

Why do Competition Authorities need Artificial Intelligence?

by

Isabella Lorenzoni*

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Abstract

Recent technological developments are transforming the way antitrust is enforced as well as the way market players are infringing competition law. As a result, enforcers are starting to equip themselves with sophisticated digital investigation tools. This paper explores this interest in building an Artificial Intelligence (AI) arsenal for the fight against algorithmic infringements. What are the key factors motivating regulators to develop their own technological tools to enforce competition law? Building on interviews with a number of competition authorities, this paper finds that changes in digital markets, the need for enforcers to reverse-engineer companies' algorithms in order to better understand their implications for competition law, the need to enhance efficiency and keep pace with the fast

* Isabella Lorenzoni is a doctoral researcher at the University of Luxembourg in Competition Law and Artificial Intelligence within the DILLAN program (Digitalisation Law and Innovation). E-mail: isabella.lorenzoni@uni.lu. Supported by the Luxembourg National Research Fund PRIDE19/14268506. ORCID: 0000-0002-8004-1130.

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evolution of the digital economy, and, finally, the decrease in leniency applications, are all reasons for which competition authorities should strive for more innovative and alternative means to boost their *ex officio* investigations.

Résumé

Les récents développements technologiques transforment la manière dont les règles de la concurrence sont appliquées et la manière dont les acteurs du marché enfreignent le droit de la concurrence. En conséquence, les autorités ont commencé à se doter d'outils d'investigation numériques sophistiqués. Cet article explore cet intérêt à construire un arsenal basé sur l'Intelligence Artificielle pour lutter contre les infractions algorithmiques. Quels sont les principaux facteurs qui motivent les autorités à développer leur propre équipement technologique pour faire respecter le droit de la concurrence ? En s'appuyant sur des entretiens avec certaines autorités de la concurrence, cet article constate que les changements survenus sur les marchés numériques, la nécessité d'appliquer la rétro-ingénierie aux algorithmes des entreprises afin de mieux comprendre leurs implications pour le droit de la concurrence, la nécessité d'améliorer l'efficacité et de suivre le rythme de l'évolution rapide de l'économie numérique, et enfin la diminution des demandes de clémence, sont autant de raisons pour lesquelles les autorités de concurrence devraient rechercher des moyens plus innovants et alternatifs pour dynamiser leurs enquêtes.

Key words: Artificial Intelligence; Competition law; enforcement; digital economy; digital market.

JEL: K21, K29

I. Introduction

Competition law is not immune to the so-called 'fourth industrial revolution' (or AI revolution),¹ as developments in technology are transforming the way antitrust is enforced and the way market players are infringing competition law. In fact, antitrust is not a static domain but changes within the evolution of society and its economy.² An economy which is, nowadays, a digital economy

¹ Garikai Chimuka, 'Impact of Artificial Intelligence on Patent Law. Towards a New Analytical Framework – [the Multi-Level Model]' (2019) 59 *World Patent Information* 101926.

² SchrepeL Thibault is referring for example to 'Antitrust 3.0' which 'appeared in the early 2010s when antitrust agencies have shifted their focus on the issues related to the digital economy'. Thibault SchrepeL, 'Computational Antitrust: An Introduction and Research Agenda' (2021) 1 *Stanford Journal of Computational Antitrust*, 1 2.

because of the relevance that Big Data, AI and technology in general play in our daily lives.³

Competition law needs to be adapted and shaped according to the changes in economic dynamics⁴ as ‘the digitalization of markets requires the adaptation of some rules and mechanisms.’⁵ An example of how digitalization affects competition can be seen in the recent debate about the standard that should be used to enforce antitrust. In the U.S., the dominant Chicago School advocates for ‘consumer welfare’ as the standard for enforcing competition rules. It focuses on ‘consumer surplus’, understood as the benefits gained from consumption of goods and services.⁶ However, this standard has lately been criticised for being anachronistic, as it does not represent the dynamics and evolution of the modern digital market. Some courts have used the ‘consumer welfare’ standard to assess an infringement of competition law only when there is ‘an increase in price or reduction in quality’⁷, which does not necessarily mirror the reality of the digital market, in which goods and services are often provided to consumers free of charges.⁸ An emerging current called the ‘new Brandeis School’⁹ advocates for a different standard which does not focus only on the outcomes (low prices and efficiency) but also on other aspects.¹⁰ In the digital economy, where the ‘zero-price’ policy applies to consumers, it

³ Digital revolution affects economy <<https://ec.europa.eu/jrc/en/research-topic/digital-economy>> accessed 7 March 2022. See also Pinar Akman, ‘Competition Policy in a Globalized, Digitalized Economy’ (World Economic Forum White paper 2019), according to which a ‘truly ‘digital economy’ is one in which businesses from across the industrial spectrum invest in digital capabilities and make the most productive use of them. As digitalization continues to transform the economy, and the line between offline and online businesses further blurs [...]’ 5.

⁴ Michael L. Katz and A. Douglas Melamed, ‘Competition law as common law: American express and the evolution of antitrust’ (2020) 168 University of Pennsylvania Law Review 2061 citing *Leegin Creative Leather Prods., Inc. v. PSKS, Inc.*, 551 U.S. 877, 899 (2007) ‘As the Supreme Court explained in *Leegin*, “[j]ust as the common law adapts to modern understanding and greater experience, so too does the Sherman Act’s prohibition on ‘restraint[s] of trade’ evolve to meet the dynamics of present economic conditions.’ 2064.

⁵ Thibault Schrepel, ‘Antitrust Without Romance’ (2020) New York University Journal of Law & Liberty 326.

⁶ Marshall Steinbaum and Maurice E. Stucke, ‘The Effective Competition Standard A New Standard for Antitrust’ (2018) Roosevelt Institute, 15.

⁷ ‘A “prototypical example of antitrust injury” is that consumers “had to pay higher prices (or experienced a reduction in the quality of service) as a result of a defendant’s anticompetitive conduct”.’ *Mathias v. Daily News, L.P.*, 152 F. Supp. 2d 465, 478 (S.D.N.Y. 2001) in Steinbaum and Stucke (n 6) 16.

⁸ Akman (n 3).

⁹ <<https://www.pbwt.com/antitrust-update-blog/a-brief-overview-of-the-new-brandeis-school-of-antitrust-law>> accessed 28 March 2022.

