ISSN 2281-5147

Opinio Juris in Comparatione

Studies in Comparative and National Law

Vol. 1, n. 1/2020

Regulating Algorithms in The European Data-Driven Economy: The Role of Competition Law and Civil Liability

Andrea Parziale

Pacini Giuridica

Articles

Regulating Algorithms in The European Data-Driven Economy: The Role of Competition Law and Civil Liability

Andrea Parziale*

Abstract

While showing the potential to make the market more competitive and efficient, algorithms are acknowledged to pose a challenge to competition law enforcement. This is because algorithmic tacit collusion does not amount to an outright agreement but is something more than mere market parallelism, which is normal in competitive markets. This essay reviews the economic and legal scholarship, the national and supranational case law and the supranational policy debate on this issue to explore if and how competition law can play a role in clarifying such a grey area, without discouraging technological innovation and economic development.

In this regard, this essay finds that, while the case law has already addressed algorithms implementing explicit anticompetitive agreements under Article 101 TFEU, scholars fail to agree on how

* PostDoc Researcher, Sant'Anna School of Advanced Studies (Pisa, Italy). The author wants to thank the reviewers of the original manuscript. Their constructive comments made a substantial contribution to this paper.

to tackle algorithmic tacit collusion. This has come under the radar of ongoing policy initiatives, such as the European Commission's New Competition Tool initiative. Waiting for innovative regulatory and competition law solutions to better tackle algorithmic collusion, this essay proposes to use, as an alternative to Article 101 TFEU, the notion of collective abuse of dominant position under Article 102 TFEU. Finally, this essay considers how civil liability and private enforcement may contribute to competition law enforcement against algorithmic collusion.

Keywords

Competition Law – Concerted practice – Collective abuse of dominant position – Algorithmic collusion – Private Enforcement

Table of contents

1. Introduction

Algorithms and Big Data have revolutionised digital markets, offering new commercial opportunities to companies and more information to consumers. They have the potential to make the market more competitive and efficient for the benefit of all the stakeholders involved. They are essential to the EU Single Digital market Strategy of 2015, and so is competition in digital markets for the sake of innovation and economic development.
At the same time, the EU Commission sector inquiry into e-commerce (2017) found that two-thirds of market operators employ algorithms to monitor their competitors' prices[1].

[1] EU Commission, *Report from The Commission to The Council and The European Parliament. Final report on the E-commerce Sector Inquiry*, Brussels, 10.5.2017, COM(2017) 229 final, p. 5, available at: http://ec.europa.eu/competition/

This is suspected to be the sign that algorithms are being used to create collusive, anti-competitive outcomes.
Algorithms have become a competition law concern and pose several challenges to competition law enforcement. We are shifting from a world were corporate executives negotiated cartels in physical meetings or by exchanging correspondence or phone calls to a world were algorithms detect competitors' information and adapt to it, retaliating to any deviation from a collusive equilibrium. Algorithm-driven tacit collusion does not amount to an outright agreement but is something more than mere market parallelism, where firms rationally adapt to changing market conditions, which is normal in competitive markets. In other terms, 'algorithmic collusion' inhabits a grey area, calling for regulatory clarification. Building on the scholarly and policy debate on this issue, this essay will explore if and how competition law and civil liability can play a role in clarifying such a grey area without discouraging technological innovation and economic development[2].

2. Algorithms and Big Data in a digital market economy: benefits and risks for competition

Businesses have always used data to gain an advantage in the marketplace. However, the digitalisation of the economy has significantly increased the amount of available data as well as the scope for its commercial application. Smartphone use and web surfing feed unlimited volumes of information. This is used for an expanding number of economic activities. An essential productive factor in a data-driven economy, Big Data has become key to optimising decision-making processes, driving innovation, and fostering markets' efficiency[3]. Nevertheless, Big Data would be useless if it were not for algorithms, which treat wide amounts of data automatically and at an ever-increasing speed.
Algorithms are nothing new. Wilson and Keil (1999) defined algorithms as «unambiguous and precise lists of simple operations applied mechanically and systematically to a set of tokens or objects, where the initial state of the tokens is the input and the final state is the output»[4]. Put this way, virtually any list of instructions aimed at a certain result (including recipes) is technically an algorithm. As such, algorithms are integral to the experience of every human being. As computer science improved, algorithms have been created to

antitrust/sector_inquiry_final_report_en.pdf. Last accessed 3 Dec 2020.

[2] N. Petit, A*ntitrust and Artificial Intelligence: A Research Agenda*, in *Journal of European Competition Law & Practice*, 2017, Vol. 8, No. 6, p. 361.

