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**DIRECTORATE FOR FINANCIAL AND ENTERPRISE AFFAIRS
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Summary of Discussion of the Roundtable on Algorithmic Competition

Annex to the Summary Record of the 140th Meeting of the Competition Committee held on 14-16 June 2023

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This document prepared by the OECD Secretariat is a detailed summary of the roundtable discussion on Algorithmic Competition, held during the 140th OECD Competition Committee meeting on 14-16 June 2023.

More documents related to this roundtable can be found at
www.oecd.org/competition/algorithmic-competition.htm

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Summary of Discussion of the Roundtable on Algorithmic Competition

By the Secretariat

1. Introduction by the Chair

1. On 14 June 2023, the OECD Competition Committee held a roundtable on Algorithmic Competition chaired by Professor Frédéric Jenny.

2. **The Chair** introduced the topic and stressed that discussions would build on the conclusions of a previous roundtable on algorithmic collusion. He explained the growing relevance of algorithmic decision-making across firms, which has led to accountability concerns. These concerns grow even bigger in the case of autonomous self-learning algorithms, which could lead to collusive behaviours even when they are not programmed to do so. The Chair noted the lack of relevant real-world cases of algorithmic collusion and stressed that algorithmic harm can expand beyond coordinated effects. He also pointed out to a trend among competition authorities to build algorithmic investigative capacities, through the creation of data units and the hiring of specialists. The Chair then proceeded to explain that the discussion would be structured in three parts:

- A presentation of algorithmic theories of harm, focusing on their implications for unilateral and coordinated behaviour and illustrated by cases from jurisdictions. This part would be in itself be divided in two: an examination of pricing algorithms that create competitive concerns and a discussion of search ranking and matching algorithms.
 - A discussion on the potential responses and remedies for algorithmic harm;
 - And a reflection on existing tools and methods to investigate algorithms.
3. The Chair introduced the five expert speakers who took part in the discussion, either online or in the room:
- **Michal Gal**, Professor of Law at the University of Haifa;
 - **Emilio Calvano**, Professor at the University of Rome and Associate Faculty at the Toulouse School of Economics; and
 - **Cathy O’Neil**, Data Scientist and CEO at ORCAA (O’Neil Risk Consulting & Algorithmic Auditing).

2. Background paper by the Secretariat

4. **The Chair** then thanked the Secretariat for its background paper, and asked the Secretariat to present its main findings.

5. **The Secretariat** explained that the paper is structured in three sections:

- A framing of the discussions on algorithmic competition;
- An outlining of the various algorithmic theories of harms;
- And the exploration of authorities’ options for investigating algorithms.

6. Regarding the first section, the Secretariat explained that the paper defines the types of algorithms discussed and assesses their prevalence in the wider economy. The paper contains the broader definition of algorithms as a list of operations that transforms inputs into outputs, and it clarifies that two types of algorithms are particularly relevant in the competition policy domain: (i) pricing and monitoring algorithms; and (ii) search recommendation and allocation algorithms. These are usually reliant on machine and deep learning technologies, although firms also resort to simpler versions. Based on a set of surveys by competition authorities, the paper finds a widespread adoption of pricing and monitoring algorithms across jurisdictions, which has led to both benefits and threats for consumers and competition.

7. Based on these potential threats to consumers, the second section of the paper discusses algorithmic theories of harm, which are grouped in three categories: algorithmic collusion, algorithmic exclusionary conduct (such as self-preferencing) and algorithmic exploitative conduct. The Secretariat clarifies that most enforcement cases relate to explicit collusion through self-preferencing, and that autonomous tacit algorithmic collusion is widely considered unlikely, given the lack of successful cases. However, extensive academic research identifies this autonomous tacit collusion as a real threat.

8. Lastly, the third section is sub-divided into five sections that address the mechanisms available to competition authorities in their algorithmic investigations, referring to necessity, feasibility, methods, resources and expertise needed, and potential benefits of collaboration. This section acknowledges that algorithms are diverse in their complexity and for this reason appropriate investigation techniques will be case specific. But the Secretariat also stresses that accessing input and output data, or even the source code, will be needed as investigative methods, which can be supported by documental review and staff interviews. Lastly, this third section introduces the few cases in which authorities have successfully investigated algorithms, thanks to the creation of data units and the development of in-house capacities.

