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Future Challenges for Automation in Competition Law Enforcement

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Abstract. Competition authorities have started to benefit from the potential of Artificial Intelligence ("AI") for enforcing competition law. This leads to Automated Decision-Making ("ADM") systems supporting and replacing human decisions in specific phases of competition law enforcement, from the initiation phase to the monitoring phase. An overview of the digital tools developed by some agencies seems to confirm the trend of moving toward computational antitrust. However, the increasing reliance on ADM systems by public enforcers will bring about challenges for compliance with basic principles of law, stemming from possible automation biases, difficulties in reasoning, hearing, and access to document requirements. These challenges need to be also addressed in competition law enforcement.

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I. Introduction

New digital technologies and the increased use of Artificial Intelligence (AI)[1] affect the way private companies and public institutions make choices and take decisions. AI is gradually integrated into the decision-making processes of both the public and the private sector.[2] The increasing use of Automated Decision-Making (ADM) systems is not only the prerogative of private companies that are increasingly experimenting with and relying on cutting-edge technologies.[3] This phenomenon is also visible in the public sector, including in the field of competition law, where administrative bodies integrate technologies in their decision-making processes.[4] AI, machine learning (ML), and data analysis techniques are in fact already employed in many policy areas to support and even replace certain decision-making phases.[5]

Some administrative tasks can be performed at greater speed and taking into account an increasing amount of ever more available data through ADM at a speed and quality unthinkable for a human being.[6] So far, most ADM systems are employed only in specific phases of a decision-making process leading to a final enforcement decision[7] – in the initiation phase of a procedure, the investigation of a suspicion of a violation of competition law, or the adoption of a decision and its enforcement.

In competition law enforcement, for instance, competition authorities have started to build *ad hoc* digital units, acquire technical expertise, and invest in AI as a strategy to better understand and monitor the current dynamics in markets[8] and

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[1] In its "Proposal for a Regulation Laying down Harmonised Rules on Artificial Intelligence," Brussels, April 21, 2021 COM(2021) 206 final, 2021/0106 (COD), the European Commission has defined AI as "software that is developed with one or more of the techniques and approaches listed in Annex I and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with".

[2] 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), Virtual Event (March 1–10, 2021), https://doi.org/10.1145/3442188.3445921).

[3] The term ADM can also be explained as followed: "[a]lgorithmically controlled, automated decision-making or decision support systems are procedures in which decisions are initially – partially or completely – delegated to another person or corporate entity, who then in turn use automatically executed decision-making models to perform an action" ALGORITHMWATCH, AUTOMATING SOCIETY: TAKING STOCK OF AUTOMATED DECISION-MAKING IN THE EU (A Report by AlgorithmWatch in Cooperation with Bertelsmann Stiftung, Supported by the Open Society Foundations), (2019), 148, https://algorithmwatch.org/wp-content/uploads/2019/01/Automating_Society_Report_2019.pdf

[4] Herwig C.H. Hofmann, *An Introduction to Automated Decision Making (ADM) and Cyber- Delegation in the Scope of EU Public Law*, Indigo Working Paper, (2021).

[5] *Id.*

[6] *Id.*; Jennifer Cobbe, *Administrative Law and the Machines of Government: Judicial Review of Automated Public-Sector Decision-Making* 39 LEGAL STUDIES 636 (2019); Vivienne Brand, *Corporate Whistleblowing, Smart Regulation and Regtech: The Coming of the Whistlebot?* 43(3) UNIVERSITY OF NEW SOUTH WALES LAW JOURNAL 1 (2020); Cary Coglianese and David Lehr, *Regulating by Robot: Administrative Decision Making in the Machine-Learning Era*, 6 FACULTY SCHOLARSHIP AT PENN LAW 1147, 1168 (2017).

[7] Simona Demková, *The Decisional Value of Information in European Semi-Automated Decision-Making* 14 REVIEW OF EUROPEAN ADMINISTRATIVE LAW 29 (2021); Hofmann, *supra* note 4; Rashida Richardson, *Confronting Black Boxes: A Shadow Report of the New York City Automated Decision System Task Force*, AI NOW INSTITUTE, (2019).

[8] This is the suggestion to "fight 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", Niccolò Colombo, *Virtual Competition: Human Liability Vis-À-Vis Artificial Intelligence's Anticompetitive Behaviours* 1 CORE 11 (2018). *See also* Marcela Mattiuzzo and Henrique Felix Machado, *Algorithmic Governance in Computational Antitrust—a Brief Outline of Alternatives for Policymakers*, 2 STAN. COMPUT. ANTITRUST 23 (2022); Thibault Schrepel, *Computational Antitrust: An Introduction and Research Agenda*, 1 STAN. COMPUT.

the AI tools used by market participants to decide real-time pricing strategies and supply chain flows.[9] New business models are being developed in digital markets, sometimes leading to a strong concentration of powers in only a few digital platforms.[10]

Different uses of ADM raise different questions, especially as to accountability mechanisms. Competition authorities, like any other administrative bodies, are subject to procedural rules and principles that need to be considered when integrating computational tools into their decision-making process.[11]As far as the use of ADM in public enforcement decisions is concerned, challenges arise both from procedural justice-related considerations as well as from substantive rights.

The objective of this article is to analyze ADM in competition law enforcement and to highlight the main challenges for competition authorities in terms of legal procedural principles. In order to do so, Section II provides an overview of projects carried out by competition authorities in Europe, which have already developed computational tools. Section III assesses which procedural phases of competition law enforcement can benefit from the use of ADM systems. Section IV shows the challenges for competition law enforcement when ADM systems are employed, and Section V concludes with some comparative remarks and a research outlook.

II. Competition authorities' enforcement tools

Competition authorities have several tools they can rely on to base a decision to open a formal investigation and ultimately issue a positive decision of an infringement of competition law. Traditional enforcement tools are usually divided between "reactive detection methods" and "proactive detection methods."[12] The first category refers to methods that rely on evidence and information that competition authorities receive from third parties.[13] Leniency and whistle-blower programs are among the reactive tools. The second category refers to initiatives of competition authorities when they undertake a proactive approach to detecting cartels without relying on external hints.[14] This last category includes screening tools, market studies, and empirical economic analysis.[15]

The arrival of new and sophisticated technological systems can help competition authorities to reinforce their toolkit in their fight against competition

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ANTITRUST 1 (2021); Thibault Schrepel and Teodora Groza, *The Adoption of Computational Antitrust by Agencies: 2021 Report*, 2 STAN. COMPUT. ANTITRUST, 78 (2022).

[9]OECD, ALGORITHMS AND COLLUSION: COMPETITION POLICY IN THE DIGITAL AGE, https://www.oecd.org/competition/algorithms-collusion-competition-policy-in-the-digital-age.htm (last visited March 8, 2023).

[10] Mattiuzzo and Machado *supra* note 8. See for instance the structure of the online markets with the "multi-sided platform model" Pınar Akman, *Competition Policy in a Globalized, Digitalized Economy* (World Economic Forum White paper 2019); D. Daniel Sokol and Jingyuan Ma, *Understanding Online Markets and Antitrust Analysis* 15 NORTHWESTERN JOURNAL OF TECHNOLOGY AND INTELLECTUAL PROPERTY 43 (2017).