¹⁰ Akman (n 3) 7.

is difficult to measure their ‘surplus’ in terms of monetary transactions.¹¹ If it is true that consumers do not spend money on certain online items,¹² they nevertheless ‘pay’ with their attention and data.¹³ Hence, only focusing on the increase in price does not give justice to the real dynamics of our digital economy where data, innovation, and quality should be the new consumer surplus.¹⁴ At the European Union (EU) level, consumer welfare is not the only paradigm used to enforce competition law; European Competition Authorities use it in a broader way to also include innovation, quality, and choice – not only price.¹⁵

Traditionally, competition authorities had several tools they can rely on to enforce competition law. They are commonly known as ‘reactive’ and ‘proactive’ tools. Whistle-blower and leniency programmes fall into the first category. Screening tools, market studies and empirical economic analysis are used to flag potential abnormal behaviours in industries and companies, where resources should mostly focus on starting *ex officio* investigations.¹⁶ In this digital world, competition authorities are now facing new challenges, as the market structure becomes more complex, undertakings interact with each other in the cyberspace in a way that can hurt consumers and other competitors, and a few big tech giants, also known under the name of ‘GAFA’, hold an ‘ultra-dominant’ position.¹⁷ In this new scenario, competition authorities seem to be aware of the need to reinforce the pool of ‘pro-active’ enforcement tools, as computer science and data engineering expertise is needed as well as sophisticated digital investigation tools which have now started to be acquired. Interviews with a number of competition authorities have revealed that the use of AI for enforcement purposes is still in its infancy, but more and more regulators are looking into expanding their units to develop and acquire digital expertise. This paper analyses the key factors motivating regulators to develop their own technological equipment to enforce competition law. It also considers

¹¹ Akman (n 3).

¹² For instance, consumers do not pay to use WhatsApp or other applications. Steinbaum and Stucke (n 6).

¹³ Akman (n 3).

¹⁴ ‘[...] to provide courts and agencies greater guidance, we first propose the following effective competition standard: Agencies and courts shall use the preservation of competitive market structures that protect individuals, purchasers, consumers, and producers; preserve opportunities for competitors; promote individual autonomy and well-being; and disperse private power as the principal objective of the federal antitrust laws’ Steinbaum and Stucke (n 6) 29.

¹⁵ Akman (n 3) 7.

¹⁶ OECD, ‘Roundtable on ex officio cartel investigations and the use of screens to detect cartels’ (2013).

¹⁷ For instance, the General Court defined Google has holding an “undisputed ultra-dominant position [...] on the market for general search services”, case T-612/17 *Google LLC, and Alphabet, Inc. v. European Commission* [2021] EU:T:2021:763 [180].

whether new tools are needed in order to fight competition infringements in the digital era, and which challenges might arise in this context.

This paper is divided as follows: Section II analyses recent projects of a number of competition authorities that involve the use of AI and other sophisticated enforcement tools. Section III analyses the key factors for developing AI enforcement tools. In particular, enhancing efficiency to keep up with evolving technologies; understanding the structure of the digital market and of companies' algorithms; as well as the decrease of leniency applications are among the reasons why competition authorities should develop their own digital tools for enforcement purposes. Section IV provides an overview of the main legal procedural challenges that competition authorities might have to face when (and if) they fully develop AI systems to enforce competition law. Problems related to transparency, reasoning of decisions, as well as the 'equality of arms' issue are among the main problems that arise when AI is involved. Section V concludes with some final remarks.

II. A glance inside Competition Authorities and their AI projects

Competition authorities are starting to look into developing their own in-house digital investigation tools. Some have already developed digital units with AI systems applied to real cases. Others have started to hire IT experts to bring digital knowledge into the competition agency and help case handlers to understand how competition law enforcement can benefit from digitalisation. Other competition authorities have projects underway that they hope to extend to real cases in the near future.

The Italian Competition Authority (*Autorità Garante della Concorrenza e del Mercato*) has put in place a pilot project based on data analysis, AI, and machine learning (ML) techniques (for example classification, clustering and reinforcement learning) to investigate online platforms such as Amazon, as well as their ranking algorithms, in order to detect potential competition issues such as price discrimination and collusion. The software used is able to investigate the parameters for Amazon's algorithm to decide the winner of the 'Buy Box'. A web-scraping method was used on a daily basis for a month to collect data of some products in order to create a database. Subsequently, a supervised ML algorithm, 'Random Forest', was implemented and the classification model made it possible to identify some of the parameters used by Amazon's algorithm to decide the winner of the Buy Box.¹⁸

¹⁸ Antonio Buttà, Andrea Pezzoli, Manuel Razza and Emanuel Weitschek, 'Inferire il funzionamento degli algoritmi nelle piattaforme di e-commerce con il machine learning –

The Greek Competition Authority (Hellenic Competition Commission, hereinafter: HCC) has set a Forensic Investigation Detection Unit, which has developed its own data collection platform (Data Analytics & Economic Intelligence Platform) that gathers publicly available data from different sources (retail, fuel, vegetables, fruits prices, and public procurement data).¹⁹ An algorithmic screening tool with linear regression is also used to compare prices between products on a daily basis, observe important changes in the prices, and monitor whether the prices of the same product of different firms rise simultaneously over a time series. Both the screening tool and the platform are mainly used for cartel detection and help the HCC to conduct a first screening of the market and to identify suspicious industries, which will be prioritised when opening an *ex officio* investigation.²⁰

In 2018, the Spanish Competition Authority created an Economic Intelligent Unit, which is in charge of strengthening *ex officio* investigations and detect anticompetitive behaviours by developing new tools based on data mining, quantitative techniques, and forensic analysis that help to identify collusive patterns in the data.²¹ '[M]ore complex statistical and econometric techniques, network analysis and machine learning methods, both supervised and unsupervised, are beginning to be applied.'²² In particular, due to the possibility of accessing large amounts of data, 'automated detection tools'²³ are particularly prominent in cases of bid rigging cartels in public procurement.²⁴ The Unit is also in charge of providing investigation tools designed to face new challenges of the digital reality, as well as for the analysis and detection of behaviours such as algorithmic collusion.²⁵

aspetti di tutela della concorrenza e del consumatore' (Ital-IA 2022 – Workshop AI per la Pubblica Amministrazione, February 2022).

¹⁹ Ioannis Lianos, 'Computational Competition Law and Economics: Issues, Prospects – An Inception Report' (2021) Hellenic Competition Commission.

²⁰ Ibid.