3. Algorithmic theories of harm

9. **The Chair** thanked the Secretariat for its background paper, and introduced the first part of the roundtable's discussion. He then asked **Professor Calvano** to present his views on algorithmic theories of harm.

10. Professor Calvano stressed that his intervention would aim to present expanding academic debates on algorithmic competition.

11. Research on algorithmic competition is scattered across disciplines (economics, computer sciences, competition law) which do not always speak to one another. A first key step in the study of an algorithm's impact is its definition, and the literature diverges on this end. This is because algorithms serve multiple goals. They reduce uncertainty by predicting important economic quantities with precision, they provide informational advantage for big platforms as they leverage users' data to inform managerial decisions, they can be trained as commitment or coordinating devices, and they can be implemented as market design tools in the coordination of economic activity. Professor Calvano explained that this functional diversity of algorithms inevitably leads to different theories of harm.

12. He stressed that the exploration of these different theories must be preceded by a key distinction, already introduced by the Secretariat: deep or machine learning algorithms (AI algorithms) on the one hand, and rule-based algorithms on the other hand. The latter refers to algorithms that execute a set of instructions, while the former learn autonomously

and can perform tasks out of their own experience. It is deep or machine learning algorithms that pose a more challenging threat in terms of harms to competition and consumers. Professor Calvano gave the examples of an AI pricing algorithm that fails in its task and ends up setting excessively high prices, and recommender system mechanisms which predict consumer preferences and end up over-recommending to a subset of lucky products. He also explained how experiments have proven that in some cases algorithmic harm is non-intentional and is simply due to a failure of the algorithm. For this reason, harm could be considered either as an exploitative conduct or as reckless decisions by companies to deploy an algorithm that unintentionally harms competition, leading to different liability questions.

13. Besides failures that cause competitive harm, AI algorithms can also be successful, and learn how to effectively defeat competition and increase prices. In this regard, a recent theoretical strand shows that by decreasing economic uncertainty, deep and machine learning algorithms may facilitate tacit collusion. They could also be configured to establish exclusionary conducts through targeted prices and targeted manipulation of search results. This theoretical research has also proven that algorithms withhold information from users in order to push them towards specific choices.

14. Next, Professor Calvano introduces theories of harm that deal with alternative definitions of algorithms and focus on their role as coordinating or commitment devices. Furthermore, other theories of harm focus on firms delegating to a same company which operates a price setting algorithm, allowing them for a fast reaction to changing prices and ultimately leading to a lower incentive to cut prices which harms competition. Research has proven that pricing algorithms are restrictive in term of the strategies that they provide to firms, potentially leading to higher prices. There is also research on algorithms that lead to self-preferencing and biased rankings even when there is no price-based incentive, which leads to the placement of big platform's products ahead of better alternatives in search results.

15. Professor Calvano ended his intervention with a reflection a recent line of research that deals with price directed prominence. This refers to platforms in which buyers and sellers interact, which use algorithms to shift user attention towards cheaper products, therefore creating a non-levelled playing field: more emphasis is put on prices compared to a scenario in which there is no algorithmic interference. This is an example in which algorithms finetune the extent of competitive pressure in a market. A key question that Professor Calvano poses is whether the development of these algorithms follows the right incentives.

16. **The Chair** thanked the Professor for his presentation of theories of harm, and invited France to share its insights into the competitive risks of deep and machine learning algorithms.

17. **France** stressed that since the launch of ChatGPT in November 2022, conversational language models have sparked a major public debate. These models are becoming accessible for all internet users, with big platforms like Meta and Google developing their own versions. The delegate explained that conversational language models are trained through databases which optimize their hyperparameters. These hyperparameters act as a weight given to specific pieces of information, which allows them to make inferences and predictions for new data (from either open or private sources) on which they have not been trained. France clarified that the training of algorithms is expensive and resource intensive, and that based on these characteristics, it has identified a series of potential risks for algorithmic competition. First, a small number of companies that also enjoy a preferential position in other digital markets, which entails a potential reduction in competition. Second, entry barriers due to the significant investment costs

needed to enter the algorithmic market. Third, problems related to the use of training data. And last, self-preferencing and self-ranking.

18. **The Chair** thanked France for its intervention, and asked Portugal to share its experience in dealing with pricing algorithms.

