dominant position, do not abuse it. Given the lack of strong criticism of tacit collusion under the provisions of Article 102 TFEU, it is important to note the position of the Commission on this matter, which notes that where comparable behaviour is attributable to an agreement or coordinated conduct in violation of Article 101 TFEU, it should be criticized.<sup>149</sup>

In the absence of specific cases of the application of Article 102 TFEU within the framework of tacit collusion leading to a collective dominant position, some legal practitioners have identified a different approach to the issue of abuse of a collective dominant position. Facilitating tacit collusion leading to the maintenance of an already existing collective conciliation position can be perceived as an abuse of the provisions of Article 102 TFEU. The competition agencies must prove that enabling activities caused a non-collusive oligopoly to become a tacitly collusive oligopoly.<sup>150</sup> This method can be applied to predictable agent and digital eye scenarios. The competition agencies might claim that using pricing algorithms to control and monitor competitors and their algorithmic price changes, the use of AI, the revelation of an algorithm by one competitor followed

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<sup>146</sup> *Ibid* para 122

<sup>147</sup> Dariusz Tokarczuk, 'Abuse of a dominant position in the light of legal provisions and case law of the European Communities', Office for Competition and Consumers' Protection, (2013) p. 26

<sup>148</sup> Bartłomiejczyk (n 33) p. 39

<sup>149</sup> Philip Bergkvist, 'Collective Dominance and EU Competition Law: An assessment of the concept and the challenge facing the European Court of Justice', Orebro University, (2019) pp. 14-15

<sup>150</sup> Bartłomiejczyk (n 33) p. 40

by its use by others, or providing other competitors access to the technology leads to the mentioned facilitation process.<sup>151</sup>

#### 5.4. Future challenges that may raise competition concerns and possible solutions

Pricing algorithms have strengthened the durability of pre-existing collusive arrangements by improving transparency and allowing for swift reprisal against deviations from the intended market price.<sup>152</sup> They may also drive markets that are prone to tacit collusion towards dependency. Considering pricing algorithms from a legal point of view and applying EU legislation in relation to competition law, there is a need to explore possible solutions to ensure the free use of algorithms that contribute to maintaining healthy competition in the market and future challenges in connection with unregulated issues. Thus, given the approaches of various legal practitioners, it is necessary to explore various directions in ensuring the free use of pricing algorithms. However, before looking at solutions, it is important to note the increasing role of pricing algorithms and the resulting lack of regulation. Regulation itself is only possible with the regular provision of information regarding the use of pricing algorithms and their positive or negative impact on the market from a competitive point of view. The lack of desired regulation is due to the lack of interest of politicians, legislators and representatives of leading companies in the implementation of a project that allows the application of pricing algorithms without potential harm to competition. Expansion of powers of competition authorities, namely giving them the opportunity to investigate the activities of companies, obtain the necessary information and engage in market investigations will seriously affect the process of observing the market. A closely related approach is to empower companies, along with market participants, to also control and monitor companies involved in any collusions.<sup>153</sup> This will facilitate and speed up the process of stopping illegal activities or even intentions of companies that contribute to anti-competitive effects. The expansion of powers of competition authorities is possible only with clear regulation and definition of the technical capabilities of these authorities, the availability of information and the rights and obligations of companies involved in such investigation. In addition to the expansion of powers, it is important to note the establishment of the mutual supportive activity of all other authorities, the activity of

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<sup>151</sup> Ibid p. 40

<sup>152</sup> Dobbin (n 90)

<sup>153</sup> Harrington (2018) and Nicolas Petit (2017)

which may be influenced by pricing algorithms.<sup>154</sup> An example of such authorities are those related to intellectual property, consumer rights protection, personal data protection, etc. However, such a method of regulation, according to Marty, will not have a significant impact on recognizing the complex one-sided competitive risks associated with the use of AI skills.<sup>155</sup>

Auditing mechanisms could be another solution to the problem of the increased number of collusions between companies driven by pricing algorithms. These mechanisms involve programming pricing algorithms in such a way that they ensure compliance with the rules of competition. This approach involves technical development to recognize potential collusions arising from pricing algorithms.

To make the algorithm “*at the same time the object and the vector of the regulation*” is one potentially serious solution.<sup>156</sup> This idea proposed by Vestager is that regulators may develop their own algorithms and utilize them to combat anti-competitive pricing algorithm activities.<sup>157</sup> However, the implementation of this idea, which may have a strong impact on competition law, has not yet found serious support at the political level.