[11] Hofmann, *supra* note 4; Mattiuzzo and Machado, *supra* note 8.

[12] OECD, ROUNDTABLE ON EX OFFICIO CARTEL INVESTIGATIONS AND THE USE OF SCREENS TO DETECT CARTELS, DAF/COMP(2013)14 (November 4, 2013) https://one.oecd.org/document/DAF/COMP(2013)14/en/pdf.

[13] *Id. at* 7.

[14] *Id*.

[15] *Id.*

law infringements, creating new opportunities that can help regulators to enforce competition law more efficiently or in a way more adapted to modern data-driven economies in which market structures are becoming more complex and different ways of infringing antitrust rules have emerged.[16] Competition authorities seem to be increasingly aware of this digitalization process of society and the way it impacts competition rules.[17] This can be seen in the increasing number of projects taking place within competition authorities with the aim to develop their own technological expertise to better understand the use and functionalities of companies' algorithms and monitor potential competition infringements.[18]

From the interviews conducted with some competition authorities,[19] it is possible to grasp a general interest in "computational antitrust," i.e., competition law enforcement that relies on sophisticated ADM tools,[20] with some competition authorities in Europe indicating the creation of *ad hoc* digital units.[21] For example, the Italian Competition Authority has developed a pilot project that aims to collect data from popular e-commerce platforms and monitor their ranking algorithms with data analysis, web scraping, AI and machine learning techniques.[22] The study was conducted on Amazon, and with the development of a supervised machine learning algorithm, "Random Forest" in an attempt to monitor e-commerce platforms that hold a dominant position in the market and investigate potential competition infringements, such as discrimination and collusion.[23] This is an example of the development of proactive detection methods. This tool is used for decisions on the initiation of an enforcement procedure. However, its market surveillance function can also lead to its use in the investigation of alleged misconduct. In the same vein, the Greek Competition Authority (Hellenic Competition Commission) has developed a Forensic Investigation Detection Unit composed of economists and data scientists and has put in place a platform in charge of collecting publicly available data on different products to observe trends in price changes over a time series (daily, weekly, etc.). An algorithmic screening

[16] Cary Coglianese & Alicia Lai, *Antitrust by Algorithm*, 2 STAN. COMPUT. ANTITRUST 1, 10-11 (2022) (discussing the importance of algorithms in antitrust).
[17] *See for instance* Bundeskartellamt & Autorité de la Concurrence, Working Paper - Algorithms and Competition, https://www.bundeskartellamt.de/SharedDocs/Publikation/EN/Berichte/Algorithms_and_Competition_Working-Paper.html (last visited March 8, 2023); OECD, *supra* note 9; Competition & Markets Authority, Algorithms: How they can reduce competition and harm consumers, https://www.gov.uk/government/publications/algorithms-how-they-can-reduce-competition-and-harm-consumers/algorithms-how-they-can-reduce-competition-and-harm-consumers (last visited March 8, 2023).
[18] *See* Computational Antitrust First Annual Conference: Exploring Antitrust 3.0 (Transcript of the Conference on 13, 14 and 15 December 2021).
[19] One of the co-authors of this paper, Isabella Lorenzoni, conducted oral interviews between 2021 and 2022 at the competition authorities of Belgium, France, Italy, Greece, Luxembourg and Sweden. The European Commission, the German and the Estonian competition authorities replied to questions only in writing. Also, one law firm and one software provider were interviewed orally. The interviews focused on the type of computational tools currently developed, their purposes, potential projects for the future, and the main legal and technical challenges they encountered in developing such tools.
[20] Computational Antitrust First Annual Conference, *supra* note 18; Schrepel, *supra* note 8.
[21] Schrepel, *supra* note 8. *See also* Coglianese & Lehr, *supra* note 6, 1171 (saying "Antitrust Division might conceivably come to rely on machine learning to predict what effects a proposed merger would have on future competition and market pricing, perhaps entirely automating the antitrust review process").
[22] Autorità Garante della Concorrenza e del Mercato.
[23] Antonio Buttà, Andrea Pezzoli, Manuel Razza and Emanuel Weitschek, *Inferire il funzionamento degli algoritmi nelle piattaforme di e-commerce con il machine learning – aspetti di tutela della concorrenza e del consumatore* (2022) (Ital-IA 2022 – Workshop AI per la Pubblica Amministrazione). The software was reported to be able to identify the parameters that influence Amazon's algorithm that decides the winner of the Buy Box. Prices, number and score of reviews were not always the decisive factors that assigned the winner.

tool is employed to monitor the prices of a single product offered by different sellers to identify suspicious behavior that may require further investigation.[24] Also, according to Quinn, Brand and Hunt, the UK Competition and Markets Authority (CMA) has set up a Data, Technology, and Analysis (DaTA) unit with data scientists, lawyers, and economists. [25] The unit is also in charge of providing a better understanding of how companies' algorithms function and how they use the data collected in order to monitor competition or consumer law infringements.[26] Reportedly, under its auspices, AI systems were first used in cases of consumer law infringements and are now also used for antitrust and merger cases. For instance, natural language processing is employed to review internal documents submitted by companies.[27] These systems, being used for both proactive as well as reactive enforcement, will be employed at different moments in an enforcement procedure but predominantly in the investigation of a suspicion.

Finally, also the Spanish Competition Authority reports to have put in place since 2018 an Economic Intelligent Unit for developing new computational investigative tools that can help with detecting various anticompetitive behaviors, such as algorithmic collusion.[28] According to an OECD report, in the Spanish unit "more complex statistical and econometric techniques, network analysis and machine learning methods, both supervised and unsupervised, are beginning to be applied"[29] working, according to Fountoukakos, especially to detect bid rigging cartels in public procurement, since it is a data intensive sector.[30] Here, the use of AI concerns largely the discovery and investigation of a possible competition law violation.

III. Automating antitrust enforcement – phases and values

These few examples already illustrate that competition authorities appear to value systems, such as machine learning algorithms with pattern recognition features and prediction-making[31] moving toward computational antitrust.[32] They are especially used to assess large data pools, a type of work difficult to conduct without the help of digital tools. Machine learning is used to discover potentially suspicious patterns of behavior on markets or co-relations between various data points.

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[24] Ioannis Lianos, Computational Competition Law and Economics: Issues, Prospects - An Inception Report, (Hellenic Competition Commission 2021).
[25] Helena Quinn, Kate Brand and Stephan Hunt, *Algorithms: helping competition authorities be cognisant of the harms, build their capabilities and act,* 3 Concurrences 5, 11 (2021). The CMA was not part of the interviews conducted. Data comes from publicly available information.
[26] Stefan Hunt, <https://competitionandmarkets.blog.gov.uk/2018/10/24/cmas-new-data-unit-exciting-opportunities-for-data-scientists/> (last visited on Mar. 10, 2022). Competition & Markets Authority, *supra* note 17, 24, 50-51.
[27] *See also* Stanford Computational Antitrust, *supra* note 18, at 279.
[28] <https://www.cnmc.es/en/ambitos-de-actuacion/competencia/unidad-de-inteligencia-economica> (last visited on Mar. 27, 2022). The Spanish Competition Authority was not part of the interviews conducted. Data comes from publicly available information.
[29] Lynn Robertson, *Latin American and Caribbean Competition Forum – Session I: Digital Evidence Gathering in Cartel Investigations – Contribution from Spain,* OECD, (2020), 3.
[30] 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).
[31] Hofmann, *supra* note 4, 4.
[32] Schrepel, *supra* note 8. Mattiuzzo and Machado, *supra* note 8; Coglianese and Lai, *supra* note 16.