²¹ <<https://www.cnmc.es/en/ambitos-de-actuacion/competencia/unidad-de-inteligencia-economica>> accessed 27 March 2022.

²² Lynn Robertson, 'Latin American and Caribbean Competition Forum – Session I: Digital Evidence Gathering in Cartel Investigations – Contribution from Spain' (OECD 28–29 September 2020).

²³ Competition Policy International 'CPI Talks...with Cani Fernández' (CPI 27 September 2020) <<https://www.competitionpolicyinternational.com/cpi-talks-with-cani-fernandez/>> accessed 27 March 2022.

²⁴ Kyriakos Fountoukakos, 'Interview with María Luisa Tierno Centella (CNMC) by Kyriakos Fountoukakos (Herbert Smith Freehills)' (3rd Cartels Workshop: An advanced seminar on substantive and procedural EU developments Workshop I – Substantive Issues, Wednesday 19 January 2022 – Concurrences).

²⁵ <<https://www.cnmc.es/en/ambitos-de-actuacion/competencia/unidad-de-inteligencia-economica>> accessed 27 March 2022.

Furthermore, since 2018, the UK Competition and Markets Authority (hereinafter: CMA) has built what is now a fully developed Data, Technology and Analytics (hereinafter: DaTA) Unit with a team of around 50 people including data scientists, lawyers and economists.²⁶ The unit works with data engineering, Machine Learning (ML) and Artificial Intelligence (AI) solutions in consumer, merger and antitrust cases to detect clusters of suspicious market movements through a network analysis, or use natural language processing to review internal documents received from companies. Moreover, this Unit helps the CMA to understand how companies' algorithms work, and for which purpose they use AI and ML, as well as how they use the data they collect, in order to infer whether or not the CMA should intervene and if a breach of competition or consumer law can be foreseen.²⁷

Finally, it is worth mentioning that the Polish Office of Competition and Consumer Protection (hereinafter: UOKiK)²⁸ has launched a project in the field of consumer protection with the aim to encourage the use of AI to detect unfair contract terms, before a violation actually takes place. AI technologies will then be employed to automatically analyse online contract templates, and to look for potential unfair terms and conditions, facilitating consumer protection enforcement.²⁹ The Polish government has put in place a service called 'GovTech Polska'³⁰ in order to develop innovative digital solutions for the public sector³¹ by connecting 'public administration with entrepreneurs, start-ups, the scientific community, and citizens'³², and to contribute to the 'technological revolution'.³³

²⁶ Helena Quinn, Kate Brand and Stephan Hunt, 'Algorithms: helping competition authorities be cognisant of the harms, build their capabilities and act' (2021) 3 *Artificial Intelligence and Competition Law – Concurrences* 5.

²⁷ Ibid; <<https://competitionandmarkets.blog.gov.uk/2018/10/24/cmas-new-data-unit-exciting-opportunities-for-data-scientists/>> accessed 10 March 2022. Competition & Markets Authority, 'Algorithms: How they can reduce competition and harm consumers' (2021) 50–51.

²⁸ <https://uokik.gov.pl/consumer_protection_in_poland.php> accessed 1 September 2022.

²⁹ <<https://www.gov.pl/web/govtech/specjalisci-od-ai-poszukiwani-konkurs-GovTech>> accessed 31 August 2022. Translated by the author.

³⁰ <<https://www.gov.pl/web/govtech-en>> accessed 1 September 2022.

³¹ 'The direct recipient of GovTech services is the broadly understood local and central administration, as well as other entities performing public tasks, such as hospitals, schools, or transport companies. However, the effects of technology services always affect citizens: service recipients of administration' <<https://www.gov.pl/web/govtech-en>> accessed 1 September 2022.

³² <<https://www.gov.pl/web/govtech-en/administracja>> accessed 1 September 2022; 'The main objective of the program is to increase the efficiency of implementing innovations by the public sector in dialogue with the society, private and foreign sectors. It is connected with the implementation of best practices and coordination of the state policy in the field of innovation.'

³³ <<https://www.gov.pl/web/govtech-en/misja>> accessed 1 September 2022.

From interviews conducted in this field, it emerged that the aim of most competition authorities is to expand their digital enforcement tools, but this process would take time in many cases. Among the problems that have been flagged, not having enough data is by far the most challenging one, as it makes AI impossible to use. Also, some competition authorities do not have enough resources to dedicate to the development of in-house AI systems, or not enough cases that would require the use of AI.

III. Key factors for developing AI enforcement tools

As seen in the previous section, we can grasp a general trend and an interest among competition authorities to invest in digital technologies and participate in the debate about enforcing competition law in the digital era. Even smaller agencies, which have not (yet) developed any digital tools, are already participating in working groups within the European Competition Network to learn from the most technologically advanced competition authorities and exchange best practices.³⁴ From the interviews conducted so far, it clearly emerges that most of the competition authorities aim to expand their own technological capability in the near future. But why does the ‘AI race’ exist among competition authorities? Which are the factors motivating enforcers to invest in AI? The following section is dedicated to highlighting some of the reasons why enforcers are, and should explore and take advantage of the new opportunities provided by AI for the enforcement of competition law.

1. Enhancing efficiency

One obvious reason that may incentivise competition authorities to invest in digital tools is to enhance efficiency, in terms of accuracy of case analysis and in terms of time. Enforcers are often criticised for their time-consuming investigations,³⁵ which does not go hand in hand with the fast pace at which the digital market moves. In fact, after a competition authority has reached a decision and before a remedy is ordered, it may be needed to re-examine

³⁴ See for instance the ‘Working group on Digital Investigations and Artificial Intelligence’ in Conseil de la Concurrence of Luxembourg, ‘Annual report 2020’ (2020) 19.

³⁵ Javier Espinoza, ‘EU Struggles to Build Antitrust Case against Amazon’ *Financial Times* (2021) <<https://www.ft.com/content/d5bb5ebb-87ef-4968-8ff5-76b3a215eefc>> accessed 28 March 2022.

the market and the case, in order to see if the economic dynamics of the digital market have in fact already changed.³⁶

Given their increasing computational power, and thus high speed of analysing vast amounts of data, AI systems are well suited to replace and be even better at some administrative tasks.³⁷ AI can enhance efficiency and it is for this reason that governments use it already in many different sectors.³⁸ Competition law enforcement should not be left behind.