19. **Portugal** stressed that the surveillance of algorithmic competition has been one of the main objectives of its Competition Authority. This surveillance has focused on how Portuguese companies use algorithms for monitoring competitors and set their prices. A recent 2021 survey from the Portuguese Authority explores the use of algorithms in the electronic products and online retailing sectors, and whether they were developed internally or by third parties. Resulting from this survey, Portugal tried to communicate with external developers, but the delegate stressed that since most of these are based abroad it was complicated to cooperate with them. For this reason, Portugal suggested international cooperation to map existing algorithm developers in their respective jurisdictions.

20. The 2021 survey also found that 21% of respondents systematically monitor competitors' prices, and that price monitoring is more frequent across large competitors. Regarding the monitoring tools, most large firms resort to software and information acquired from third parties, while most small and medium firms monitor prices manually. Portugal concluded its intervention stressing the widespread use of price monitoring algorithms among online large retailers, and that the use of pricing algorithms is less common.

21. **The Chair** explained that the Portuguese findings could be extended to other jurisdictions, and asked Brazil to present the results of its 2021 Ipiranga Consultation, which involved the review of a pricing algorithm in the petrol station retail sector.

22. **Brazil** clarified that its competition authority, CADE, has dealt with many cases involving the use of pricing algorithms, concluding that despite algorithmic collusion being the main policy concern, there is also room for more sophisticated practices like price discrimination or self-preferencing. The delegate explained that Ipiranga is one of the few large petrol distributors in Brazil, and that it planned to use a platform to gather data on the sales made by its affiliated resellers (i.e., gas stations) in order to suggest maximum prices. These suggestions would be made by a pricing algorithm considering certain features of the resellers' regional markets. Ipiranga had explained to CADE that its main goal was to bring down both wholesale and retail prices, as it planned to give discounts to gas stations if they agreed to set their prices below the maximum set by the algorithm. CADE concluded that this strategy was not legal, and made suggestions to mitigate anticompetitive risks: the platform could be used to only suggest optional maximum prices, and none of the information collected should be shared among the resellers. The Authority also recognized some competitive potential as the platform would incentivize lower prices.

23. **The Chair** raised the question of whether there had been discussions on the strategic lowering of prices by competitors, in order to affect the maximum price suggestions by the algorithm. **Brazil** explained that the maximum price suggestions were made individually to the gas stations, which cannot fully understand how these suggestions are made to other resellers. This would avoid coordinated effects.

24. **The Chair** then asked Spain to present the PROPTECH case, an ex officio investigation launched by its competition authority (the CNMC) on algorithmic price fixing.

25. **Spain** introduced the PROPTECH case, which refer to an online real estate intermediation in which operators were using the software to set minimum commissions and facilitate information sharing on confidential commercial information. For this reason,

the case was approached as a cartel. Investigations were launched ex officio in 2019, based on insights from the press and the operators' web pages, which led to several dawn raids. These investigations revealed the use of the Multiple Listing Service (MLS), a database where real estate brokers and agencies share listings, which was used to fix a fee for both the operator who found the property and the one who would finally find a buyer or a tenant. Participants made sure that the use of MLS became binding, as there was no other way to operate in the market. For this reason, the CNMC concluded that MLS entailed a price fixing through the setting of minimum fees and the exchange of confidential information. The investigation sanctioned two real estate franchisors who had launched the system and enforced the rules, and several IT companies who acted as facilitators. The delegate stressed that the case was launched ex officio thanks to the work of the CNMC's intelligence unit.

26. **The Chair** asked whether the investigation actually entailed an analysis of the algorithm. **Spain** clarified that although the case started from non-algorithmic investigations, later stages demanded an exploration of how the MLS platform worked.

27. **The Chair** then invited South Africa to present on a case referring to a market sharing agreement that was attained through the manipulation of an algorithm.

28. **South Africa** explained that its market inquiries into online intermediation platforms have revealed that algorithms shape the competitive landscape of online markets in which visibility (in various forms, such as rank, size or display) is very relevant. The delegate argued that operators with large resources can end up dominating online spaces and search engine optimizations. This refers to a virtuous circle, by which those players pay large sums to platforms to gain more consumer traffic, and platforms themselves then leverage these resources to entrench their own power.

29. South Africa then introduced the algorithmic manipulation case, which took place within Takealot, the country's largest e-commerce platform. During the Covid-19 pandemic, two operators coordinated through telephonic discussion the setting of prices and inventories of personal protection equipment that they sold on the platform. This coordination effectively manipulated the platform's algorithm in order to give each other higher ranks and visibility in the platform's search results. The delegate mentioned the use of AI tools to monitor prices and estimate demand by operators in the travel accommodation sector, and concluded by stressing the importance of screening tools for detecting price recommender systems.