The above possible approaches in relation to pricing algorithms are only descriptive in nature and are not yet reflected in the current agenda of EU institutions. Given the above issues and envisaged approaches, the question arises of whether pricing algorithms pose a fairly large risk to competition law. In order to answer this question, it is necessary to study the possible future challenges of pricing algorithms in the framework of competition law. New technologies gaining wide scope in all areas also strongly influence pricing policy. As long as there is no specific regulation at the EU level, pricing algorithms are indicators of the potential risk to economic growth, competitiveness and consumer welfare in the market.<sup>158</sup> Therefore, one of the important challenges of the future is the immediate development of technology and its penetration into all spheres of human life, which affect the complexity of regulating pricing algorithms. It is worth considering if the regulatory approach is enough to deal with pricing algorithms. Because competition authorities are frequently faced with a shortage of information, it is difficult for them to discover the subtle infringements of competition law facilitated by algorithms.<sup>159</sup> The challenge about the possible inefficiency of the

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<sup>154</sup> Ezrachi and Stucke (n 13) p. 227

<sup>155</sup> Frédéric Marty, ‘*Algorithmes de prix, intelligence artificielle et équilibres collusifs*’, *Revue Internationale de Droit Economique*, (2017) p.103

<sup>156</sup> Ezrachi and Stucke (n 13) p. 227

<sup>157</sup> Thoby (n 72) p. 19

<sup>158</sup> *Ibid* p. 19

<sup>159</sup> *Ibid* p. 20

regulatory approach comes from the dangers of collusion with other areas such as the protection of personal data, which includes various information. This is also due to the development of the information exchange process and the strengthening of the role of protecting information held by the company.

## 5.5. Conclusion

This chapter has covered the legal side of the potential forms of competitive harm posed by pricing algorithms. By dividing the risks of harm into two groups and studying them from various aspects, conclusions about their application can be drawn. The result of the scenario studies showed that the intention of companies is important for the legal assessment of the entire process. The messenger arrangements are certainly prohibited under existing competition regulations since it amounts to explicit collusion.<sup>160</sup> Among the four competition harm risks, hub-and-spoke can be recognized as the most harmful, since it has serious difficulties in establishing communication between third parties and, due to late investigation, can cause serious harm to competitiveness in the market. Algorithms can promote tacit collusion in predictable agent and digital eye scenarios, which the existing legal framework does not properly capture.<sup>161</sup> The role and influence of the predictable agent and digital eye are increasing with advances in the technological world. This allows being concerned about future challenges in pricing algorithms and their potential harm to the market.

Considering these scenarios in terms of Articles 101 and 102 TFEU has taken a big step towards establishing the role of competition law and its coverage by pricing algorithms. Unfortunately, the issue of the application of Articles 101 and 102 TFEU in relation to predictable agent and digital eye scenarios is still open for discussion. After analyzing the EU case law, it can be concluded that the improvement of new forms of relations arising from these forms of arrangement has a significant impact on the possible future application of these provisions in the legal regulation of issues.

As a result, the absence of regulation and the weak influence of competition authorities in the process of control and monitoring of pricing algorithms is recognized as an important challenge

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<sup>160</sup> Oxera (n 6) p. 23

<sup>161</sup> Ibid p. 24



for pricing algorithms. Due to the development of technology and the emergence of new subjects for the application of pricing algorithms, the assumption of an increase in the number of offences is growing. Such an outcome makes it possible to note the mandatory raising of questions at the political level of the EU institutions on the establishment of clear measures to prevent impending uncertainty in the sphere of influence of pricing algorithms on competition law.

## 6. Conclusion

Algorithms are creating entirely new markets, allowing new players to enter current markets, and assisting certain customers in getting greater value for their money.<sup>162</sup> Having studied pricing algorithms from various aspects, it can be argued that the increasing role of algorithms undoubtedly has both positive and negative effects on competition in the market. The process of automation in various fields of activity and the use of pricing algorithms by large market participants affects the overall atmosphere of the competitiveness of companies in the market and allows clearly reflecting of the impact of algorithms on the competition. This work, along with a conceptual approach to pricing algorithms, provides a study of them from the point of view of economic and legal aspects. This diversified approach to pricing algorithms serves the purpose of this paper and covers the identified questions for study.

A conceptual approach to pricing algorithms is the first step in establishing the positive and negative effects on competition in the market. The concepts given by various authors allow establishing a different approach to pricing algorithms and, based on these approaches, apply an analysis from the point of view of competition law.