However, in public enforcement, such technological tools have different strengths in various phases of an enforcement procedure, which according to a typical decision-making cycle model, would contain an initiation phase, investigation, decision-making, and implementation. The above-listed examples of European competition law enforcement agencies already show that ADM systems are applied mostly in only one phase of a procedure. This does not exclude, however, that sometimes various ADM tools are used in subsequent phases,[33] such as initiation and investigation, but that it would be quite unusual for administrative procedures to be fully automated from initiation to implementation.

A. Initiation phase

In competition law enforcement, computational tools are mostly used in the initiation phase when setting the enforcement agenda. Traditionally, economic and statistical analyses have often been used by competition authorities and researchers to provide an indication of problematic industries that are worthy of further investigation.[34] These tools are commonly known as screens.[35] Such methods can be used either to screen an industry or a market that shows "propensity for collusion"[36] (structural screens), or to closely examine firms' behavior in a market to understand whether that behavior is indeed the result of a collusion (behavioral screens).[37] Screens do not provide direct evidence of collusion, but are useful to raise flags on unusual behaviors that could be the result of anticompetitive practices.[38] However, not all competition authorities have implemented those tools as they are a "resource-intense activity."[39]

Today screening tools using machine learning algorithms are increasingly used by competition authorities (and by companies in their compliance programs) to uncover agreements and practices falling potentially foul of competition rules, especially cartel arrangements.[40] Screening tools using machine learning

[33] Hofmann, *supra* note 4, 16 ss. on cyber-delegation.
[34] OECD, *supra* note 12. *See for instance* the LIBOR scandal in Rosa M. Abrantes-Metz, *Proactive vs Reactive Anti-Cartel Policy: The Role of Empirical Screens*, 8th European Summer School (2013), and Rosa M. Abrantes-Metz, *Ex Officio Cartel Investigations and the Use of Screens to Detect Cartels*, OECD, (2013), OECD, Policy Roundtables Ex Officio Cartel Investigations and the use of Screens to Detect Cartels, DAF/COMP (2013) 27.
[35] "Screening refers to a process whereby industries are identified for which the existence of a cartel is likely" See Joseph E. Harrington, Jr, *Behavioral screening and the detection of cartels*, European University Institute Robert Schuman Centre for Advanced Studies 2006 EU Competition Law and Policy Workshop/Proceedings, (2006), 2. "A screen is a statistical test based on an econometric model and a theory of the alleged illegal behavior, designed to identify whether manipulation, collusion, fraud or any other type of cheating may exist in a particular market, w may be involved, and how long it may have lasted. Screens use commonly available data such as prices, bids, quotes, spreads, market shares, volumes, and other data to identify patterns that are anomalous or highly improbable". Abrantes-Metz (2013), *supra* note 34, 2.
[36] OECD, *supra* note 12, at 17.
[37] Abrantes-Metz, *supra* note 34; OECD, *supra* note 12; Harrington, *supra* note 35.
[38] Abrantes-Metz, *supra* note 34; OECD, *supra* note 12.
[39] OECD, *supra* note 12, at 39; *and* Abrantes-Metz, *supra* note 34, at 10-11.
[40] Hannes Beth & Thilo Reimers, *Screening Methods for the Detection of Antitrust Infringements*, 3 COMPLAINCE BUS. – DAS ONLINE-MAGAZIN 1, 3 (2019), https://doi.org/10.2139/ssrn.3501700. For instance, a "set of intelligent algorithms is currently being developed in the procurement systems at Deutsche Bahn with the intention to further develop this in the future. The aim is to implement a diverse range of algorithms that will be able to identify the most diverse forms of cartel agreements. The process will then be increasingly automated and will involve more and more data to develop adaptive algorithms and machine learning." *See also* Helen Gornall, Jolling de Pree, Bart de Rijke, & Stephanie The, De Brauw Blackstone Westbroek, *Commission's AI Proposal to Bolster Antitrust Enforcement in Algorithm-Driven Markets* (June 23, 2021), De Brauw, https://www.debrauw.com/articles/commissions-ai-proposal-to-bolster-antitrust-enforcement-in-algorithm-driven-markets (last visited Sept. 10, 2021) (describing how

techniques can aid competition authorities, for example, in the field of fuel retail markets[41] and in bid rigging cartelistic structures in public procurement.[42] Such tools and models are generally based on historical data of past competition cases and, on this basis, calculate predictions on the likelihood of collusion in the same area.[43]

Thus, the use of automated systems is a question of enforcement efficiency for competition authorities in the context of finding correlations between data points.[44] At the same time, the use of machine learning models is often designed to help antitrust enforcers to adjust and balance false positive (when the system identifies a cartel that does not exist in reality which, as a consequence, might mislead competition authorities to conduct unjustified investigations[45]) and false negative outcomes (when the machine learning model is not able to recognize a case of collusion even if it occurs[46]). Machine learning systems are supposed to, as Lianos argues, "provide the possibility to find nontrivial collusive patterns that econometrics could not foresee and they may build non-trivial tests on these patterns."[47] This is linked largely to the fact that machine learning is designed around pattern learning where, according to Mullainathan and Spiess, "[t]he appeal of machine learning is that it manages to uncover generalizable patterns. In fact, the success of machine learning at intelligence tasks is largely due to its ability to discover complex structures that were not specified in advance."[48]

Although machine learning models potentially offer attractive opportunities for competition authorities, it is not uniformly understood that machine learning tools need to be taken into consideration because they would outperform traditional econometric methods. Sophisticated AI tools may work well with high volumes or types of previously unknown or unusual data (such as images and language information) that machine learning can analyze.[49] Competition authorities can, and arguably should, benefit from the considerable increase in computational powers.[50] However, to date, some interview partners in competition authorities concede that one of the biggest problems that hinder taking better advantage of existing technology is not necessarily the hardware but the availability and quality of market data.[51] In fact, machine learning algorithms need training data sets "with a sufficient number of cases of both collusion and not-

Deutsche Bahn "is testing a cartel screening algorithm that will scan for traces left behind by digital cartels, such as identical bids or suspicious pricing patterns").

[41] Douglas Silveira, Silvinha Vasconcelos, Marcelo Resende, & Daniel O. Cajueiro, *Won't Get Fooled Again: A Supervised Machine Learning Approach for Screening Gasoline Cartels*, 105 Energy Econ. 1 (2022), https://www.sciencedirect.com/science/article/pii/S0140988321005594; Lianos *supra* note 24; Martin Huber & David Imhof, *Machine Learning with Screens for Detecting Bid-Rigging Cartels* 65 INT'L J. INDUS. ORG. 277 (2019), https://doi.org/10.1016/j.ijindorg.2019.04.002.