30. **The Chair** thanked South Africa for its intervention and invited Korea to present on two cases relating to ranking and matching algorithms.

31. **Korea** presented the facts of the first of these two cases, Naver Shopping. Naver is the largest search engine in the country and operates as the most relevant platform for various services (including online marketplaces). The Korean Competition Authority (KFTC) found that it had secretly manipulated its search algorithms in order to self-preference its own products in the marketplace, therefore rising its market share in the online marketplace. The case, which constituted the first in which competition law was enforced against the self-preferencing of a platform operator, ended with the imposing of both severe sanctions and remedies by the KFTC.

32. The second cases presented by the Korean delegation referred to Kakao Mobility, the country's biggest taxi hailing operator. Through its app, Kakao provided hailing services for both standard and franchise taxis. The platform secretly manipulated its algorithm to favour the hiring of services provided by its own franchise taxi drivers, increasing its market share in the taxi market. The KFTC thus imposed sanctions on the platform for an abuse of its dominant position. Together, these two cases illustrated the

enforcement of competition law in the context of algorithmic manipulation by dominant platforms, and based on this experience, the KFTC enacted its online platform review guidelines, focusing on two points: first, the determination of an abuse of dominant position the Commission will consider effects by which power in one market is leveraged to a related market through algorithmic manipulation, and second, the guidelines details factors to account for in the determination of self-preferencing and algorithmic manipulation.

33. **The Chair** asked about the indicators and evidence that were considered to determine the manipulation of the algorithm in the Kakao case. **Korea** stressed the difficulty of finding evidence of algorithmic manipulation, and referred to dealings and calls that proved the platform's intention to manipulate the algorithm in their own benefit, along with evidence of higher margins in the hiring of the platform's drivers.

34. **The Chair** argued that this investigative approach focuses on the output of the algorithmic manipulation. He then asked Japan to present on a case involving an abuse of bargaining position in a restaurant reservation website.

35. Before explaining the case, **Japan** introduced the report by its competition authority (JFTC) on the restaurant reservation portal, which explored the modification of the algorithm and the violation of competition. This portal was scrutinized in the first place because of the large userbase and the importance of the portal for restaurants, and the report concluded that practices that arbitrarily ranked restaurants could entail discriminatory treatment. Back to the case, the trial started after a complaint by a group of restaurants for the discriminatory and arbitrary determination of their ratings. The court found the platform to have discriminated against certain restaurants through the operation of its algorithm, and plaintiffs explained that they had launched their complaint based on the conclusions of the JFTC's report.

4. Potential responses and remedies for algorithmic harms

36. **The Chair** opened the second part of the discussion, which aimed at exploring whether competition instruments are enough to address algorithmic theories of harm. He invited Michael Gal to reflect on this question.

37. **Professor Michal Gal** argued that competition law can address algorithmic harms, but only partially. In order to do so, certain assumptions must be changed and agility in the design of remedies is needed. The Professor presented five basic principles in this direction, (which relate to three main tools in the computational toolbox in the context of agreements, abuse and merger control): (i) algorithms themselves do not prevent antitrust enforcement; (ii) a human conduct that is prohibited should also be prohibited if it is conducted by a human; (iii) there is always a human involved at some level of the algorithm's operation; (iv) algorithms do not alter economic principles, but they may change the assumptions at the core of basic legal rules; and (v) algorithms often create mixed effects, as they enable technologies with potential benefits (such as cost reduction or lower prices). For this reason, regulators must balance the costs and benefits of algorithms. The Professor then introduced the role of algorithms as potential facilitators of abuse of dominance, and she presented two examples. First, regarding algorithmic predation, existing regulations assume that predatory practices are hardly feasible and therefore set high thresholds for proving them. However, algorithms challenge these assumptions: they allow for a more precise price discrimination that reduces potential losses, and they enable a subsidizing scheme for the predatory practices. This impact of algorithms on predatory pricing is illustrated in the case of Uber, which tried to attract drivers from its main competitor Lyft.

Uber developed an algorithm that detected drivers most likely to multi-home and use both platforms, in order to send them targeted offers.