Efficiency can be obtained by implementing tools that can help to analyse data faster and to respond to different requests.³⁹ For instance, interviews with law firms and competition agencies have revealed that sophisticated document management software, with pattern recognition features (ML solutions), had already been employed to identify documents covered by legal professional privilege, and to handle more efficiently huge amounts of data gathered during dawn raids. Furthermore, the Swedish Competition Authority (*Konkurrensverket*) is working on a project that uses AI solutions, such as natural language processing systems, to identify names and anonymize texts, and subsequently, to identify those covered by confidentiality before giving out the documents. These processes would likely help authorities to be more efficient and save time.

2. Changes in the market structure: online markets

Another reason for competition authorities to acquire digital skills is to better understand the modern ‘digital ecosystem’⁴⁰ and its competition dynamics. Understanding and being able to efficiently monitor the digital market is a key element to enforce competition law.

³⁶ D. Daniel Sokol and Jingyuan Ma, ‘Understanding Online Markets and Antitrust Analysis’ (2017) 15 *Northwestern Journal of Technology and Intellectual Property* 43, 52.

³⁷ Vivienne Brand, ‘Corporate Whistleblowing, Smart Regulation and Regtech: The Coming of the Whistlebot?’ (2020) 43(3) *University of New South Wales Law Journal* 1. See also Jennifer Cobbe, ‘Administrative Law and the Machines of Government: Judicial Review of Automated Public-Sector Decision-Making’ (2019) 39 *Legal Studies* 636; Herwig C.H. Hofmann, ‘An Introduction to Automated Decision-making (ADM) and Cyber-Delegation in the Scope of EU Public Law’ (2021) *Indigo Working Paper*.

³⁸ Cary Coglianese and Alicia Lai, ‘Antitrust by Algorithm’ (2022) 2 *Stanford Journal of Computational Antitrust* 1 10–11; AlgorithmWatch, ‘Automating Society: Taking Stock of Automated Decision-Making in the EU’ (2019).

³⁹ Marcela Mattiuzzo and Henrique Felix Machado, ‘Algorithmic Governance in Computational Antitrust – a Brief Outline of Alternatives for Policymakers’ (2022) 2 *Stanford Journal of Computational Antitrust* 23, 27; Schrepel (n 2).

⁴⁰ Viktoria H. S. E. Robertson, ‘Antitrust market definition for digital ecosystems’ (2021) 2 *Competition policy in the digital economy – Concurrences* 3.

Nowadays, one of the most popular digital business models is the ‘multi-sided platform model’.⁴¹ Multi-sided markets are not exclusive to the online world only, as they can be found also in other offline traditional markets.⁴² The difference here is the way in which digital platforms operate and how they generate income.⁴³ In a multi-sided market, digital platforms work as an ‘orchestrator’ of at least two groups of customers, each of them at one side of the market, interacting with each other, and creating network effects.⁴⁴ Several elements that differ from traditional antitrust analysis should be considered.

Firstly, multi-sided platforms often charge only one group of customers and offer free services to the other group.⁴⁵ ‘Zero-price’ markets mean that platforms generate revenues by attracting advertising services. In order to target ads to consumers’ needs, platforms have to know what they like, their habits and their preferences.⁴⁶ Here is where data becomes vital for this business model, as data is in fact what users ‘pay’ for enjoying free services.⁴⁷ It has also been suggested to consider ‘data’ as a currency in order to assign monetary value to free services.⁴⁸ Hence, at one side of the platform, consumers provide their personal data (collected through their online search history, client email and the like) in exchange for free products, which the platform uses for its ‘customers’ on the other side of the market.⁴⁹ AI data analytics is usually employed to extract information from users’ data in order to improve services offered and enable advertisers to best target ads to consumers.⁵⁰ Free-of-charge services should be considered within the dynamics of competition as collecting and analysing data has become ‘a common strategy in order to compete’ with more offline companies breaking into the digital market also ‘becoming avid collectors and users of data’.⁵¹

⁴¹ Akman (n 3) 5. See also <<https://businessmodelanalyst.com/multisided-platform-business-model/>> accessed 28 March 2022.

⁴² Sebastian Wismer and Arno Rasek, ‘Market definition in multi-sided markets’ (OECD 21–23 June 2017).

⁴³ Akman (n 3) 5.

⁴⁴ Ibid; Sokol and Ma (n 36); Wismer and Rasek (n 42).

⁴⁵ Wismer and Rasek (n 42).

⁴⁶ Robertson (n 40).

⁴⁷ Ibid.

⁴⁸ Wismer and Rasek (n 42) 8.

⁴⁹ John E. Villafranco et al., ‘Competition Implications of Big Data and Artificial Intelligence/Machine Learning’ (White Paper 2/2021 ‘Artificial Intelligence & Machine Learning: Emerging Legal and Self-Regulatory Considerations’ American Bar Association Antitrust Law Section Big Data Task Force <https://www.americanbar.org/content/dam/aba/administrative/antitrust_law/comments/feb-21/aba-big-data-task-force-white-paper-part-two-final-215.pdf> accessed 10 March 2022) 11.

⁵⁰ Ibid 11.

⁵¹ Ibid 12.

Secondly, another important element to consider is whether a multi-sided market is characterised by ‘multi-homing’ or ‘single-homing’; the former refers to customers having the choice to easily switch, or simultaneously use, services of competitors’ platforms⁵²; the latter refers to customers staying with only one platform.⁵³ This is relevant for competition dynamics, as customers on one side of a ‘single-home’ market will not change platforms, and so competition to attract them will be fiercer. On the opposite side, competition will be less intense when multi-homing.⁵⁴

Lastly, in multi-sided markets groups of users interact with each other and the more one group uses the platform the more it creates value for the other group.⁵⁵ This phenomenon is known as the network effect and online markets can display direct or indirect network effects.⁵⁶ Social networks, such as Facebook or Sky, are an example of direct network effects where ‘more’ users increase the benefits of the service.⁵⁷ By contrast, indirect network effects exist when ‘more’ users on a platform helps to improve the quality of the service by understanding customers’ needs.⁵⁸ Interactions between users are important to understand the structure of digital markets, as network effects have an impact on prices.⁵⁹ ‘[N]etwork effects transform digital markets into imperfect markets, meaning that the utility one user gives to a good derives not from the good itself, but from the number of other users who are part of the same network.’⁶⁰

In this scenario, antitrust’s traditional analytical tools may fail when applied to digital platform models.⁶¹ For instance, market definition becomes more complex and the traditional SSNIP test may not apply.⁶² There are also those who suggest using deep learning systems to identify the ‘product-market boundaries’

⁵² Akman (n 3) 6.