[42] Huber & Imhof, *supra* note 41.

[43] *Id*. *See also* Silveira et al., *supra* note 41 (referring *inter alia* to machine learning models, such as Random Forest, Lasso Logistic or Neural Networks).

[44] Lianos, *supra* note 24, at 9.

[45] Huber & Imhof, *supra* note 41.

[46] Silveira et al., *supra* note 41, at 4, 30, 41-42; *and* Huber & Imhof, *supra* note 41, at 290.

[47] Lianos, *supra* note 24, at 16-17.

[48] Sendhil Mullainathan & Jann Spiess, *Machine Learning: An Applied Econometric Approach*, 31 J. ECON. PERSPS. 87, 88 (2017).

[49] Lianos, *supra* note 24, 16-17.

[50] Mullainathan & Spiess, *supra* note 48.

[51] There are however tools developed by competition authorities that do not require the use of market data. See in this regard Schrepel and Groza, *supra* note 8.

collusion, with the necessary data on price, cost, and drivers of supply and demand."[52] This difficulty is corroborated by interview findings, according to which some interview partners in competition authorities cite the lack of available data, such as costs and product quantities which are companies' private data, and also the lack of training data sets, as amongst the main barriers to developing fully operational machine learning systems.[53] Due to information asymmetries between regulators and private companies, the authorities systems are likely to miss important private information that companies would unlikely disclose unless there is a formal request for information.[54] Henceforth, despite technological possibilities, some authors have raised doubts as to whether increasing use of technological tools would produce disruptive changes in the system of competition law enforcement.[55]

Nonetheless, particularly in the initiation phase, using machine learning systems for identifying correlations in data sets could potentially point to a violation of competition law. This could still be a powerful signal for competition authorities to conduct more in-depth investigations, hoping that not too many false positives will lead to a waste of resources.

B. Investigation phase

In the *phases of investigation and inspection*, document management software is used by competition authorities to handle vast amounts of data submitted by the parties or obtained during investigations. Digitalization can help law firms and competition authorities, equipping them with sophisticated document management software which is not only based on keywords, such as e-discovery tools but on machine learning solutions, with pattern recognition features.

For instance, the European Commission, when investigating a potential violation of Article 101 TFEU can issue a "Search query Request for Information (RFI)" requiring companies to provide the authority with all documents matching specific keywords given to them by investigators. Before handing out these documents, privacy and legal professional privilege (LPP) need to be guaranteed.[56]

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[52] Rosa M. Abrantes-Metz and Albert D. Metz, *Can Machine Learning Aid in Cartel Detection?* CPI ANTITRUST CHRONICLE 1 (2018).

[53] For instance, the Greek competition authority mentioned that they "have a screening tool and are currently working on more [...], but of course need more data for that, like quantities, like costs to use more algorithms. [They] are basing the platform on open data which anyone can get and this is limited data because no company will give its data to anyone to use it in a way that will not help them". Also, for the Luxembourgish competition authority, a problem is "to have more data and be able to surveil the market in a more systematic way, to have a better idea of what is going on in each market". The French competition authority has started to experiment with machine learning solutions, "but it's hard because there is no training data set". Finally, the Swedish competition authority mentioned that they "have some screening tools to detect cartels that [they] use when there is enough data and too often there is not enough data".

[54] Jay L. Himes, Jason Nieh, and Ron Schnell, *Antitrust Enforcement and Big Tech: After the Remedy Is Ordered*, 1 STAN. COMPUT. ANTITRUST 64, 78 (2021); Schrepel, *supra* note 8, 5; Quinn, Brand and Hunt, *supra* note 25.

[55] Rosa M. Abrantes-Metz and Albert D. Metz argue that the use of ML and AI methods will only "expand the toolkit" of economists and economic theories, but detection of cartels would still be based on economic expertise with the help of computational skills. Hence, AI and ML will not "replace the need for economic theory and discipline". Abrantes-Metz and Metz *supra* note 52.

[56] Data obtained from: Concurrences, *3rd Cartels Workshop: An advanced seminar on substantive and procedural EU developments – Substantive and Procedural issues* (19-20 January 2022).

For these reasons, some law firms are developing in-house search tools with machine learning features, to easily recognize documents protected by LPP before handing them over to the agencies.[57] This is particularly relevant in situations involving high volumes of data. According to interview data, the Swedish Competition Authority (*Konkurrensverket*) is also working on a project that uses natural language processing systems to identify names and anonymize texts and subsequently identify protected documents before they are handed out. This points to the larger issue of the protection of procedural and defense rights in the phase of the investigation.

One example is the right of a party to access their file. Whether this includes raw data following an AI search of data made available in an investigation is not clear. Problems with such access could arise particularly due to "the complexity and opacity of machine learning (black box effect) [...] to enable an addressee to fully understand the Commission's evidence and processes in a sufficiently transparent manner."[58] On the other hand, for the Commission to also disclose the AI search code would not help in the context of machine learning technology as it might be difficult to understand it for a non-IT expert, and overall might be deemed problematic in the protection of the Commission's possibilities to conduct meaningful investigations.

Further, in the phase of the investigation, market definition is one of the necessary steps in order to identify an infringement of competition law. Defining the relevant market could benefit from the arrival of sophisticated computational tools. In this phase, the use of econometric models is encouraged by the Commission, as stated in its notice on the definition of the relevant market.[59] Market definitions could be undertaken with the help of screening tools, already discussed above in the context of agenda setting, to enhance econometric analysis.[60] The process for defining the relevant product and geographic market is a data-intensive sector, with data concerning price elasticity, demand, and supply substitutability.[61] Where quantitative techniques based on economic analysis are employed, machine learning algorithms can likewise be developed. For instance, it has been suggested to use deep learning techniques to identify the "product-market boundaries" and "understand the dynamics of market structure."[62] Considering the challenges to defining the relevant market, especially in the digital era, it could be possible to leverage the use of computational tools to help competition authorities in their tasks to identify the relevant market for enforcing competition law. Furthermore, the accuracy of certain machine learning systems and the speed in

[57] Information provided in an interview with a law firm.
[58] Andreas Von Bonin and Sharon Malhi, *The Use of Artificial Intelligence in the Future of Competition Law Enforcement*, 11 JOURNAL OF EUROPEAN COMPETITION LAW & PRACTICE 468, 471 (2020).
[59] European 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> (last visited on Mar. 28, 2022).
[60] Abrantes-Metz, *supra* note 34; Abrantes-Metz and Metz, *supra* note 52.
[61] European Economic & Marketing Consultants *supra* note 59. *See also* Sebastian Wismer and Arno Rasek, *Market definition in multi-sided markets* (Hearing on Re-thinking the use of traditional antitrust enforcement tools in multi-sided markets, OECD 21-23 June 2017).
[62] Yi Yang, Kunpeng Zhang and P.K. Kannan, *Identifying Market Structure: A Deep Network Representation Learning of Social Engagement*, 86 JOURNAL OF MARKETING 37, (2022).

analyzing data could overcome some of the criticism of econometric analyses, such as the complexity of methodology and time constraints.[63] But the above-discussed problems concerning training data would apply at this stage also. Furthermore, if it is not explainable how an AI tool has conducted its market modeling, such lack of explainability might hamper the evidential value of the modeling of the market definition.