38. Professor Gal explained how algorithms also increase both the feasibility and profitability of price discrimination for three main reasons: (i) they enable the calculation of personal willingness to pay; (ii) they lower the cost of setting personalized prices; and (iii) they even allow for price discrimination at the retail level. For these reasons, existing laws of price discrimination are challenged, and the economic models that inform them should be revisited. The Professor then proceeded to present two ways in which algorithms can serve competition authorities in the setting of remedies: (i) competition by design, in which authorities order the undertaking to modify the anticompetitive sources in the algorithm's code, although it might be difficult to identify these sources; and (ii) mandating the sharing of the unlawfully obtained data on which an anticompetitive algorithm has been trained.

39. Algorithms can also function as coordination facilitators, as Professor Gal explained, and become part of coordination agreements. In this regard, undertakings can coordinate either through the operation of their own algorithm or the exploitation of a third-party algorithm. However, most of algorithmic coordination refers to hub and spoke agreements, which brings new questions for competition authorities concerning: (i) the data that is collected; (ii) the users of the algorithm; (iii) the facilitation of coordination that the algorithm entails; and (iv) the existence of psychological effects, in which algorithmic price determination leads to higher prices among competitors. Regarding deep learning algorithms, Professor Gal referred to existing mechanisms to which authorities can resort to target coordination: their supervision of facilitating practices or plus factors and joint or shared monopolies. She supported the idea that authorities should focus on the conduct, rather than on the agreement, and stressed that the major challenge is the design of remedies. Lastly, Professor Gal addressed merger control as tool for combatting algorithmic coordination. In this regard, algorithmic coordination could incentivize mergers, and the use of algorithms impacts the calculation of thresholds. For instance, the application of the SSNIP test becomes problematic in cases of algorithmic price discrimination, and algorithms allow firms to accumulate in smaller markets which are not captured by traditional thresholds. Merger investigations should be extended in order to account for the learning dynamics of algorithms, and algorithmic remedied should be explored.

40. **The Chair** stressed the relevance of resorting to existing antitrust enforcement tools to tackle algorithmic coordination. He asked Professor Gal to expand on the potential use of counter-algorithms to fight anticompetitive behavior. **Professor Gal** clarified that these counter-algorithms could be not only those used by competitors, but also algorithms that are operated by consumers.

41. **Turkey** intervened to explain that its Competition Authority had been the first to investigate the functioning of an algorithm (which had led to self-preferencing practices) during a dawn raid, and asked other delegations to share if they had undergone similar on-site reviews of algorithms.

42. **The EU** took the floor to elaborate on the intersections between European legal standards and algorithmic collusion, which can be of two kinds. In this regard, algorithms might just be facilitators of previous collusive agreements, or they might be the collusive actors themselves (autonomously from human agreements). However, the viability of this second type of algorithmic collusion is still contested. Regarding algorithms which simply facilitate collusion, there is no substantial objection to the enforcement of current EU law provisions (and namely, Article 101 TFEU), although there might be some challenges regarding the collection of evidence. And in terms of algorithms that autonomously collude,

it is not clear whether they are already possible, but they will likely be developed in the near future. In these cases, undertakings benefiting from the collusion should be held liable. However, the finding of an agreement under current case law would be challenging: it is hard to find a “meeting of minds”, a “communication of mutual commitment” or a “concurrence of will” when there is an algorithm colluding autonomously. The EU concluded that it has yet no clear answer for the application of existing rules to algorithmic collusion, but it also clarified that any conduct prohibited for people should also be prohibited for algorithms. A potential solution could be a *culpa in vigilando* approach, by which undertakings are held accountable for the collusive impact of their algorithms.

43. **Professor Gal** stressed that while existing tools might be sufficient to tackle algorithms that facilitate collusive agreements, we do not currently have the appropriate mechanisms to fight autonomous algorithmic coordination.

44. **Professor Calvano** gave the example of recommender systems run through algorithms that estimate consumer preferences and match them with products or content to be consumed, which have been found to increase the market share of certain firms at the expense of others. These algorithms shape the competitive landscape beyond the control of the companies that operate them, and for this reason the Professor found the idea of *culpa in vigilando* to be useful. However, it is very hard for companies to anticipate the impact of algorithms, and close collaboration with authorities in their deployment is recommended.