⁵³ Wismer and Rasek (n 42) 9.

⁵⁴ *Ibid* 4, 9–11; Villafranco et al. (n 49) 22–23.

⁵⁵ Sokol and Ma (n 36) 51.

⁵⁶ *Ibid*.

⁵⁷ A social network works better when more people use it. *Ibid* 51; Akman (n 3) 6; Villafranco et al. (n 49) 15–16.

⁵⁸ Sokol and Ma (n 36); Villafranco et al. (n 49) 16.

⁵⁹ Akman (n 3) 6.

⁶⁰ Virginia Pavel Dobre, ‘Old rules for new practices: Tying in the digital era’ (2021) 2 Competition policy in the digital economy – Concurrences 35, 39.

⁶¹ Sokol and Ma (n 36) 46.

⁶² ‘The original SSNIP test does not account for interdependencies between distinct customer groups. In a two-sided market, for example, a price increase for one customer group (side A) leads to changes in demand not only on this side, A, but also on the other side, B. Ignoring such volume changes that emanate from indirect network effects may distort the result of the SSNIP test.’ Wismer and Rasek (n 42) 12. Sokol and Ma (n 36) 46.

and to ‘understand the dynamics of market structure’.⁶³ Given the complexity of multi-sided markets, and the challenges to define the relevant market according to traditional competition tools, it is not going too far to speculate on the use of AI as a tool that can help competition authorities to define the relevant ‘digital’ market. In fact, econometric tools are usually applied and encouraged by the Commission for the definition of the relevant market for antitrust analysis.⁶⁴ Since experimentations with ML solutions for market screening are ongoing, which will substitute or at least help the economic analysis traditionally carried out with econometric tools,⁶⁵ a parallel conclusion could be drawn for using ML for market definition. It remains to be seen how far competition authorities are willing to go to develop AI tools as well as the evidentiary value in case such systems would actually be implemented.⁶⁶

3. The need to reverse-engineer companies’ algorithms

Interviews conducted with some competition authorities revealed that the main reason why they are starting to develop in-house technologies is to be able to reverse-engineer and understand how companies’ algorithms work, and make sure that they do not distort competition.⁶⁷ Enforcers need to develop new tools to be able to better protect consumers and competition from anti-competitive behaviours, especially in the digital world.⁶⁸ These tools should put agencies in a better position to understand companies’ algorithms, given the fact that ‘[g]overnments and regulators are at an ‘enormous informational disadvantage’ relative to technology companies.’⁶⁹

⁶³ Yi Yang, Kunpeng Zhang and P.K. Kannan, ‘Identifying Market Structure: A Deep Network Representation Learning of Social Engagement’ (2021) *Journal of Marketing* 1.

⁶⁴ Commission, ‘Commission Notice on the definition of relevant market for the purposes of Community competition law’ (97/C 372/03); European Economic & Marketing Consultants, ‘Application of econometric methods in market definition’ (2005) <https://www.ee-mc.com/fileadmin/user_upload/Market_Definition.pdf>; <<https://www.ee-mc.com/expertise/digital-economy/market-definition-digital-economy.html>> accessed 28 March 2022.

⁶⁵ Rosa M. Abrantes-Metz, ‘Proactive vs Reactive Anti-Cartel Policy: The Role of Empirical Screens’ (8th European Summer School and Conference in Competition and Regulation, Corfu, Greece, July 2013); Rosa M. Abrantes-Metz and Albert D. Metz, ‘Can Machine Learning aid in Cartel Detection?’ (2018) *CPI Antitrust Chronicle* 1.

⁶⁶ ‘In many cases, authorities refrain from applying complex econometric methods, in particular due to time constraints, lack of proper data or methodical complexity which often comes along with limited robustness and difficulties in interpreting and communicating results.’ Wismer and Rasek (n 42) 14.

⁶⁷ Buttà et al. (n 18).

⁶⁸ *Ibid.*

⁶⁹ Akman (n 3) 16 citing Furman Jason, et al., ‘Unlocking Digital Competition: Report of the Digital Competition Expert Panel’ (2019).

This is the idea of ‘fight[ing] technology with technology’ as ‘[t]hese intelligent devices will be based on the idea of reverse-engineering algorithms in the hand of antitrust enforcers, with the purpose of understanding the decision-making process functions of their counter-actors [...] and also for officials to gain inside expertise on how price software works and are implemented by undertakings.’⁷⁰ In fact, business strategies are often delegated to algorithms in the digital economy. Among others, price is often ‘decided’ by an AI algorithm.⁷¹ Not only undertakings, but also consumers benefit from technological innovations.⁷² However, regulators and scholars have raised awareness on how algorithms can also represent a threat for competition law by way of, for example, discrimination or collusion.⁷³

Firstly, algorithmic discrimination can occur when different prices are applied to consumers for the same product, without costs being an influencing factor, but only based on their willingness to pay (price discrimination).⁷⁴ Preferencing practices involving the use of algorithms are also a case of discrimination, when online platforms favour their own products, as in the *Google Shopping* case⁷⁵; or when they favour products of a company that pays higher commissions by placing its items in a better position than those of its competitors⁷⁶, as in the *Trivago* case⁷⁷.

Secondly, algorithms can infringe competition law by implementing and facilitating more stable cartels, which would increase the attractiveness of

⁷⁰ Niccolò Colombo, ‘Virtual Competition: Human Liability Vis-À-Vis Artificial Intelligence’s Anticompetitive Behaviours’ (2018) 1 CoRe 11.

⁷¹ OECD, ‘Algorithms and Collusion: Competition Policy in the Digital Age’ (2017).

⁷² *Ibid.* 11 ss, the use of algorithms by businesses and governments and how they may create pro-competitive effects.

⁷³ Ariel Ezrachi and Maurice E. Stucke, ‘Artificial Intelligence & Collusion: When Computers Inhibit Competition’ (2017) 5 University of Illinois Law Review 1775; OECD (n 63); Bundeskartellamt & Autorité de la concurrence, ‘Algorithms and Competition’ (2019) Working Paper; Justin Johnson and Daniel D. Sokol, ‘Understanding AI Collusion and Compliance’ in D. Daniel Sokol and Benjamin van Rooij (eds), *Cambridge Handbook of Compliance* (SSRN 2020); Competition & Markets Authority (n 27); Stefano Azzolina, Manuel Razza, Kevin Sartiano and Emanuel Weitschek, ‘Price Discrimination in the Online Airline Market: An Empirical Study’ (2021) 16 Journal of Theoretical and Applied Electronic Commerce Research, 2282.