[3] AGCM, AGCOM, *Big data. Interim report nell'ambito dell'indagine conoscitiva di cui alla delibera n. 217/17/CONS*, June 2018, pp. 5 ff., available at: https://www.agcom.it/documents/10179/10875949/Studio-Ricerca+08-06-2018/c72b5230-354d-444f-9e3f-5467ca450714?version=1.0. Last accessed 3 Dec 2020.

[4] R.A. Wilson, F.C. Keil, *The MIT Encyclopedia of the Cognitive Sciences*, Boston, 1999.

automatically carry out complex calculations and data processing, relieving humans from repetitive tasks[5]. Artificial Intelligence[6] and Machine Learning[7] are now enabling algorithms to solve problems, make predictions, and take decisions more efficiently than human beings. Deep Learning is a particularly promising subfield of Machine Learning where computer systems generate digital neural networks to imitate the human brain[8]. While granting higher complexity and abstraction than traditional, linear algorithms, Deep Learning algorithms do not allow their own programmers to understand the decision-making process behind their outcomes. Nevertheless, more and more companies are using Deep Learning to make predictions and optimise business processes. Predictive algorithms can estimate demand, anticipate price variations and customer preferences, as well as appraise commercial and even natural risks. This greatly improves companies' decision-making capacity[9]. Algorithms can also optimise business processes, allowing enterprises to cut production and transaction costs by setting optimal prices and ensuring significant operational results (e.g., fraud prevention, corporate security)[10]. This way, algorithms analysing complex fluxes of data in real time have come to play a pivotal role in the competitive processes of the contemporary digital economy.

Governments and supranational institutions have appraised the potential benefits of economic digitalisation and set policy strategies to foster it. In May 2015, the European Commission set the target to create a European Digital Single Market, shifting towards a data-driven economy to increase economic growth and employment, offer innovative services to consumers, and promote social progress[11]. A Digital Single Market is one where «the free movement of goods, persons, services and capital is ensured and where individuals and businesses can seamlessly access and exercise online activities under conditions of fair competition, and a high level of consumer and personal data protection, irrespective of

[5] OECD, *Algorithms and Collusion – Background Note by the Secretariat*, June 2017, available at: https://one.oecd.org/document/DAF/COMP(2017)4/en/pdf. Last accessed 3 Dec 2020.

[6] Artificial Intelligence (AI) investigates and designs intelligent agents that perform tasks of significant difficulty (P. Swarup, *Artificial Intelligence*, in *International Journal of Computing and Corporate Research*, 2012, Vol. 2, No. 4, http://www.ijccr.com/july2012/4.pdf. Last accessed 3 Dec 2020).

[7] Machine learning (ML) is an AI subsector which designs intelligent machines based on algorithms that iteratively learn from experience without being explicitly programmed. (P. Anitha, G. Krithka, M.D. Choudhry, *Machine Learning Techniques for learning features of any kind of data: A Case Study*, in *International Journal of Advanced Research in Computer Engineering & Technology*, 2014, Vol. 3, No. 12, pp. 4324-4331, http://ijarcet.org/wp-content/uploads/IJARCET-VOL-3-ISSUE-12-4324-4331.pdf. Last accessed 3 Dec 2020).

[8] I Goodfellow, Y. Bengio, A. Courville, *Deep Learning*, Boston, 2016, http://www.deeplearningbook.org/. Last accessed 3 Dec 2020; Y. LeCun, Y. Bengio, G. Hinton, *Deep Learning*, in *Nature*, 2015, Vol. 521, pp. 436-444, https://www.cs.toronto.edu/~hinton/absps/NatureDeepReview.pdf. Last accessed 3 Dec 2020.

[9] A. Ezrachi, M.E. Stucke, *Virtual Competition: The Promise and Perils of the Algorithm-Driven Economy*, New Haven, 2016.

[10] Id.

[11] EU Commission, *A Digital Single Market Strategy for Europe*, Brussels, 6 May 2015, COM(2015) 192 final, available at: https://eurlex.europa.eu/legalcontent/EN/TXT/?uri=COM%3A2015%3A192%3AFIN. Last accessed 3 Dec 2020.

their nationality or place of residence»[12]. The Digital Single Market Strategy relies on three pillars, where competition plays a multidimensional role:

1. «Better access for consumers and businesses to online goods and services across Europe – this requires the rapid removal of key differences between the online and offline worlds to break down barriers to cross-border online activity».
2. «Creating the right conditions for digital networks and services to flourish – this requires high-speed, secure and trustworthy infrastructures and content services, supported by the right regulatory conditions for innovation, investment, fair competition and a level playing field».
3. «Maximising the growth potential of our European Digital Economy – this requires investment in ICT infrastructures and technologies such as Cloud computing and Big Data, and research and innovation to boost industrial competitiveness as well as better public services, inclusiveness and skills»[13].