On the other hand, it is also unclear whether markets which rely on machine learning technologies, for example for pricing decisions, can at all be supervised without the help of "supervisory" AI technology re-modeling what was observed on the markets. The hurdles, however, are high. Such an approach would require that at any given time, data would need to be recorded and made available to investigatory software by regulators, which shows the available information and the decisions taken by an algorithm in the market. These are very high data retention requirements, which, to our knowledge, are currently non-existent in product or services markets.

C. Decision-making and monitoring phase

The *decision-making phase,* which can lead to decisions requesting behavioral changes and can result in decisions fining companies for infringing competition law, could also be used to identify appropriate behavioral changes and the conditions that lead to the calculation of a fine. Projects that rely on training machine learning algorithms on past antitrust cases that can be "used for assisting antitrust enforcers in regulating markets" are ongoing.[64] Past decisions of national and international competition authorities could then be used as input to train machine learning algorithms and analyze elements that drove decisions in past cases and evaluate the outcome. Accordingly, such a tool could help shape the decision-making process by relying on a benchmark that ensures that similar cases are treated in a similar way.[65] Machine learning solutions have the great advantage of being able to analyze huge amounts of data that would be impossible to process for a human being in the same time frame.

Finally, the subsequent *monitoring phase* could be automated as well. Computational tools could be used when the remedy is ordered, especially for an online company, to ensure compliance.[66] For instance, in cases of anticompetitive behavior of tech companies, among the remedies, they could be ordered not to upload certain contents on their web page, such as links or ads, and this could easily be monitored using advanced software tools.[67]

[63] "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, *supra* note 61, 14.
[64] Giovanna Massarotto, *Antitrust Settlements: How a Simple Agreement Can Drive the Economy,* INTERNATIONAL COMPETITION LAW SERIES (Wolters Kluwer 2019);.
[65] Interview with one Competition Authority.
[66] Himes, Nieh, and Schnell, *supra* note 54.
[67] *Id.*

IV. Challenges

One central challenge for introducing the use of ADM tools in competition enforcement by agencies as well as for developing accountability mechanisms consists of designing the interfaces between human action and information technology. The above-discussed use of ADM systems in different phases of decision-making procedures has underlined that there are interactions between various ADM systems or different admixtures of human input into decision-making procedures and elements of ADM. Boundaries between human and automated decision-making are thus not always clear.[68] In real-life competition enforcement the examples discussed above also show that ADM systems are generally only one tool among several to be relied on by a human decision-maker, who ultimately may bring their judgment to make the final decision.[69] ADM systems will become part of competition authorities' toolkit to enforce competition law, but case handlers would still prepare final decisions, considering the great level of discretion a competition authority usually has. This does not exclude that generative AI tools as being increasingly rolled out for public use, being employed in the drafting process. Therefore, integration of ADM into decision-making procedures could, in most cases, be described as augmented decision-making or as "quasi- or semi-automated decision-making".[70] This results in factual changes to conditions of decision-making, which in turn must be understood from a normative point of view.

A. Quantity and quality of data processing and data biases

In assessing the human-machine interfaces in the context of semi-automated decision-making with ADM technology, the impact of the integration of ADM technologies into the decision-making process concern not only the quantity of information and the speed by which information can be processed (quantitative effects) but also the quality and depth by which information can be analyzed (qualitative effects).

1. Quantitative effects

The quantitative effects consist primarily in increasing the volume of information that can be incorporated into decision-making and rule-making procedures. This consists in extracting greater amounts of relevant information from public or private data collections as well as combining various data sets across sources. This approach is particularly useful in areas where fast-paced decision-making takes place – such as banking, energy and digital markets – areas where considerable market data may be essential for the capability of reacting to and influencing market conditions by regulatory means.

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[68] Algorithm Watch, *supra* note 3, 9.
[69] Cobbe, *supra* note 6; Jean-Bernard Auby, *Le droit administratif face aux défis du numérique,* ACTUALITE JURIDIQUE DROIT ADMINISTRATIF (2018), 835.
[70] Council Of Europe, *Algorithms and Human Rights: Study on the Human Rights Dimensions of Automated Data Processing Techniques and Possible Regulatory Implications* (The Committee of Experts on Internet Intermediaries (MSI-NET) 2018) 7; Demková, *supra* note 7.

However, in terms of quantity of data, the question is whether the data is complete. Incomplete data can be problematic as it will skew the result of an ADM procedure by what research in political science and sociology has described as biases.[71] Some authors alert to phenomena in data collection referred to as "sample bias, feature bias and label bias."[72] Within this terminology, a "*sample bias*" arises if data used by an ADM system to train software algorithms is in itself biased. A "*feature bias*" relates to different labeling or categorization of data across the data samples used by ADM systems which do not allow a system to properly identify the necessary input. If confirmed, this may become problematic in interoperative or composite databases. 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 the categorization of certain data points, a phenomenon described as "*label bias*" which may arise if a variable contains too many elements, each having an effect on output.

Where such biases may manifest themselves, the informational input into the decision making may become incomplete. The reason is that due to the selection of relevant information under conditions of biased criteria, certain information would not be taken into account in the decision-making process. Without the bias, such information should have weighed in the overall assessment of a situation. Therefore, the existence of the various types of biases described as sample bias, feature bias and label bias may lead to sub-optimal data processing, which in itself might lead to problems with the use of an ADM system in decision-making. It may be important to note, however that the fact that biases arise is not exclusive to decision making by ADM systems since also human decision-making may suffer from biased approaches. But the scale and speed of decision making with ADM systems as well as the systematic nature of such biases when arising in ADM systems may add to the problematic nature of biases in automated systems.

2. Qualitative effects

The increased use of ADM system also has qualitative effects. For example, the computing power underlying ADM systems will allow the comparison of data sets and matching information which would not have been possible for human-only analysis. Qualitative effects also arise where algorithms are programmed to improve search results by drawing comparisons between current analytical results and prior analytical results, making decisions built on probabilities based on statistical comparisons.[73] In competition law, this may work for market analysis regarding past markets, but it is difficult to implement regarding future situations and assessments like, for example in merger control. More generally, algorithms which calculate outcomes based on factual correlations of data collected in the past will not necessarily include normative statements about the future.

[71] It is unclear whether the biases of humans are temporary findings, which can change over time with ever more ADM technologies being rolled out, or whether these findings as to human biases are long-term structural features. In any case, when designing systems which necessarily link humans to ADM technology such findings should be taken into account.
[72] Aziz Z. Huq, *Constitutional Rights in the Machine Learning State,* 105 CORNELL L. REV. 1875, 1924 (2020), https://www.cornelllawreview.org/2020/11/19/constitutional-rights-in-the-machine-learning-state/.
[73] Auby, *supra* note 69, with further references also to Dominique Cardon, *À quoi rêvent les algorithmes. Nos vies à l'heure des big data*, Paris, Le Seuil, 2015, 39.