⁷⁴ Also known as personalised pricing, Competition & Markets Authority (n 27) 10 ss; Bundeskartellamt & Autorité de la concurrence (n 73) 6; Azzolina et al. (n 73).

⁷⁵ Commission Case AT.39740 *Google Search (Shopping)*, 27.06.2017 and case T-612/17 *Google LLC, and Alphabet, Inc. v. European Commission* [2021] EU:T:2021:763. See also Competition & Markets Authority (n 27) 25 ss.

⁷⁶ This is the case of so-called ‘ranking algorithms’. Competition & Markets Authority (n 27); Bundeskartellamt & Autorité de la concurrence (n 73). See also Buttà et al. (n 18).

⁷⁷ Competition & Markets Authority (n 27) 23 and ‘Trivago misled consumers about hotel room rates’ 2020, in ACCC <<https://www.accc.gov.au/media-release/trivago-misled-consumers-about-hotel-room-rates>> accessed 22 March 2022.

collusion. For example, the same pricing algorithms could be shared by competitors and be programmed to collude and set higher prices⁷⁸ (as in the *Topkins* case⁷⁹) or a third party, that is, a consultancy or an IT company could provide the same software to all its clients and have an interest in generating collusion when their remuneration depends on its clients' revenues⁸⁰ (as in the *Eturas* case⁸¹). Another scenario that is heavily discussed is 'algorithmic collusion', which could occur when (*and if*) autonomous self-learning algorithms learn that the best strategy to maximise their company's profit is to collude with its competitors.⁸² This is not yet a real-life scenario, but several experiments have demonstrated the feasibility of this hypothesis.⁸³ Therefore, enforcers might soon be called to deal with such a situation, and having the right set of tools will help analysing companies' algorithms faster and in a more efficient way. And even if this could be considered a case of tacit collusion, the more companies use AI, the more these practices may become frequent, leading to undesired consequences for competition.⁸⁴

4. The decline of leniency applications

Another reason why competition authorities should invest in AI technologies to boost their *ex officio* investigations is the decline in leniency applications, the enforcement tool on which agencies mostly rely to uncover cartels. Leniency programmes have been implemented worldwide since the earlier 90s when

⁷⁸ Ibid; OECD (n 71).

⁷⁹ OECD (n 71) 28; Johnson and Sokol (n 73); Ezrachi and Stucke (n 73) 1786.

⁸⁰ This is the so-called 'hub-and-spoke' scenario. OECD (n 71) calls this category 'parallel algorithms'. See also Ezrachi and Stucke (n 73); Johnson and Sokol (n 73); Bundeskartellamt & Autorité de la concurrence (n 73) 31 ss.

⁸¹ Case C-74/14 *'Eturas' UAB et al., v Lietuvos Respublikos konkurencijos taryba* [2016], EU:C:2016:42.

⁸² OECD (n 71); Bundeskartellamt & Autorité de la concurrence (n 73); Johnson and Sokol (n 73); Ezrachi and Stucke (n 73) 1795.

⁸³ Bundeskartellamt & Autorité de la concurrence (n 73) 45. See also Ai Deng, 'From the Dark Side to the Bright Side: Exploring Algorithmic Antitrust Compliance' (2019 NERA Economic Consulting and Johns Hopkins University); Thomas Fetzer, Damaris Kosack, Heiko Paulheim and Michael Schlechtinger, 'How algorithms work and play together' (2021) 3 *Artificial Intelligence and Competition Law – Concurrences* 19.

⁸⁴ OECD (n 71) 33 ss. according to which '[a]lgorithms can amplify the so called "oligopoly problem" and make tacit collusion a more frequent market outcome.' Ezrachi and Stucke (n 73) 1795 stated that 'conscious parallelism is legal. The question is whether such practices, when implemented by smart machines in a predictable digitalized environment, ought to be condemned.'

the U.S. first adopted its antitrust amnesty programme in 1993.⁸⁵ The EU Commission followed with its leniency programme implemented in 1996 and revised in 2002 and 2006.⁸⁶

Under the EU leniency programme, companies participating in a cartel may be granted full immunity from the fines, which would have been eventually imposed on them, if ‘sufficient added value’ as they can be rewarded for their cooperation by granting partial immunity from fines of up to 50%.⁸⁷ The aim of this programme is to detect cartels and obtain direct evidence by the participants, and work as a deterrent and ‘a destabilising instrument for the cartels’⁸⁸, as it creates distrust among cartelists who may have to race to be the first to seek leniency and have the chance to benefit from ‘full’ immunity.⁸⁹

According to a study, many of the cartels detected by the Commission in recent years come from immunity applicants.⁹⁰ The leniency programme is considered the most effective tool the Commission relies on to uncover secret cartels.⁹¹ However, some scholars have questioned this reactive behaviour of the Commission⁹², which seems to ‘over-rely’ on its leniency programme as the sole methodology to uncover cartels.⁹³

Applying for immunity is not an immediate consequence of a weak cartel, as taking such a decision implies a complicated risk analysis, where benefits and disadvantages need to be accurately weighted.⁹⁴ Among the disadvantages, besides the most obvious one – the risk of facing private damage actions⁹⁵, the uncertainties around the concept of a cartel are considered a factor able to keep away a potential leniency applicant.⁹⁶ For instance, the concept of a ‘secret cartel’ becomes blurry in hypothesis of information exchange, price

⁸⁵ OECD (n 16).

⁸⁶ Ibid; Peter T. Dijkstra and Jonathan Frisch, ‘Sanctions and Leniency to Individuals, and its Impact on Cartel Discoveries: Evidence from the Netherlands’ (2018) 166 *De Economist* 111 112.

⁸⁷ Ibid.

⁸⁸ Joan-Ramon Borrell, Juan Luis Jiménez and José Manuel Ordóñez-de-Haro, ‘The Leniency Program: Obstacles on the way to collude’ (2015) 3 *Journal of Antitrust Enforcement* 149.

⁸⁹ Ibid; OECD (n 16).

⁹⁰ Johan Ysewyn and Siobhan Kahmann, ‘The decline and fall of the leniency programme in Europe’ (2018) 1 *Concurrences* 44.

⁹¹ Ibid; Abrantes-Metz 2013 (n 65).