Against this backdrop, algorithms are acknowledged to have pro-competitive effects both on the supply and demand side[14]. On the supply side, algorithms increase transparency, improve existing products and services, and help develop new ones. This lets companies reduce production costs and selling prices. On the demand side, algorithms can provide consumers with quick access to well-organised information, thus reducing transaction costs and helping consumers make more rational and faster decisions.
All these advantages, however, do not come without risks. The very structure and functioning of the digital market may jeopardise both individuals' rights and interests and the correct functioning of the market. Within the so-called Big Data ecosystem, data subjects, especially internet users, generate data; then data brokers gather and sell them to companies; in turn, companies explore and exploit data through algorithms[15]. European public regulators have started to address the striking information asymmetries between users and operators and the resulting data protection concerns with the much-hyped Regulation (EU) n. 679/2016 (General Data Protection Regulation, GDPR), which entered into effect on 25 May 2018.
At the same time, the European Commission has expressed concerns over the economic distortions that may occur in the digital market, where a small number of highly integrated transnational companies interact with loads of small-sized specialised enterprises[16]. An

[12] Id.

[13] Id.

[14] OECD, *Algorithms and Collusion - Background Note by the Secretariat*, cit. Last accessed 3 Dec 2020.

[15] AGCM, AGCOM, *Big data. Interim report nell'ambito dell'indagine conoscitiva di cui alla delibera n. 217/17/CONS,* cit.

[16] EU Commission, *Report from The Commission to The Council and The European Parliament. Final report on the E-commerce Sector Inquiry*, cit.

issue of the utter importance for competition dynamics, the EU Commission expressed concerns that «pricing software, detecting deviations from 'recommended' retail prices» in «a matter of seconds» may enable manufacturers «to monitor and influence retailers' price setting. The availability of real-time pricing information may also trigger automatised price coordination. The wide-scale use of such software may in some situations, depending on the market conditions, raise competition concerns»[17]. In a remarkable example of conciseness, the OECD labelled this risk as 'algorithmic collusion'[18].

Authoritative scholars persuasively argued that the algorithmic collusion conjecture should not be presented as a given[19]. This is because significant technological challenges may prevent algorithms from approaching a collusive equilibrium. However, the most updated economic literature largely shares the concerns of policymakers. Previous works had found that algorithmic collusion, albeit possible, is rather unlikely[20]. Conversely, while conceding that we still have a limited understanding of algorithmic pricing collusion, recent studies suggest that algorithmic collusion is a real possibility that may challenge competition policy[21]. These findings are somehow confirmed by novel empirical research[22], which found that AI adoption actually has significant effects on competition[23]. Therefore, these studies confirm that policymakers should be concerned about the widespread implementation of algorithmic pricing software in the market.[24]

These policy, theoretical and empirical developments suggest that the day has come when self-learning and independent algorithms have become a competition law issue. It is feared that they may enable innovative ways of co-ordination between competing firms.

[17] Id., para 13.

[18] OECD, *Algorithms and Collusion – Background Note by the Secretariat*, cit.

[19] A. Ittoo, N. Petit, *Algorithmic Pricing Agents and Tacit Collusion: A Technological Perspective*, in H. Jacquemin, A. De Streel (eds.), *L'intelligence artificielle et le droit*, Bruxelles, 2017, pp. 241-256, available at: https://ssrn.com/abstract=3046405 or http://dx.doi.org/10.2139/ssrn.3046405. Last accessed 3 Dec 2020.

[20] *Ex multis*, I. Dogan, A.R. Guner, *A Reinforcement Learning Algorithmic pricing approach to Competitive Ordering and Pricing Problem*, in *Expert Systems*, 2015, 32, pp. 39-47.

[21] E. Calvano, G. Calzolari, V. Denicolò *et al.*, Algorithmic *Pricing What Implications for Competition Policy*, in *Rev Ind Organ*, 2019, 55, pp. 155-171, doi: 10.1007/s11151-019-09689-3. In line with these results, a recent study found that that Q-learning pricing algorithms systematically learn to collude and punish deviations by trial and error, without prior specific knowledge (E. Calvano, G. Calzolari, V. Denicolò, S. Pastorello, *Artificial Intelligence, Algorithmic Pricing and Collusion*, in *American Economic Review*, 2020, 110(10), pp. 3267-3297).

