PRICING ALGORITHMS AND ANTITRUST ENFORCEMENT: SANDBOXES TO THE RESCUE?

BY PIETER VAN CLEYNENBREUGEL[1]

1   Pieter Van Cleynenbreugel LL.M. (Harvard), Ph.D (KULeuven) is Professor of law, University of Liège, Belgium; Guest Professor of competition law, Paris-Dauphine University, France and a part-time member of the Belgian Competition Authority. Research for this contribution benefited from funding by an interdisciplinary ARC research grant of the French Community of Belgium (DIGITALPLATFORMS, 2019-2024)). The opinions expressed in this contribution are the author's own. The author can be contacted at pieter.vancleynenbreugel@uliege.be

CPI ANTITRUST CHRONICLE
February 2024

Visit **www.competitionpolicyinternational.com** for access to these articles and more!

PRICING ALGORITHMS AND ANTITRUST ENFORCEMENT: SANDBOXES TO THE RESCUE?
By Pieter Van Cleynenbreugel

Pricing algorithms make it easier for businesses dynamically to respond to market tendencies and set prices in an instant manner. In doing so, they can contribute to more efficient price setting and better functioning markets. However, algorithms' potential for swift automated responses to market tendencies also increases the likelihood for collusive or other anticompetitive behavior or practices to emerge as well. Given the uncertainties accompanying the use of pricing algorithms and their impact on competition, this paper calls on enforcement authorities to consider a so-called "antitrust sandbox" approach. It outlines the promises and pitfalls of sandboxes in the particular context of pricing algorithms.

Scan to Stay Connected!
Scan or click here to sign up for CPI's **FREE** daily newsletter.

I. INTRODUCTION

Pricing algorithms make it easier for businesses dynamically to respond to market tendencies and set prices in an instant manner. In doing so, they can contribute to more efficient price setting and better functioning markets. However, algorithms' potential for swift automated responses to market tendencies also increases the likelihood for collusive or other anticompetitive behavior or practices to emerge as well. Although, at this stage, the potential for pricing algorithms to engage in autonomous anticompetitive behavior still seems limited, the antitrust risks associated with the use of increasingly powerful pricing algorithms cannot be excluded anymore. As a result, they would need to be taken seriously and incorporated in any businesses' compliance strategy and in enforcement authorities' monitoring activities.

Given the uncertainties accompanying the use of pricing algorithms and their impact on competition, this paper calls on enforcement authorities to consider a so-called "antitrust sandbox" approach. Sandboxes have been relied on increasingly by financial regulators in the field of fintech (financial technology). It will be submitted that, if and when used correctly, sandboxes may offer a tool enabling both enforcers and businesses to learn how to use pricing algorithms in a pro-competitive manner as well.

To that extent, this contribution first briefly summarizes the opportunities, risks and challenges pricing algorithms may bring to both businesses and enforcement authorities (II.). Confronted with those challenges, it argues that one way to address them could be through antitrust sandboxes. The contribution to that extent revisits the key characteristics and promises of those sandboxes (III.). On the basis of that analysis, it will identify four key practical issues requiring attention when envisaging sandboxes in the particular framework of pricing algorithms (IV.).

II. PRICING ALGORITHMS: THE NEW FRONTIER OF ANTITRUST ENFORCEMENT?

Pricing algorithms assist businesses in setting and adjusting their prices on the basis of a pre-determined set of criteria or guidelines.[2] Analyzing different data, often by means of artificial intelligence-fueled software, pricing algorithms are able to determine prices dynamically in accordance with those guidelines.[3] In doing so, they are a cost-efficient tool for businesses to keep track of changing demand and other market circumstances and reflect those directly in their prices.[4] However, the use of pricing algorithm software has also given rise to fears that algorithmic software may facilitate collusion and/or price discrimination.