In terms of quality, dangers of biases have also been discussed in the literature. Some authors alert to the possibility of a so-called "automation bias", an effect under which humans are reported to tend to find input arising from an automated system more persuasive than human-only analysis.[74] Such bias might affect discretionary decision-making, when the exercise of discretion is influenced by input based on an ADM system.[75] ADM technologies therefore not only inform and improve human decision-making by allowing it to take into account more data, but they may also shape, constrain, or limit human discretion by structuring information intake. Automation bias, if confirmed, may thus entail the risk of officials "shirking of responsibility" to the benefit of ADM output.[76]

In summary, both qualitative and quantitative effects allow for faster and more data-reliant decision-making procedures than human-only analysis of databases. In some areas, it cannot be excluded that EU legal principles such as the "duty of care" requiring full and impartial assessment of all relevant facts prior to decision-making, might even *de facto* require the use of advanced data collection and computation systems in decision-making.[77] The reason is that under EU law's duty of care, a decision may be invalidated or annulled when it is shown that the decision-maker failed to examine "carefully and impartially all the relevant aspects of the individual case" and reason their decisions on this basis accordingly.[78] The quantitative element of the obligations defined by the CJEU under the duty of care requires the collection and examination of all relevant aspects[79] of a case which may have a bearing on the adoption of a measure,[80] including in cases where the decision maker has discretion.[81] The qualitative effect is related in that a reasoned decision must actually ensure that the decision is based on this analysis. According to the CJEU in *Tetra Laval,* the decision maker must especially analyse "all the information which must be taken into account in order to assess a complex situation".[82] Where the complete picture of a situation cannot be sufficiently modelled without automated analysis of complex datasets, for example in largely data-driven markets such as in finance, relying on human-only analysis might simply not be regarded sufficient to pass the "full and impartial assessment of all relevant facts" test.

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[74] "[A]utomation 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". Cobbe, supra note 6, 641. See also Karen Yeung, *Why Worry about Decision-Making by Machine*, in ALGORITHMIC REGULATION 25, 21-48 (Karen Yeung & Martin Lodge, eds., Oxford University Press 2019), with reference to LJ Sktika, K Moiser, MD Burdick, *Accountability and Automation Bias* 52 INTERNATIONAL JOURNAL OF HUMAN-COMPUTER STUDIES 701 (2000).

[75] Demková, *supra* note 7, section 3.1.

[76] Matthew L. Smith, Merel E. Noorman, & Aaron K. Martin, *Automating the Public Sector and Organizing Accountabilities,* 26 COMMUNICATIONS OF THE ASSOCIATION FOR INFORMATION SYSTEMS 1, 4 (2010), https://aisel.aisnet.org/cais/vol26/iss1/1.

[77] *See* for the details of the obligations under this principle: Herwig C.H. Hofmann, *The Duty of Care in EU Public Law – A Principle Between Discretion and Proportionality,* 13 REVIEW OF EUROPEAN ADMINISTRATIVE LAW 87, (2020).

[78] *Id.,* para 48 with reference to Case C-269/90 *Technische Universität München* [1991] EU:C:1991:438, para 14 and Case C-349/07 *Sopropé* [2008] EU:C:2008:746, para 50.

[79] Case C-269/90 *Technische Universität München v Hauptzollamt München-Mitte* [1991] EU:C:1991:438.

[80] Case C-408/04 P *Commission v Salzgitter* [2008] EU:C:2007:491, Opinion of AG Bot, para 265.

[81] Case C-269/90 *Technische Universität München v Hauptzollamt München-Mitte* [1991] EU:C:1991:438 para 14.

[82] Case C-12/03 P *Commission v Tetra Laval* [2005] EU:C:2005:87, para 39.

B. Integration of ADM into competition law enforcement

The integration of ADM systems into distinct phases of competition law enforcement may affect various elements of the procedure.

1. ADM systems and discretion

As stated, ADM systems are, to date, only very rarely established to undertake an entire decision-making procedure from initiation to enforcement. They are instead deployed in single phases of an administrative procedure. This currently holds true especially in terms of competition law enforcement by public agencies, where ADM tools are just beginning to come into use. Would the use of ADM technologies within a phase of a decision-making procedure therefore *de facto* or *de jure* limit the discretion of a human decision-maker in a later phase of the same procedure?[83] For example, when used for establishing predictions in risk assessment procedures, such as assessment of an abuse of dominant position on the market, ADM could lead to the conclusion that specific acts of control and enforcement may be necessary. Such predictions might limit discretion concerning the assessment of whether or not to act. Such predictions might also equally create an obligation to react to the automated risk assessment.[84] This example illustrates how the use of ADM in early phases of decision-making, such as the phase of initiation or investigation, might have effects in subsequent phases of decision-making.

Although using predictions in normative decision-making is not foreign to legal reasoning, in competition law enforcement, problems concerning automation bias that would limit or remove human discretion may arise. The use of ADM systems in one phase, e.g. agenda setting, could influence the decision to initiate an investigation and inspect a company or even to issue a final decision. In this regard, the use of statistical and econometric tools is already applied in competition law to help corroborate findings of anticompetitive behavior, thereby influencing the following enforcement phases.

In the event a case handler decides not to follow the outcome of an econometric analysis, she has to explain the basis of that decision. This could be even more complicated if applied to ADM systems considering the black-box nature of some AI and lead to consequent problems of intelligibility. Furthermore, case handlers are rarely computer scientists with IT expertise and their understanding of such systems could be limited.[85] As a result, outcomes from ADM systems would likely

[83] Maja Brkan, *Do algorithms rule the world? Algorithmic decision-making and data Protection in the framework of the GDPR and beyond*, 27 INTERNATIONAL JOURNAL OF LAW AND INFORMATION TECHNOLOGY 91, 105 (2019). The author finds that "at least theoretically, a legal possibility of fully automated decisions is still a matter of the future", yet reminds that in practice often decisions are increasingly fully automated. See in this respect the "human in the loop" as a minimum safeguard under Article 22 against decision-making based solely on automated processing of personal data in the GDPR context.

[84] This would affect the discretionary decision whether to act – be it for investigative purposes or the purpose of taking a final binding decision (in German this is referred to with the more specific term of *Entschliessungsermessen*). See Yoan Hermstrüwer, *Artificial Intelligence and Administrative Decisions under Uncertainty*, REGULATING ARTIFICIAL INTELLIGENCE 215, 200-221 (Tho Wischmeyer & Timo Rademacher eds., 2020).

[85] *See, e.g.,* Yann Guthmann's intervention from the French Competition Authority at the Computational Antitrust First Annual Conference: Exploring Antitrust 3.0, who explained that based on "an in-house

be considered and influence decisions. In fact, it might prove *de facto* impossible for a case handler to challenge ADM output by herself and even if feasible, it might be possible only with considerable effort and resources. Moreover, in case of errors, an officer having relied on the ADM might not be considered to have acted wrongly, despite having taken a decision which was later overturned, whereas an officer who challenged the ADM system and instead took a decision on the basis of an own assessment would have to justify the decision to a much higher degree including the justification of the choice of data taken into account, why the data suggested by the ADM system was deemed insufficient and many other factors more. The possible reasons to challenge such decisions would multiply and make the individual case-handlers reasoning quite difficult. These considerations show that the "biases", discussed above may also have simple hierarchical motivations as well.