⁹² Abrantes-Metz 2013 (n 65).

⁹³ Ysewyn and Kahmann (n 90) 45.

⁹⁴ Ibid.

⁹⁵ See for instance International Competition Network, ‘Good practices for incentivising leniency applications (Subgroup 1 of the Cartel Working Group, 30 April 2019).

⁹⁶ Ysewyn and Kahmann (n 90).

signalling and hub-and-spoke cases⁹⁷, without even involving any sophisticated technological means. It is stated that '[l]eniency may therefore be the right option for the classic 'smoke-filled room' hardcore cartels.'⁹⁸ Legal concepts may become even more blurry now in the digital era where new ways of infringing competition law are emerging, making collusion easier and far from traditional 'smoke-filled room' cartel agreements.

If companies are not sure whether their conduct can be considered a 'secret cartel', they might decide that it is better to let 'the regulator [deal] with legal concepts that are in flux and fighting the case.'⁹⁹ The chances to have a company coming forward with an immunity application is even reduced if they lack knowledge of the way their algorithms make certain decisions. In fact, they might not even be aware of any wrongdoing. This could be a case of tacit collusion or parallel behaviour and therefore not of interest for competition authorities. However, sooner or later, competition authorities should start thinking of dealing with such situations as the outcome is still undesirable for competition and consumer welfare.¹⁰⁰ If leniency applications have decreased by almost 50% in the last years (mostly because of the risk of facing long and expensive private actions, especially against the immunity applicant),¹⁰¹ this instrument will not be of much help with unconventional ways of infringing competition law, such as some of those highlighted in the previous section. Therefore, given the lesser appeal that leniency programmes have due to the risk of follow-up damages claims, and the potential of being less effective and adapt for the digital market, it is desirable for competition authorities to develop new and alternative pro-active means to boost their *ex officio* investigations.

IV. Legal challenges for developing AI enforcement tools

Advanced digital technologies have revolutionised our lives in many different ways: as consumers, by reducing search costs and enhancing market transparency that makes it possible to make better and more informed

⁹⁷ Ibid.

⁹⁸ Ibid 51.

⁹⁹ Ibid 52.

¹⁰⁰ OECD (n 70).

¹⁰¹ Ysewyn and Kahmann (n 90) 45 citing the Global Competition Review's Rating Enforcement Reports 2017, 2016 and 2015.

choices;¹⁰² and also as recipients of administrative services, when smart technologies enable public bodies to make decisions faster and more efficiently and improve the provision of services.¹⁰³ Therefore, digital transformation is responsible for countless benefits when compared to the previous ‘analogue society’. However, not everything is as positive as it looks – when technologies such as AI are involved, which can make autonomous decisions and affect human beings, challenges arise and they need to be scrutinised also through a legal lens.¹⁰⁴

Competition law enforcement reflects this reality: AI and innovative enforcement tools would eventually enhance competition authorities’ efficiency to better detect potential algorithmic infringements in an increasingly digitalised society; at the same time, legal challenges cannot be disregarded, as procedural rights might be undermined. As it is for any other fields that make use of sophisticated algorithmic systems, competition authorities that aim to implement their own digital investigation tools, might have to deal, sooner or later, with problems concerning bias, transparency and the need to deliver a reasoned decision in accordance with procedural rules and rulings of the Court of Justice, which would become more difficult if (and when) most of the decision-making process relies on AI.

As a matter of fact, one of the main concerns when AI is used in the decision-making process, to determine an outcome that might have a negative (or positive) impact on human beings, is the problem of bias. Machines, just like humans, can be exposed to bias.¹⁰⁵ However, this fact is not a prerogative of data collection only. Indeed, when humans are required to make a final

¹⁰² Ariel Ezrachi and Maurice E Stucke, *Virtual Competition: The Promise and Perils of the Algorithm-driven Economy* (Cambridge Mass. London: Harvard U, 2016).

¹⁰³ See for instance AlgorithmWatch (n 38).

¹⁰⁴ Ezrachi and Stucke (n 102). In this regard see also the European Commission, ‘Proposal for a Regulation Laying down Harmonised Rules on Artificial Intelligence’ Brussels, 21.4.2021 COM(2021) 206 final, 2021/0106 (COD).

¹⁰⁵ It has been demonstrated that algorithms fed with data by a programmer can provide results not less biased than a human being. See for instance Hofmann (n 37) 14–15. ‘Data collections, on which ADM [Automated-Decision Making] technology is based, might equally suffer from biases. These are frequently referred to with the terms of “sample bias, feature bias and label bias.” “Sample bias” arises from data used by an ADM system to train software algorithms. If training data used has certain inbuilt biases the outcome of computer-based calculations can reflect or even accentuate that same bias. “Feature bias” is particularly problematic in interoperative or composite databases and relates to different labeling or categorization of data across the data samples used by ADM systems. A particular feature assigned to the data might translate into systematically erroneous outcomes in other contexts. Errors can consist of mislabeling data or arise from simple differences in categorization of certain data points. Finally, “label bias” may arise if a variable contains too many elements each

decision, after an AI has already (and autonomously) made its own assessment, the intended use of discretionary powers of a decision-making body could be compromised, as it is assumed that AI might dangerously ‘shape, constrain, or remove human discretion by structuring information intake.’¹⁰⁶ This is known as the problem of ‘automation bias’.¹⁰⁷ In competition law enforcement at the EU level, the Commission has a great level of discretion in its decision-making process, and the use of AI, at different stages of this process, might influence the final decision. Case-handlers (who most likely are not computer scientists) might tend to trust the outcome provided by an AI system, and in any case, they might not be able to contradict it, due to their lack of understanding.¹⁰⁸

This is strictly related to another issue that competition authorities, that is, those willing to develop and implement new digital investigation tools, might need to deal with: the black box character that certain types of AI systems display.¹⁰⁹ Problems related to transparency and the ability to explain the process would likely arise and collide with the right of a reasoned decision, on which the principle of effective judicial review is based.¹¹⁰ In fact, ‘[a]n inadequately reasoned decision will be understood as a breach of the “duty of care” and can thus justify annulment of the contested measure. Reasons must demonstrate that the decision was taken on the basis of “the most complete

having an effect on output. Together the biases result in poor quality input data and therefore faulty data processing, which in itself might disqualify an entire ADM system.’

¹⁰⁶ Hofmann (n 37) 14.