First, it has been argued that algorithms' capacity to learn from data and past market behavior, but also to learn from each other may result in horizontal price fixing arrangements being implemented. By monitoring the market, they could be used to sustain a horizontal price fixing agreement between businesses or an anticompetitive vertical resale price maintenance mechanism.[5] As such, the algorithm would aid businesses in keeping (concealed) illegal behavior in place. Even more problematically, their data analyzing capacities may trigger them to learn not to compete with each other, which may in practice result in a price fixing concerted practice without any formal coordination between businesses.[6] A real-world study in the retail gasoline market in Germany has shown that algorithms can learn not to compete with each other.[7] From a legal point of view, questions in that last context arise as to whether that kind of behavior could or should result in antitrust liability.[8]

---

2   David Smith & Steven Tadelis, *Algorithmic Pricing: What Every Antitrust Lawyer Needs to Know* in THE PRICE POINT- newsletter of the American Bar Association Section of Antitrust Law Pricing Conduct Committee, Volume 22, Issue 1, Fall 2021, also available on https://www.analysisgroup.com/globalassets/insights/publishing/2021-aba-the-price-point-algorithmic-pricing.pdf, 2.

3   Jeanine Miklós-Thal & Catherine Tucker, *Collusion by algorithm: Does better demand prediction facilitate coordination between sellers.* 65 MANAGEMENT SCIENCE (2019), 1551-1562, https://doi.org/10.1287/mnsc.2019.3287.

4   See already, Robert M. Weiss & Ajay K. Mehrotra, *Online Dynamic Pricing: Efficiency, Equity and the Future of E-commerce,* 6 VIRGINIA JOURNAL OF LAW & TECHNOLOGY (2001) 11, available at https://www.vjolt.org/volume-6 and, more recently, David Krieghbaum Jr., *Algorithms Take Flight: Modern Pricing Algorithms' Effect On Antitrust Laws in the Aviation Industry*, 32 LOYOLA CONSUMER LAW REVIEW (2020) 282-317.

5   For general background, see Ullrich Schwalbe, *Algorithms, machine learning, and collusion* ,14 JOURNAL OF COMPETITION LAW & ECONOMICS (2019) 568-607. By way of example UK CMA, Decision of Aug. 1, 2019 of the Competition Markets Authority: Online Resale Price Maintenance in the Digital Piano and Digital Keyboard Sector, Case 50565-2, available at https://www.gov.uk/cma-cases/musical-instruments-and-equipment-suspected-anti-competitive-agreements-50565-2, p. 36-37, see also David Smith & Steven Tadelis, note 2, 4.

6   Emilio Calvano, Giacomo Calzolari, Vincenzo Denicolò & Sergio Pastorello, *Algorithmic Pricing What Implications for Competition Policy?*, 55 REVIEW OF INDUSTRIAL ORGANIZATION (2019), 155–171. https://doi.org/10.1007/s11151-019-09689-3.

7   Stephanie Assad et al., Algorithmic Pricing and Competition: Empirical Evidence from the German Retail Gasoline Market, (CESifo Working Paper No. 8521, 2021).

8   Compare Ariel Ezrachi and Maurice E. Stucke, *Sustainable and Unchallenged Tacit Algorithmic Collusion*, 17 NORTHWESTERN JOURNAL OF TECHNOLOGY AND INTELLECTUAL PROPERTY (2020) 17-60, https://scholarlycommons.law.northwestern.edu/njtip/vol17/iss2/2 217-260 with Jan Blockx, *Antitrust in digital markets in the EU: Policing price bots* in DIGITAL MARKETS IN THE EU 75 (Marc Veenbrink et al. eds. 2018)

Second, pricing algorithms could help businesses in setting a price for each individual customer on the basis of data collected pertaining to that customer.[9] By transforming each individual customer into a separate market, however, pricing algorithms may set the price at a level that would be considered unfair from either an individual or an overall competition law point of view.[10] As a result, pricing strategies thus developed could, depending on the circumstances, be considered anticompetitive as well.[11] Given the different learning mechanisms involved, it is nevertheless unlikely that one and the same pricing algorithm could both contribute to sustaining price discrimination and price fixing arrangements.[12]