2. Reason giving requirements

Further, in terms of the accountability of decision-making with the support of ADM, the interfaces between complex algorithms and the specific level or reasoning and evidence required in judicial review of competition decisions may cause concern.[86] The requirements imposed by the Court of Justice of the European Union (CJEU)'s general principle of a right to a reasoned decision are not ADM-specific but nonetheless directly relevant for ADM design. A decision must demonstrate compliance with essential procedural requirements. Obligations are frequently restated by the CJEU's requirement that a decision's reasoning must enable a concerned person

> "to ascertain the reasons upon which the decision taken in relation to him or her is based, either by reading the decision itself or by requesting and obtaining notification of those reasons, without prejudice to the power of the court with jurisdiction to require the authority concerned to provide that information, so as to make it possible for him or her to defend his or her rights in the best possible conditions and to decide, with full knowledge of the relevant facts, whether there is any point in applying to the court with jurisdiction, and in order to put the latter fully in a position in which it may carry out the review of the lawfulness of the national decision in question."[87]

This passage evokes a set of essential procedural requirements,[88] including compliance with the duty of care and the obligation to give adequate reasons for

survey inside the authority and we found the case handlers can be afraid of digital tools." Computational Antitrust First Annual Conference, *supra* note 18.

[86] Hofmann, *supra* note 4.

[87] Joined Cases 225 & 226/19, *R.N.N.S., K.A. v. Minister van Buitenlandse Zaken,* ECLI:EU:C:2020:951 para 43 (Nov. 24, 2020).

[88] *See, e.g.*, Case T-483/11, *Sepro Europe Ltd. v. Comm'n*, ECLI:EU:T:2013:407, para 162 (Sep. 6, 2013); Case T-554/10, *Evropaïki Dynamiki v. Frontex,* ECLI:EU:T:2015:224, para 79-81 (Apr. 22, 2015); Case T-786/14, *Bourdouvali a.o. v Council a.o.,* ECLI:EU:T:2018:487, para 389 (July 13, 2018); Case T-591/16 *Wahlström v. Frontex* ECLI:EU:T:2018:938, para 88 (Dec. 13, 2018); and Case C-442/15, *Pensa Pharma SA v. EUIPO,* ECLI:EU:C:2016:720, para 35 (Sep. 22, 2016).

the adopted measure.[89] These requirements must be complied with even where they are not explicitly or implicitly required under the specific EU legislation.[90] Generally speaking, reasoning is a concept requiring the administration to document their reflection on all matters which may be subject to later judicial review.[91] For example, the more important proportionality considerations are to a specific decision, the more the record must document indications that the competition authority considered all matters relevant to the exercise of such discretion.

The duty to give adequate reasons is a legal requirement in public law which in terms of AI systems and the general ADM discussion is discussed more generally in terms of the "explainability" of decision-making. Explainability can mean two things: on one hand, explainability of the ADM system, and, on the other hand, an explanation of the specific decision-making process in the individual case. Although in the context of advanced AI systems the general programming and processes might not be comprehensible to non-experts, this might not matter if such explanation would not yield many useful explanations for the individual decision-making output. For example, understanding current generative AI systems built on large language models using Internet content as a data source will not help explain the specific answer given by such a model to an individual request. On the other hand, accountability of public decision-making, including in competition law decisions, will depend on the explainability of the evidence used in decision-making for an individual decision, to show the source of the information used, which information was used, how such information relates to decision-making, and whether it actually supports the decision or not. The explanation of what led to an individual decision must therefore be considered to be part of the essential requirements of explaining the reasons of an act ensuring and enabling the effective review of a decision.

Therefore, advanced AI systems using machine learning can be problematic if these systems do not explicitly record and report the data used, the weighing of information and the reasons for the choice between different decision-making approaches. The "right to an explanation" with respect to ADM[92] based acts, is thus linked to the right to a reasoned decision and the degree of reasoning required mostly by the case law of the CJEU concerning the duty of care.[93] To some degree,

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[89] *See, e.g.,* Case C-166/13, *Mukarubega v. Seine-Saint-Denis,* ECLI:EU:C:2014:2336, para 43–49 (Nov. 5, 2014); Case C-604/12, *H. N. v. Minister for Justice, Equality, and Law Reform and Others,* ECLI:EU:C:2014:302, para 49 (May 8, 2014); and Case C-521/15, *Spain v. Council,* ECLI:EU:C:2017:982, para 89 (Dec. 20, 2017).

[90] Joined Cases 225 & 226/19, *R.N.N.S., K.A. v. Minister van Buitenlandse Zaken*, ECLI:EU:C:2020:951, para 33–34 (Nov. 24, 2020), where the Grand Chamber reiterates that "Article 41 of the Charter reflects a general principle of EU law, which is applicable to Member States when they are implementing that law, to the effect that the right to good administration encompasses the obligation of the administration to give reasons for its decisions." With further reference to Case C-230/18, *PI v. Landespolizeidirektion Tirol*, ECLI:EU:C:2019:383, para 57 (May 8, 2019).

[91] The right to a reasoned decision is a right guaranteed under the right to good administration, explicitly given in Article 41(1)b) CFR, as well as under the right to an effective judicial remedy, as also recognized in Article 47(1) CFR.

[92] Lilian Edwards & Michael Veale, *Slave to the Algorithm? Why a "right to an Explanation" Is Probably Not the Remedy You Are Looking For*, 16 DUKE LAW & TECHNOLOGY REVIEW 18 (2017); Bryan Casey, Ashkon Farhangi & Roland Vogl, *Rethinking Explainable Machines: The GDPR's "Right to Explanation" Debate and the Rise of Algorithmic Audits in Enterprise* 4 BERKELEY TECHNOLOGY LAW JOURNAL 143 (2019) 3.

[93] C-405/07 P *Netherlands v Commission* [2008] EU:C:2008:613, para 56; C-12/03 P *Commission v Tetra Laval* [2005] EU:C:2005:87, para 39 ; C-367/95 P *Commission v Sytraval and Brinks France* [1998] EU:C:1998:154, para 60, 62; Case C-269/90 *Technische Universität München v Hauptzollamt München-Mitte* [1991] EU:C:1991:438; C-269/90 *Technische Universität München* [1991] ECR I-5469, para 14.

elements of this requirement have been proposed in the Commission's draft AI Act.[94] But its Article 12, which lays down a series of requirements for AI systems to keep record of the steps taken to ensure traceability, does not cover all the necessary standards for reaching a decision under the CJEU's duty of care standards.[95] This does not exclude that in certain cases where this is helpful to understand decision-making and necessary under the reasoning obligations of decisions, the duty to give reasons in individual cases might also require explanations concerning the system-level functioning and logic of programs used in ADM.[96]

In fact, under the duty of care, the right to a reasoned decision arguably requires competition authorities to provide explanations as to the input taken into account in the decision-making process and the outcome resulting therefrom.[97] An inadequately reasoned decision will thus potentially be in breach of the "duty of care" which, as an essential procedural requirement, may lead to an annulment of the contested measure in case of contestation in court. Reasons must demonstrate that the decision was taken on the basis of "the most complete factually accurate, reliable and consistent information possible".[98] And where in competition law enforcement, the use of machine learning as screening tools may lead to opening an investigation and conducting unannounced inspections at the premises of the companies concerned, the CJEU has also laid down that the Commission must show that it "has serious indicia of an infringement" in order to justify certain enforcement measures.[99]

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[94] European Commission, Proposal for a Regulation of the EP and the Council laying down harmonised rules on Artificial Intelligence (Artificial Intelligence Act) of 21.4.2021, COM(2021) 206 final, 2021/0106 (COD).