As we noted before, the work characterized both positive and negative effects of pricing algorithms on competition. As positive effects, process automation, increased accuracy in activities, more companies utilizing pricing algorithms, the growth of the role of automated task execution and the ability of businesses to enter into unknown to those businesses markets are highlighted. This general approach, before moving on to demand-side and supply-side efficiencies, is reassuring with ample room for improvement in pricing algorithms. Cost reduction, price comparison websites, the entrance of companies into a new market and the “digital butler” are shown as the main positive effects in terms of the demand-side. Within the framework of the DSE, it should be noted that price comparison websites, which both provide customer welfare and facilitate the activities of companies with a gradual transition to the digital market, acquire a wide role. Within the framework of the SSE, the increasing role of AI is actively discussed on the agenda at the political level of the EU. These positive effects under the DSE and SSE classifications are characterized within the digital market, as most of the effects of actions affecting transparency stem from digitalization and the increased role of companies in applying new technologies.

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<sup>162</sup> Oxera (n 50) p. 8

Negative effects have a broader analysis due to their complex and versatile nature, however, this approach does not affect the conclusions about the predominance of negative effects over positive ones. Unilateral and coordinated harm risks are new within this work, which has been classified according to the principle of the subject of the competition harm scenario. Coordinated harm risks, including messenger and hub-and-spoke, reaffirm the role of humans in the automation process, and most importantly in the emergence of negative effects on competition law. This is due to the influence of humans on pricing algorithms by assigning tasks inappropriate to maintaining healthy competition, which leads to collusion between competitors in the market. On the other hand, unilateral harm risks, including predictable agent and digital eye scenarios, rely on the decision of the algorithms themselves to automate information and set prices in the market. The transition to the active use of AI complicates the process of recognizing all sorts of negative effects in the market. However, a general economic analysis of the scenarios establishes the impending importance of the application of pricing algorithms and the role of strengthening the position of companies due to process automation. Thus, noting the increasing role of pricing algorithms, a plurality of positive and negative effects of algorithms on competition were identified. These effects have a practical and theoretical justification, which greatly complicates the process of applying legislation to all the noted effects and problems arising from the use of algorithms.

The legal aspect of harm risks relies on the provisions of Articles 101 and 102 TFEU, which most clearly reflect competition law issues. The application of the provisions of Article 101 TFEU and the ability to analyze the concluded agreements or the impact on agreements in the framework of the implementation of pricing algorithms contribute to the study of these scenarios from various aspects, with particular attention to case law and legal aspects envisaged by the competition authorities. Article 101 TFEU applies to the hub-and-spoke scenario, however, which cannot be said to apply to the predictable agent and digital eye scenarios, which are regarded as a reflection of tacit collusion. This work has once again practically shown the impossibility of expanding the concept of an agreement established under Article 101 TFEU, which can greatly change the whole essence of this article and negatively affect future decisions of the CJEU due to the recognition of the inherent features of tacit collusion in all automated processes. In addition, the question of the collective dominance of companies under Article 102 TFEU is the other side of the study of pricing algorithms that lead from the perspective of tacit collusion. In view of the lack of practical application of this article to a collective dominant position, it is difficult to apply such an approach

as a basis that the CJEU will use in its decisions. It is important to note that these positions are supported by the CJEU's interpretation in various cases. Thus, the study of the effects of pricing algorithms from a legal point of view fails under the provisions of articles 101 and 102 TFEU and creates difficulties due to the lack of a legal framework and well-established regulations on the impact of algorithms on competition in the market.

This work ultimately discusses the possible solutions that the competition authorities can turn to and, in connection with the noted positive and negative effects, points out the future challenges that pricing algorithms can create. Studying several approaches of various legal practitioners, regulation of the issues of the use of pricing algorithms in connection with the impact on competition in the market plays an important and similar meaning. In addition, a significant role is given to increasing the competence of competition authorities, which can ensure regular checks of companies on the market, carry out investigations and assess the situation on the market during possible transactions or communications between companies. With the increasing role of AI, the methods of regulating pricing algorithms become more complicated and new ways of ensuring process automation are emerging, while weakening the fundamental foundations of competition in the market. Thus, future challenges to strengthen the role of technology and AI are directly related to present problems due to the unregulated use of pricing algorithms and the weak role of competition authorities in making decisions about the activities of companies using such algorithms that negatively affect the market.

Ultimately, pricing algorithms are the future. A future that is immediately looming and is already part of the present with an increasing number of positive and negative effects. These positive and negative effects are interrelated but do not limit each other. This growing role suggests once again the need to apply certain measures to regularly discuss the issue of the use of pricing algorithms at the political level of the EU. The challenges of pricing algorithms are unlimited and with the improvement of technology and AI, the number of challenges will rise even more.

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