It would seem that the potentially anticompetitive role played by pricing algorithms is in essence highly context- and market-dependent. In the current state of technology, the potency of pricing algorithms and their role in triggering (automated or algorithmic) anticompetitive behavior remains somewhat unpredictable.[13] However, that unpredictability has not halted (private and public) enforcement actions to take place in this context (e.g. in the United States the class actions against casino operators' software[14] and pending investigations against real estate leasing services providers[15]).[16] It is no surprise therefore that algorithmic pricing practices have been referred to as the "new frontier" of antitrust law.[17]

It transpires from the foregoing that applying antitrust provisions to pricing algorithms requires a careful and in-depth analysis of technological capabilities and operations. Any enforcement strategy either giving free reign to pricing algorithms or out rightly prohibiting their use is likely to be sub-optimal, considering that the purpose of antitrust enforcement should be to enhance consumer welfare and contribute to more efficiently-functioning markets. On the one hand, absent full knowledge about how pricing algorithms will steer businesses' strategies, giving those algorithms free reign may indeed give rise to anticompetitive behavior and imperfect competition. On the other hand, however, at the same time simply prohibiting their use is also likely to remove businesses from reaping the benefits of efficiency-enhancing tools making markets function better overall. Enforcement authorities' simply contemplating to prohibit the use of pricing algorithms may be sufficient for businesses to refrain from introducing those algorithms, given the antitrust liability risks that they may bring. That in itself may stifle innovation, as software designers would be confronted with less interest in what could be efficiency-enhancing pricing tools. As a result, a kind of negative spiral may emerge, resulting in pricing algorithms being abandoned overall as useful business instruments. As a result, neither enforcement choice results in what is best for a competitive market.

In order to avoid both sub-optimal antitrust enforcement and pricing algorithm development, a somewhat more nuanced and balanced pricing algorithm enforcement approach would seem welcome. In such an approach, both businesses and enforcement authorities would need to find common ground in understanding when pricing algorithms can be used, when their use needs to be restricted or when modifications or corrections to their functioning are needed. It is submitted that the proper use of so-called sandboxes could constitute a useful enforcement tool to achieve that objective.

III. SANDBOXES AS AN ANTITRUST ENFORCEMENT SOLUTION?

The sandbox notion refers to a controlled environment in which businesses can safely test a new product or service, especially in a heavily regulated context (A.). The comforting features of sandboxes nevertheless also make them a potentially useful instrument for the antitrust monitoring of pricing algorithms (B.).

---

9   However, privacy awareness may make this strategy more costly, see Paul Belleflamme & Wouter Vergote, *Monopoly price discrimination and privacy: The hidden cost of hiding 149 Economic Letters* (2016) 141–144.

10   Oren Bar-Gill, *Algorithmic Price Discrimination When Demand Is a Function of Both Preferences and (Mis)perceptions*, 86 UNIVERSITY OF CHICHAGO LAW REVIEW (2019), 217-254.

11   Marco Botta & Klaus Wiedemann, *To discriminate or not to discriminate ? Personalised pricing in online markets as exploitative abuse of dominance*, 50 EUROPEAN JOURNAL OF LAW AND ECONOMICS (2020), 381-404.

12   Axel Gautier, Ashwin Ittoo & Pieter Van Cleynenbreugel, *AI algorithms, price discrimination and collusion: a technological, economic and legal perspective*, 50 EUROPEAN JOURNAL OF LAW AND ECONOMICS (2020), 430.

13   See also Axel Gautier, Ashwin Ittoo & Pieter Van Cleynenbreugel, *Pricing Algorithms aren't colluding, Yet,* PROMARKET (Jul. 11, 2023), https://www.promarket.org/2023/07/11/pricing-algorithms-arent-colluding-yet/. Algorithmic design nevertheless needs to take into account this risk, see John Asker, Chaim Fershtman, & Ariel Pakes, *Artificial Intelligence and Pricing: The Impact of Algorithm Design* (NBER Working Paper No. 28535, 2021).