[95] Article 12 of the Commission's draft AI act provides for "high-risk AI systems" that they "shall be designed and developed with capabilities enabling the automatic recording of events ('logs')" and "ensure a level of traceability of the AI system's functioning throughout its lifecycle" and "the logging capabilities shall provide, at a minimum: (a) recording of the period of each use of the system (start date and time and end date and time of each use); (b) the reference database against which input data has been checked by the system; (c) the input data for which the search has led to a match; (d) the identification of the natural persons involved in the verification of the results".

[96] Coglianese and Lehr, *supra* note 6, at 1207 (state that reason giving will require to also "disclose algorithmic specifications, including the objective function being optimised, the method used for that optimisation and the algorithm's input variables.").

[97] Hofmann, *supra* note 4, at 34.

[98] Hofmann, *supra* note 4, at 36-37; *see also* Hofmann, *supra* note 77 *at* 100 (citing *inter alia* Case C-525/04 P *Spain v Lenzing* ECLI:EU:C:2007:698, at 57 where the Court reiterated that "not only must the Community judicature establish whether the evidence relied on is factually accurate, reliable and consistent but also whether that evidence contains all the information which must be taken into account in order to assess a complex situation and whether it is capable of substantiating the conclusions drawn from it.").

[99] Case T-249/17, *Casino, Guichard-Perrachon, Achats Marchandises Casino SAS (AMC) v European Commission*, para 114. The court continued stating 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" [117]. "[T]he Commission must state as precisely as possible the presumed facts which it intends to investigate, namely what it is looking for and the matters to which the inspection must relate. More specifically, the inspection decision must contain a description of the features of the suspected infringement, indicating the market thought to be affected, the nature of the suspected restrictions of competition and the sectors covered by the alleged infringement to which the investigation relates, and explanations of the way in which the undertaking is supposed to be involved in the infringement." [110]. "[...] It is important to enable the undertakings covered by inspection decisions imposing obligations on them [...], to grasp the reasons for those decisions without excessive interpretative effort, so that they can exercise their rights efficiently and in good time." [111] "It is settled case-law, moreover, that the Commission is required to disclose in detail in the decision ordering an inspection that it had in its file information and indicia providing reasonable grounds for suspecting the infringement of which the undertaking subject to inspection is suspected". [114].

Therefore, since the use of AI systems in one phase of competition law enforcement would influence measures adopted in the final decision, the outcome of such computational tools should be intelligible and explainable so as to meet the legal standards set by reasoning requirements under the duty of care standards established by the CJEU.[100] The transparency requirement, which is debated when ADM systems are employed, is linked to the right of a reasoned decision, and it is discussed what should be in fact disclosed in order to make such computational tools understandable and provide an explanation of their use.[101] Problems may stem from understanding which data will be the input for a decision, how such information has been weighted, and how its evaluation would provide a decision-making proposal.[102]

Also, for competition law, the use of AI-based computational tools, therefore, requires agencies to undertake comprehensive recordings of any operation within a system. For example, under Article 12 of the cited EU Commission's draft AI Act, "the input data for which the search has led to a match" must be recorded and, under the duty of care, explanations must be given as to the information that was used for the decision-making and its relevance for the final decision. Together, these requirements may result in increased traceability of data and an enhanced capacity to review its processing within an AI system than would be possible by purely human investigations.[103] These requirements might be stricter than those required from purely human investigations. But this would mark an increase in the accountability of competition law enforcement. Explanation in individual decision-making could therefore concern the functioning and the logic of the system chosen, as well as documents and reports of processing activities within the system,[104] ideally with a view to ensuring that such reports are understandable for non-experts in the field.[105]

VI. Outlook

Computational antitrust promises to contribute to the efforts of enforcing competition law in the digital era. However, risks and challenges need to be carefully considered. Competition authorities seem to have understood that ADM systems and other technological tools can provide them with powerful instruments for enhancing internal efficiency by accessing greater amounts of data from more diverse sources and computation thereof at a greater speed than human analysis could offer. Thereby, for example, competition authorities can hope to better understand the dynamics of markets and the factors influencing competition

[100] For instance, the use of machine learning as screening tools in the initiation phase. Hofmann, *supra* note 4, at 15.
[101] *Id. See also* Coglianese and Lehr, *supra* note 6.
[102] Hofmann, *supra* note 4, at 28 & 37; *see also* Ida Koivisto, *The Anatomy of Transparency: The Concept and its Multifarious Implications,*09 EUI MWP Working Paper, (2016).
[103] Hofmann, *supra* note 4, at 29; Herwig C.H. Hofmann & Morgane Tidghi, *Rights and Remedies in Implementation of EU Policies by Multi-Jurisdictional Networks*, 20 EUROPEAN PUBLIC LAW 147 (2014) (discussing notions of tagging of information).
[104] Hofmann, *supra* note 4, at 37-38; European Union Agency For Fundamental Rights And Council Of Europe, *Handbook on European Data Protection Law* http://fra.europa.eu/en/publication/2016/handbook-european-law-relating-access-justice (last accessed March 29, 2017); *see also* Coglianese and Lehr, *supra* note 6.
[105] Hofmann, *supra* note 4.

therein, especially by being able to model interactions between actors and possible subsequent infringements of market participants.

Within competition authorities around the world, *ad hoc* digital units, pilot projects and experiments with AI and machine learning solutions are being undertaken. It is thus not un-reasonable to expect a not-so-distant-future where enforcers will increasingly rely on such tools, even if at the moment they have taken only the first steps in this direction. We are of the opinion that not only the efficiency of antitrust enforcement must be taken into account in the development of these tools, but also their effect on procedural rights and obligations of individuals must be defined. Programming of such tools must be understood to allow for compliance with legal principles. For example, the exercise of rights of defense, from hearing, access to a file, and the right to a reasoned decision must be ensured also in the context of automated decision-making based on the computation of high data volumes.

In summary, this paper has tried to highlight some possibilities for integrating ADM systems in certain phases of competition law enforcement. Interfaces between the AI systems, on one hand, and data collection, on the other, as well as AI systems and humans, need to be carefully designed. Potential consequences are that new technologies might affect the current accountability mechanisms for competition authorities. Among others, this paper has put forward the risk of changing the nature of discretionary decisions as a consequence of automation bias and the need to comply with the standard of a reasoned decision. By understanding benefits and costs, competition authorities should take advantage of the potential of technology for enforcement, while at the same time being aware of the necessity to develop computational tools that comply with legal principles and standards in their decision-making process.