45. **Norway** discussed the issue of remedies in algorithmic competition. Algorithms collect price information from competitors and swiftly react to competitors’ price changes. This quick response to price fluctuations is central to the theories of harm in horizontal algorithmic competition, as it allows firms to implement tit-for-tat retaliation strategies. In turn, these strategies incentivize competitors to set even higher prices. Furthermore, algorithms can also respond fast to changes in costs and demand. In terms of potential remedies to the restrictive effects of algorithmic pricing, Norway proposed a strict merger control policy that preserves market structure and the decrease of barriers to entry. Furthermore, regulations could restrict the frequency of price fluctuations and the collection of competitors’ price information. These remedies should be assessed on a case-by-case basis, as they could also reduce efficiency gains.

46. **Australia** referred to a case in the city of Perth, in which the competition authority resorted to the regulations introduced by Norway and restricted the time frequency of pricing for retail fuel. However, an unintended consequence led to price cycles becoming longer and prices going higher than in other regions without these regulations. The delegate added that a potential remedy could also be transparency measures, by which consumers are given access to the data on which competitors determine their pricing.

47. **Italy** presented a case in which its National Association notified to the competition authority its proposal to create an extensive database and operate algorithms in order to reduce fraud at the stage of claims. The proposal was focused on maximizing efficiency, but it also raised anti-competitive concerns which the authority and the Associations jointly addressed. Initially, the proposal aimed to detect fraud risks at both the writing stage of insurance contracts and the claim stage. However, the authority found that at the writing stage the database could lead to a standardization of contracts and increase insurers’ refusals to deal, and therefore the Association committed to not deploy the database and its algorithms at this stage. Furthermore, it committed to expanding access to the database to insurers who are not members of the Association and to only resort to the database on a case-by-case basis. The Authority also feared greater risks of collusion and impunity if the algorithm was fully autonomous and precise, and ordered the Association to commit to a human operation of the algorithm in which inputs are manually weighed. Overall, the

Italian delegate stressed the relevance of considering the precision of algorithms: the more precise, the higher the risk of collusion.

5. Existing tools and methods for algorithmic auditing

48. **The Chair** opened the third part of the discussion, focusing on the resources and challenges that authorities have for the analysis of algorithms.

49. **Cathy O’Neil** discussed algorithmic auditing based on the experience of her firm, ORCAA. The firm assists both regulators and companies in assessing regulatory compliance of algorithms. However, O’Neil explained that this auditing takes place without much guidance and takes place on a case-by-case basis, as algorithms keep developing. Algorithmic auditing must therefore be adapted to specific contexts, and pay attention to impacted stakeholders. In this regard, the most important component of algorithmic auditing is to discern what harm could be done by algorithms and to whom, an exercise which is not as technical as it might seem. Then, an important balancing must be made between accuracy and efficiency, as well as fairness and other considerations.

50. When taking the contexts of algorithms into account, the list of affected stakeholders could potentially grow excessively large. For this reason, O’Neil recommended focusing first on the most obvious concerns. Any initial evidence of wrongdoing by an algorithm should immediately be factored for the auditing. A next auditing step is the rating of the potential harms, to then choose the metric to define them. Ultimately, this is a black-box approach to the auditing of algorithms, which does not require an understanding of their functioning, just a measuring of their outcomes. When this measuring points to signs of harms or wrongdoing, the auditing suggests the modification of the algorithm, without getting involved in the modification process.

51. **Professor Calvano** advocated for an approach that aims to explore and test the functioning of algorithms. He stressed the importance of developing a strong methodological approach to the identification of algorithmic collusion. A key tool in this direction is empirical evidence, which Professor Calvano argued should be extracted from experiments which take a close look at the functioning and architecture of algorithms. Experiments can be of two kinds: (i) synthetic experiments, in which real algorithms are deployed in artificial environments, controlling the inputs and other factors; and (ii) field experiments, in which algorithms are deployed in real marketplaces. The latter are similar to the black-box approach introduced by O’Neil, and allows to make educated interactions in order to identify harms.

52. Synthetic experiments can create fake consumers and user preferences grounded on economic theory, to then create a high-quality data set and test the functioning of the algorithm. These experiments can overcome external validity challenges and provide a methodology to determine how pricing algorithms work, and therefore detect cases in which algorithms lead to anti-competitive behavior.

53. **Cathy O’Neil** restated her argument that algorithmic auditing does not require a profound understanding of how algorithms work, and claimed that synthetic experiments might not lead to conclusions applicable in real scenarios.