14   *Gibson et al. v. MGM Resorts International et al.*, No. 2:23-cv-00140 (D. Nev.) and *Altman et al. v. Caesars Entertainment, Inc. et al.*, No. 2:23-cv-02536 (D.N.J.).

15   Edward D. Rogers, Elizabeth P. Weissert & Haesun K. Burris-Lee, *Algorithmic Pricing – The 'New Frontier' of Antitrust Law,* BALLARD SPAHR LEGAL ALERT (January 5, 2024), https://www.ballardspahr.com/insights/alerts-and-articles/2024/01/algorithmic-pricing-the-new-frontier-of-antitrust-law.

16   See for an overview up to 2020, Claudia Patricia O'Kane & Ioannis Kokkoris, *A Few Reflections on the Recent Case Law on Algorithmic Collusion*, CPI ANTITRUST CHRONICLE (July 13, 2020), https://www.competitionpolicyinternational.com/a-few-reflections-on-the-recent-case-law-on-algorithmic-collusion/.

17   Edward D. Rogers, Elizabeth P. Weissert & Haesun K. Burris-Lee, *Algorithmic Pricing – The 'New Frontier' of Antitrust Law*, note 15.

A. Key Features of Sandboxes

A sandbox is a regulatory instrument allowing to test innovative propositions in a live – but yet "controlled" market environment with real customers.[18] The European Union legislator has recently agreed upon a working definition of sandboxes in the context of its Artificial Intelligence Act Regulation. According to that definition, a so-called AI sandbox is "a concrete and controlled framework set up by a competent authority which offers providers or prospective providers of AI systems the possibility to develop, train, validate and test, where appropriate in real world conditions, an innovative AI system, pursuant to a sandbox plan for a limited time under regulatory supervision."[19] As such a sandbox can be defined as a time-limited controlled environment or "safe space" established by a regulator, allowing for new products or services to be tested under close regulatory supervision and without risks of (strict) liability for businesses.[20]

The purpose of such testing is either to establish whether the new product or service falls within the ambit of existing regulations, whether it needs to be exempted from those regulations or whether it does not qualify as a regulated product.[21] The successful operation of a sandbox requires regulators and regulated businesses to collaborate with each other in a constructive and open manner so as to make testing and monitoring possible.

In practice, a business applies to the regulator for testing a new product or service. Upon approval of the application, a product- or service-specific sandbox will be established. As part of that sandbox, the regulated business would have to provide all relevant technical and economic information regarding the new product or service to the regulator. The regulator will designate a case officer or team to analyze that information and to monitor how that product or service functions in a particular timeframe and geographical location. The product or service would thus be brought to the market in a kind of testcase scenario, but not necessarily rolled out in full. Regulators are then tasked to keep a close eye on how the product functions. It may be possible that the regulator waived the application of certain existing rules during the test phase. As a result, the business concerned would not need to comply with certain regulatory obligations pending the outcome of the test. The monitoring then helps the regulator to decide which rules apply to the product or service involved or, may conclude that no rules currently exist. In that last case, the testing may offer insights to the regulator on whether or not to adapt or extend its regulations.

However, a sandbox does not necessarily include such a waiver or exemption from existing rules.[22] It may be possible that the regulator simply monitors the product or service in order to arrive at the precise legal classification of it and with a view to giving the regulated business certainty as to which rules apply to its product or service.[23] On the basis of the test results, the regulator can either conclude that existing regulations do or do not apply or that additional rules may be necessary. In practice, the sandbox format does not mean that a separate market or space is necessarily created. In essence, businesses offer a new product or service and communicate all relevant information to the regulator. The latter monitors, from a distance or on-site, how the product evolves and what it does.[24] In practice, within a sandbox environment, regulated businesses need to exchange through an application program with the regulator on a regular basis and monitoring is completed on the basis of the analysis of test data assembled by both the business and, if necessary, the regulator.[25]

A sandbox design needs to make choices on at least five levels. First, any sandbox needs to have clearly established eligibility criteria on who may apply for sandbox testing. Second, the interaction between businesses and the regulator (modes and frequency of communication and other governance options) would need to be determined. Third, the scope of testing and restrictions that could be envisaged to such testing

---

18   Sofia Ranchordás, *Experimental Regulations and Regulatory Sandboxes – Law without Order ?*, LAW AND METHOD (2021), doi : 10.5553/REM/.000064, 5-6.