¹⁰⁷ Cobbe (n 37) 641, ‘automation bias, [...] means that humans are more likely to trust decisions made by machines than by other people and less likely to exercise meaningful review of or identify problems with automated decisions.’

¹⁰⁸ Hofmann (n 37) 14.

¹⁰⁹ For instance, some types of AI systems, such as deep neural networks, present a structure of hidden layers that make it difficult to explain the process of reaching a certain output, as well as understand the reasons behind that specific result. Rembrandt Devillé, Nico Sergeysels and Catherine Middag, ‘Basic Concepts of AI for Legal Scholars’, in Jan De Bruyne and Cedric Vanleenhove (eds), *Artificial Intelligence and the Law* (Intersentia 2021), 8 ss. ‘This lack of interpretability and explainability makes it sometimes ethically impossible to use these methods. The only information that can be retrieved is a mathematical formula consisting of non-linear combinations of the different inputs, which cannot be converted into an explanation a human would understand’, 10.

¹¹⁰ Hofmann (n 37), 37 ‘Generally speaking, reasoning is a concept requiring the administration to document having reflected on all matters which may be subject to later judicial review’ and note 142: ‘The right to a reasoned decision is a right guaranteed under the right to good administration, there also explicitly recognised in Article 41(1)b CFR, as well as under the right to an effective judicial remedy, as also recognised in Article 47(1) CFR.’ Furthermore, ‘[t]he right of an effective judicial review in general, as well as the right to compliance with the duty of care and reasoning obligations will also have the effect that an ADM [Automated-decision making] system will need to give detailed explanations as to the input taken into account and the decision-making process and outcome resulting therefrom’ 34.

factually accurate, reliable and consistent information possible”¹¹¹. Since the use of AI systems in one phase of competition law enforcement would influence measures adopted in a final decision, the outcome of an AI should be intelligible and explainable. Therefore, by solely relying on AI systems, which cannot be explained or understood even by experts in the field, the tasks of case-handlers would become more complicated (or even impossible), as they would have to understand an AI output, and to translate it into a reasoned decision. In fact, case-handlers need to justify their decisions¹¹², explain the methodology employed to reach a certain outcome, and allow the counterpart to understand how the decision was adopted and what it is based on; all this, in order for the recipients of such decision to be able to defend themselves, by putting forwards proof of the contrary, in respect with the principle of equality of arms.¹¹³

In this intertwined area of law and technology, it is debated what should be disclosed in order to make such computational tools understandable¹¹⁴, and mechanisms for accountable AI have been discussed.¹¹⁵ Further research is needed in the field of competition law enforcement, in order to find mechanisms and solutions that are capable of combining, on the one hand, the need for competition authorities to develop and rely on the most advanced digital tools, in order to better understand the dynamics of the digital economy and the challenges of an algorithm-driven society; and, on the other hand, to ensure that procedural rights in competition law enforcement are complied with.

¹¹¹ Ibid., 36–37.

¹¹² For example, according to Article 20 (4) Regulation (EC) No 1/2003 on the implementation of rules on competition laid down in Articles 81 and 82 of the Treaty, ‘[t]he decision shall specify the subject matter and purpose of the inspection [...]’. In this regard the CJEU has laid down that ‘the statement of reasons required under Article 296 TFEU for measures of the institutions of the European Union must be appropriate to the measure at issue and must disclose in a clear and unequivocal fashion the reasoning followed by the institution which adopted that measure in such a way as to enable the persons concerned to ascertain the reasons for it and to enable the competent court to exercise its power of review. [...]’ Case T-249/17 *Casino, Guichard-Perrachon, Achats Marchandises Casino SAS (AMC) v European Commission* [2020], EU:T:2020:458 [107–114].

¹¹³ In this regard, see for instance Andreas Von Bonin and Sharon Malhi ‘The Use of Artificial Intelligence in the Future of Competition Law Enforcement’ (2020) 11 *Journal of European Competition Law & Practice* 468.

¹¹⁴ See for instance Cary Coglianese and David Lehr, ‘Regulating by Robot: Administrative Decision Making in the Machine-Learning Era’ (2017) 105 *Georgetown Law Journal* 1147.

¹¹⁵ See for instance, Jennifer Cobbe, Michelle Seng Ah Lee, and Jatinder Singh ‘Reviewable Automated Decision-Making: A Framework for Accountable Algorithmic Systems’ (ACM Conference on Fairness, Accountability, and Transparency (FAccT ‘21), March 1–10, 2021, Virtual Event, Canada. ACM New York, USA); Hofmann (n 37).

V. Conclusion

Technology plays an important role in shaping market structure, economic dynamics, the way businesses make decisions and interact with each other, as well as, ultimately, the way companies can infringe competition law. Competition authorities have just started to take their first steps into the digital world of AI and ML for competition enforcement, by building in-house digital platforms, digital screening tools and pilot projects to study the functioning of algorithms used by companies.

‘Fight[ing] technology with technology’¹¹⁶ could be the most powerful means to efficiently react and detect digital infringements of competition law, which needs to be adapted and shaped according to the evolution of the economy – enforcement tools need to follow the same trend. By solely relying on reactive tools, such as leniency programmes, which have already suffered a major decrease, competition authorities may be unable to detect harmful and insidious anticompetitive practices that involve the use of technology. Without the right set of digital enforcement tools, competition authorities may, in fact, risk being left behind. They might fail to understand companies’ algorithms that may infringe competition law, or to understand how market players interact with each other in a way that is relevant for competition analysis. AI could help competition authorities to enhance efficiency, accuracy and facilitate time-savings, avoiding long investigations that may arrive at a positive decision – at this point, it is already too late and a particular remedy would not be useful anymore.¹¹⁷

This paper has highlighted some of the reasons why competition authorities have started to develop their own digital investigation tools, according to interviews conducted with some of them, such as the need to reverse-engineer companies’ algorithms. Other reasons for investing in new technologies for the enforcement of competition law have also been considered, such as the need to enhance efficiency, understand the new digital market structure, and the declining use of leniency programmes. Therefore, it seems reasonable to advocate for competition authorities to assume a more pro-active enforcement role that should use technology to meet the new challenges of ‘digital’ competition law. Finally, competition authorities should also be aware of the numerous challenges and difficulties when implementing AI systems in their decision-making process; fundamental rights, such as the right of a reasoned decision and defence rights, must be ensured and should not be compromised by the use of disruptive technologies.

¹¹⁶ Colombo (n 70).

¹¹⁷ Sokol and Ma (n 36).

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