54. **Professor Gal** opined that the mind of algorithms can indeed be read, and presented five options for competition authorities to deal with algorithmic competition. First, the use of AI tools by authorities for their enforcement and supervision tasks, which becomes challenging in the case of self-learning algorithms that are constantly evolving. Second, the creation of data units which provide institutional agility by separating hard cases from cases

of algorithmic collusion. Third, the creation of interdisciplinary working groups. Fourth, use data trusts to increase the provision of information from the data sets on which algorithms run. And lastly, the adjustment of burdens of proof to make operators responsible for proving that algorithms are not causing harms.

55. **Professor Calvano** clarified that anticompetitive conduct could be identified simply through statistical tests or the collection of data, but this is very challenging. He gave the example of algorithmic self-preferencing, in which it is hard to prove the intentions of the operator. In this case, synthetic experiments can be a helpful tool for proving the harms of the algorithm.

56. **Canada** reflected on its recent Artificial Intelligence and Data Act, which has been designed as a framework piece of legislation. A key balancing exercise for this type of regulation must be made between detail and openness, since AI cuts across all areas of society and the economy. Canada has opted for a middle-ground regulatory approach, by which cross-cutting harms and algorithmic impacts are addressed, while also leaving room for individual regulatory bodies to implement regulations in their own vertical.

57. **Italy** asked speakers to share their thoughts on the impact of different business models on the use of algorithms by companies.

58. **Professor Calvano** answered that most algorithms are deployed in multisided businesses, with both business and end users. In this context, recommender systems are aligning more and more with platforms' business models as opposed to their original intent of simply increasing consumer engagement.

59. **Professor Gal** explained that business models must be considered as part of the broader scenarios which determine the results of algorithms.

60. **BIAC** claimed that, since effects of algorithms are very hard to explore, competition agencies should first look at their specifications. These refer to the instructions, the objectives, the data and the type of output of the algorithm. This could serve as an investigatory shortcut: instead of the challenging analysis of effects, it could be useful to look at the instructions that algorithms receive. Furthermore, the BIAC highlighted the relevance of algorithms for business success, and that the sharing of confidential algorithmic know-how should only be ordered as a last-resort measure. Competitors should only be granted access to the algorithm when there is a clear antitrust violation (which could be proven by only looking at specifications, without an analysis of the effects).

61. The **United Kingdom's** Competition and Market Authority (CMA) discussed the conclusions of a paper it had published in 2021, which categorized the techniques to audit and investigate algorithms in two: those that are applicable when the investigator lacks access to the algorithm and its information, and those applicable when the investigator does have access. The former cover web scraping of algorithmic outputs, synthetic experiments and automatic program interfaces. These techniques are valuable, but having access to the algorithm's code and data allows for a more detailed review. However, no technique is stronger than the other, and different toolkits should be deployed on a case-by-case basis. An updated version of the paper from 2022 expands the categorization to three: a governance audit assessing whether the operator followed correct governance policies, an empirical audit in line with Professor Calvano's proposals, and in-depth technical audits. The UK then presented a case in which this latter technical review proved to be effective, and a second case in which different techniques were combined.

62. **Australia** noted that, in cases of algorithms developed by third parties, representations of their commercial utility could be useful to determine the algorithms' purpose.

63. **Denmark** shared its experience with web scraping in algorithmic investigations, with the purpose of reverse engineering the algorithm and understanding its outcomes. However, web scraping becomes difficult for complex algorithms. For this reason, synthetic experiments are also a useful alternative, together with dialogues with the companies running the algorithm.

64. **Mexico** presented four main technical and procedural challenges in its analysis of algorithms. The first one refers to a lack of transparency, due to opacity in their design and the technical challenges. A second challenge is the digital transformation of Mexico's competition authority, including the use of algorithms as investigative tools. Third, there is the challenge of obtaining relevant information and data for algorithmic investigations, namely when it comes to foreign companies. And last, the long-term design of monitoring and verification mechanisms regarding compliance and remedies.

65. **Germany** agreed that the investigative approach varies depending on the specific algorithm, and that business processes are considered as part of the context in which algorithms are deployed. Initial investigative steps should be basic and could include the review of internal documents. Meanwhile, technical review (such as the study of the code) should be a later option to consider.

6. Conclusion

66. **The Chair** asked the speakers and acknowledged all the investigative difficulties that were presented during discussions, showing all the work ahead. Based on these ongoing challenges, the Chair proposed to hold a future roundtable on AI data and competition.