19   Article 2(44)(bg) of the European Union's proposal for a Regulation laying down harmonised rules on artificial intelligence (Artificial Intelligence Act), leaked version of the current compromise text, available via https://iapp.org/news/a/eu-ai-act-draft-consolidated-text-leaked-online/.

20   Dirk Zetsche, Ross Buckley, Janos Barberis and Douglas Arner, *Regulating a revolution: from regulatory sandboxes to smart regulation* 23 FORDHAM JOURNAL OF CORPORATE & FINANCIAL LAW (2017) 64. See also, in the context of artificial intelligence, Jon Truby, Rafael Dean Brown, Imad Antoine Ibrahim and Oriol Caudevilla Parellada, *A Sandbox Approach to Regulating High-Risk Artificial Intelligence Applications*, 13 EUROPEAN JOURNAL OF RISK REGULATION (2022), 277.

21   Gertraud Leimüller & Silvia Wasserbacher-Schwarzer, *Regulatory Sandboxes – Analytical paper for Businesseurope* (May 2020), https://www.businesseurope.eu/sites/buseur/files/media/other_docs/regulatory_sandboxes_-_winnovation_analytical_paper_may_2020.pdf, 4.

22   Gertraud Leimüller & Silvia Wasserbacher-Schwarzer, *Regulatory Sandboxes – Analytical paper for Businesseurope*, note 21, 10.

23   As seemed to be the case in the European Commission's proposal for an Articifial Intelligence Act. For a critique on that position, see Jon Truby, Rafael Dean Brown, Imad Antoine Ibrahim & Oriol Caudevilla Parellada, note 20, 286-287.

24   Michael McKee & Marina Troullinou, *Innovation : the Evolution of the FCA Sandbox*, CPI TECHREG CHRONICLE (May 2022) , https://www.competitionpolicyinternational.com/wp-content/uploads/2022/05/2-INNOVATION-THE-EVOLUTION-OF-THE-FCA-SANDBOX-Michae-McKee-Marina-Troullinou.pdf, 3.

25   OECD, *Regulatory Sandboxes in Artificial Intelligence*, OECD DIGITAL ECONOMY PAPERS NO. 356 (July 13, 2023), https://www.oecd.org/publications/regulatory-sandboxes-in-artificial-intelligence-8f80a0e6-en.htm, 14-15.

need to be laid out in advance. Fourth, the timing and duration of the test window would have to be determined in a clear fashion. The duration of testing should enable the regulator to come to understand the implications of the product, without however threatening competition in the market by granting one business' innovation the possibility to remove all competition from the market. Fifth, the sandbox would need to put in place so-called "exit options." Those options refer to the actions the regulator can take when the sandbox closes: extending existing regulations to the new product or service, envisaging new regulations or not making the business subject to its regulations.[26] Constructed in that way, the sandbox presents an iterative process enabling dialogue and cooperation between regulators and regulated businesses in order to arrive at a solution that preserves competition within the market and ensures that consumer safeguards remain in place.[27]

It is no surprise that sandboxes thus construed have emerged principally in (heavily) regulated industries such as financial services.[28] The advent of financial technologies (fintech) resulted in regulators trying to come to terms with those new products or services. In order to enable financial firms to continue to innovate, but also to preserve competition in the sector and to remove legal uncertainty about new business models, the United Kingdom Financial Conduct Authority ("FCA") in 2014 started to establish sandboxes to monitor, in real-life setting, the application of those products or services.[29]

B. Promises of Antitrust Sandboxes for Pricing Algorithms

In light of those general observations, the sandbox model may at first sight not seem to be a good fit for antitrust enforcement. The focus of antitrust is primarily *ex post*, seeking to remove anticompetitive practices that have materialized, whereas the scope of regulation is *ex ante,* trying to regulate away unwanted consequences before a product or service is offered to consumers. Sandboxes better seem to fit such a regulatory *ex ante* enforcement context.[30]

At the same time, however, antitrust rules remain open-ended and their specific application in a given market or in light of the use of a particular technology may not be clear at the outset. From that perspective, businesses seeking to implement new or innovative tools capable of changing pricing or market dynamics may require some antitrust comfort at the start. Allowing the business practice to be in place for some time without necessarily incurring full antitrust liability during that time-frame, will enable both the businesses and the authority to verify the competitive impact of the practice concerned and, at the end of the trial period, to either continue, modify or abandon the practice. In such a scenario, antitrust sandboxes are not completely unimaginable.[31] Three particular advantages of the use of sandboxes can be highlighted in that regard.

First, the sandbox mechanism may provide both businesses and enforcement authorities a level of comfort traditional antitrust enforcement cannot offer. The application of antitrust provisions is largely grounded in self-assessment and compliance initiatives businesses have to take. That may result in legal uncertainty, especially in the face of technologies of which the impact on markets is not fully established. By allowing those technologies to be applied in a sandbox setting, antitrust authorities give a certain amount of leeway to businesses willing to dynamize their pricing strategies by means of software. That in itself may comfort the taking of such business initiatives and the development of ever finer-grained pricing algorithms.

26   For an overview, see Ivo Jeník & Shan Duff, *How to build a Regulatory Sandbox – Practical Guide for Policymakers* CGAP PUBLICATION (September 2020), https://www.cgap.org/sites/default/files/publications/2020_09_Technical_Guide_How_To_Build_Regulatory_Sandbox.pdf, 12.

27   For benefits and risks in that regard, Cristina Poncibò & Laura Zoboli, *Sandboxes and consumer protection : the European perspective*, 8 INTERNATIONAL JOURNAL ON CONSUMER LAW AND PRACTICE (2020), 15-19.

28   Although the sandbox phenomenon has also be tested by businesses rather than regulators. An exemple of this would be Google's privacy sandbox project, see https://developers.google.com/privacy-sandbox?hl=en.

29   See for an overview, Michael McKee & Marina Troullinou, *Innovation : the Evolution of the FCA Sandbox*, CPI TECHREG CHRONICLE (May 2022) , https://www.competition-policyinternational.com/wp-content/uploads/2022/05/2-INNOVATION-THE-EVOLUTION-OF-THE-FCA-SANDBOX-Michae-McKee-Marina-Troullinou.pdf.

30   Cristina Poncibò & Laura Zoboli, *The Methodology of Regulatory Sandboxes in the EU : A Preliminary Assessment from A Competition Law Perspective*, STANFORD-VIENNA TRANSATLANTIC TECHNOLOGY LAW FORUM – EUROPEAN UNION WORKING PAPERS No. 61 (June 7, 2022), https://law.stanford.edu/publications/no-61-the-methodology-of-regulatory-sandboxes-in-the-eu-a-preliminary-assessment-from-a-competition-law-perspective/, 27-30.

31   The Greek competition authority (Hellenic Competition Commission or HCC) has introduced a sandbox mechanism to stimulate sustainability agreements for small and medium-sized enterprises, making use of the sandbox logic, see https://www.epant.gr/en/enimerosi/sandbox.html; it could be argued that ex ante merger review also constitutes some kind of a sandbox, see Daniel Sokol, *Antitrust Merger Control as a Regulatory Sandbox*, CPI POST (April 16, 2023), https://www.pymnts.com/cpi_posts/antitrust-merger-control-as-a-regulatory-sandbox/. However, in that case, the review is largely hypothetical and does not involve real-world testing of the implemented merger. For its part, the European Commission has the ability not to prosecute a certain matter and to give a "comfort letter" to businesses concerned. However, such comfort letter is not necessarily accompanied by real-world testing. On that matter, see Selçukhan Ünekbaş, *The resurrection of the comfort letter; back to the future ?,* JEAN MONNET NETWORK ON EU LAW ENFORCEMENT WORKING PAPER No. 22/22, https://jmn-eulen.nl/wp-content/uploads/sites/575/2022/05/WP-Series-No.-22-22-The-Resurrection-of-the-Comfort-Letter-Back-to-the-Future-Unekbas.pdf.

Second, a sandbox would allow businesses to rely on pricing algorithms without bearing the full risk of antitrust liability. In general, the sandbox operation is accompanied by a limitation of liability or a temporary exemption of fines for behavior taking place within the testing framework. Being able to use pricing algorithms – at least for a limited duration – without significant antitrust risks would avoid the scenario in which any innovation in this field would be halted for fear of liability.

Third, by offering real-world testing environment, a sandbox enables both businesses using pricing algorithms and authorities monitoring them an important opportunity to learn. By witnessing the functioning and learning developments of algorithms in practice, both businesses and authorities can better understand their abilities and limits. Such learning would particularly enable authorities not to under- or overreact in terms of enforcement action. As mentioned above, that risk is real in the field of pricing algorithms.

IV. ANTITRUST SANDBOXES FOR PRICING ALGORITHMS: AVOIDING AND ADDRESSING PITFALLS

It follows from the previous analysis that introduction and use of pricing algorithms relying on increasingly powerful artificial intelligence tools could potentially benefit from a sandbox approach in antitrust enforcement. The learning possibilities and antitrust consequences of pricing algorithms are at present not fully understood by businesses and enforcement authorities. As a result, a sandbox could provide an opportunity to address potential anticompetitive consequences triggered by those algorithms and their self-learning capabilities. Notwithstanding their promises, antitrust sandboxes would need to be particularly attentive to four potential pitfalls.

First, sandbox testing requires real-world monitoring of pricing algorithms' operations in practice. To evaluate the impact of algorithms on competition, those algorithms would need to be confronted with a sufficient amount of data that allow to monitor their learning capabilities. As a result, pricing algorithms that would not have access to those data or would not be in a situation to engage in learning trajectories may be less suitable for sandbox testing. Absent those data, which need to be obtainable and usable in accordance with the relevant rules in place, setting up a sandbox would be rather complicated.

Second, in order for a sandbox to be relevant, access to it must clearly be circumscribed. The purpose of a sandbox is to give businesses willing to comply with antitrust the comfort they need and enforcement authorities the ability to assist them in doing so. As a result, not every business should automatically and always be granted access to a sandbox. It would seem useful clearly to define in which circumstances and for what reasons a sandbox may be used in the context of pricing algorithms. In light of this, limiting its access to businesses having only recently started to rely on pricing algorithm software could seem wise. That choice might nevertheless play to the detriment pioneering businesses that have used pricing algorithms before. By focusing on businesses starting to use those algorithms only recently, other instances of algorithmic collusion already taking place may remain under the radar or might be the subject of excessive enforcement. It would therefore seem more nuanced to open access to a sandbox to any business currently making use of pricing algorithms which have not yet been assessed from an antitrust point of view and which have proven to have taken steps to comply with antitrust rules already. Under those terms, the operations of a sandbox would likely be beneficial both to the undertakings concerned and the responsible enforcers.

Third, the testing methods relied on the sandbox must be established in advance in order for it to be effective. Testing methods would comprise at least two clusters of elements. On the one hand, the enforcement authority needs to establish how it is going to test the anticompetitive potential of pricing algorithms. To do so, it would have to involve experts capable of understanding the learning capabilities of those algorithms working together with industrial economists and competition lawyers. That setup of an interdisciplinary case team may represent an important cost to the authority concerned, but without such a case team, the sandbox operation is likely to fail. As part of those testing conditions, it needs to be established how anticompetitive behavior is going to be measured. That means that the enforcement authority must have a clear vision as to the objectives antitrust is to serve and limit the sandbox test to those objectives.

Those objectives principally relate to the consumer welfare standard, but other, complementary objectives should not be excluded whenever the authority has a mandate to protect them. On the other hand, the temporal and geographical scope of the sandbox tool should be established at the outset. The sandbox experiment should take no longer than necessary to establish the learning capabilities of algorithms. A pitfall would be to end it too soon or to have it last for too long. Depending on the technical design of algorithms, an appropriate duration for the sandbox should be established. Ideally, the law would establish the minimum and maximum limits for sandbox testing. It may be useful as well to limit the scope of the sandbox to a national or regional market for a smaller business and to test on a larger scale for larger multinational businesses.

The geographical scope of testing would nevertheless also depend on the mandate of the competition authorities. In any case, measures should be taken to avoid contradictory outcomes of sandboxes targeting the same behavior in different geographical areas of one and the same market. Therefore, clear sandbox allocation rules and a coordinated or even uniform application of sandboxes tests are preferable in that regard. In the European Union, it would be possible to coordinate the organization of sandboxes between the European Commission and the Member States' competition authorities within the framework of the ECN to ensure that sandboxes take place in a coordinated, non-contradictory and non-repetitive manner.[32] Inspiration could again be drawn from the EU's AI Act, which envisages coordination in terms of AI sandboxes among Member States' competent AI authorities.[33]

Fourth, the link between sandbox participation and antitrust liability should be established clearly in advance. By accepting to take part in a sandbox, businesses to some extent open up to enforcement authorities. Such opening up requires a relationship of mutual trust to be established. A key feature for an antitrust sandbox to work would be to establish such trust. One way of doing so could be by granting businesses immunity from fines or by limiting private enforcement possibilities for the duration of the sandbox. In addition, guarantees should be put in place to avoid excessive enforcement after the ending of the sandbox experiment, at least to the extent that businesses do everything to comply with antitrust rules at that stage. Clear enforcement benchmarks and comfort mechanisms are therefore advisable in that context.

If not given sufficient attention, those pitfalls would render the use of sandboxes problematic in antitrust enforcement practice. By contrast, when those four elements are taken care of, the use of antitrust sandboxes for pricing algorithms may be a promising complementary step to ensure their compliance with antitrust rules.

V. CONCLUSION

Pricing algorithms may present important pro-competitive benefits but their increasingly powerful learning capabilities may also have anticompetitive potential. As such, the artificial intelligence applications they rely on may bring about undesirable anticompetitive (collusive or price discriminatory) consequences, the ambit of which is presently unknown. As real-world testing is crucial to understand the competitive impact of pricing algorithms, sandboxes could offer a constructive way forward. This contribution argued that so-called "antitrust sandboxes" could be envisaged in the specific setting of pricing algorithms. It submitted that, if set up properly, antitrust sandboxes could be useful in monitoring pricing algorithms as well. To make that happen, attention should in particular be paid to four pitfalls: the availability of relevant data allowing algorithms to learn and develop, access to the sandbox, the scope and timing of the sandbox and the liability consequences of sandbox enforcement. Those pitfalls need to be addressed in advance and in a sufficiently predictable and legally sound manner.

---

32   On the need for coordination, see OECD, *Regulatory Sandboxes in Artificial Intelligence*, note 25, 19.

33   Articles 53 and 53a of the EU legislator's proposed AI Act, latest version available via https://iapp.org/news/a/eu-ai-act-draft-consolidated-text-leaked-online/. It is to be noted nevertheless that AI sandboxes serve a different regulatory purpose, compared to antitrust sandboxes, which would ensure a safe antitrust environment for learning algorithms. In the EU, it might thus very well be possible that an artificial intelligence application may be commercialised in accordance with the requirements of the EU's AI Act (and may even have taken part in an AI sandbox for that matter). However, the AI Act does not guarantee an anticompetitive use of AI technologies to become legal, see in that regard Recital 26(b) of the EU legislator's proposed AI Act.

CPI Subscriptions

CPI reaches more than 35,000 readers in over 150 countries every day. Our online library houses over 23,000 papers, articles and interviews.

Visit competitionpolicyinternational.com today to see our available plans and join CPI's global community of antitrust experts.