[22] S. Assad, R. Clark, D. Ershov and L. Xu, *Algorithmic Pricing and Competition: Empirical Evidence from the German Retail Gasoline Market*, CESifo Working Paper No. 8521, available at: https://ssrn.com/abstract=3682021. Last accessed 3 Dec 2020.

[23] Id.

[24] Id.

3. Algorithmic collusion: tacit vs. explicit

By and large, competition law frames illicit conducts as human behaviours. While antitrust law is used to sanction corporate executives manipulating prices and sharing markets, sophisticated pricing algorithms could increase the risk of new forms of sustainable tacit collusion. This raises the question of what role competition law can play in this domain. To answer this question, one must first define the concept of collusion.

Collusion can be either explicit or implicit. Explicit collusion consists in oral or written agreements. Therefore, there must be a meeting of minds between the representatives of competing companies, who act in a concerted way to restrict competition. Article 101 TFEU foresees an outright prohibition of this kind of illicit agreements (see *infra*, para 4.1).

In contrast, tacit collusion is an anti-competitive co-ordination reached in lack of any explicit agreement between the competing companies. These collude by recognising their mutual interdependence. Each company achieves an anti-competitive result by pursuing its own profit-maximisation strategy separately from its competitors[25]. This usually happens when certain conditions are met, i.e. the competing companies must offer homogeneous goods and services in oligopolistic and transparent markets, with high entry barriers[26]. This is why this phenomenon is known as the oligopoly problem. Few companies protected by high entry barriers have an incentive to start and continue colluding as they can aspire to large supra-competitive gains, which will not attract newcomers. In addition, transparent markets enable companies with frequent interactions to assess each other's decisions and identify and sanction violations of an arrangement. Conversely, a high number of companies decrease the incentives for collusion since each competitor would obtain a smaller share of the supra-competitive gains. Likewise, in lack of entry barriers, collusion is unsustainable since any increase in profits will increase the incentives to deviate from the collusive equilibrium and will attract new entrants.

Competition law does not tackle tacit collusion explicitly because, so far, the conditions thereof were unlikely to happen. However, Big Data and algorithms might render their occurrence more frequent[27]. While their impact on the number of firms and entry barriers is ambiguous, they are likely to increase market transparency, as well as the frequency of interactions between firms. Algorithms allow companies to gather and monitor in real-time competitors' behaviours, consumers' preferences, and other market data. For instance, pricing algorithms can update prices in real-time and retaliate immediately to any devia-

[25] OECD, *Roundtable on Competition Enforcement in Oligopolistic Markets*, DAF/COMP(2015)2, 2015 http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP(2015)2&docLanguage=En. Last accessed 3 Dec 2020.

[26] R. Whish, D. Bailey, *Competition Law*, Oxford, 2012, pp. 559 ff.

[27] OECD, *Algorithms and Collusion – Background Note by the Secretariat*, cit.

tion from the (tacit) collusion. Predictive models may even anticipate competitors' decisions and retaliate to deviations from collusion before they even happen[28]. The immediate detection and punishment of any actual (and even potential) violation of collusion make deviation unprofitable, which contributes to the sustainability of the tacit, anticompetitive collusion.
A scholar vividly depicted the transition algorithms are facilitating in anticompetitive collusion:

> [W]e are shifting from the world where executives expressly collude in smoke-filled rooms to a world where pricing algorithms continually monitor and adjust to each other's prices and market data. In this new world, there is not necessarily any collusive agreement among executives. Each firm may unilaterally adopt its own pricing algorithm, which sets its own price. In this new world, there is not necessarily anticompetitive intent […] The danger here is not express collusion, but more elusive forms of collusion. Computers may limit competition not only through agreement or concerted practice, but also through more subtle means. For example, this may be the case when similar computer algorithms reduce or remove the degree of strategic uncertainty in the marketplace and promote a stable market environment in which they predict each other's reaction and dominant strategy. Such a digitalised environment may be more predictable and controllable. Furthermore, it does not suffer from behavioral biases and is less susceptive to possible deterrent effects generated through antitrust enforcement[29].

Algorithms, then, might increase the risk of coordination between competing firms. Nevertheless, a distinction must be made between tacit collusion between market operators and mere market parallelism, which does not imply any coordination between competitors. Banning market parallelism *per se* could prevent businesses from updating their strategy to markets conditions (e.g. prices, demand), which is key to competition.
In a way, tacit collusion inhabits a grey area between explicit collusion, which is sanctioned, and mere parallelism, which does not fall under the scope of competition law[30]. Tacit collusion is something more than mere parallelism but is something less than an explicit arrangement between competing firms. Algorithms may enlarge this grey area by letting companies coordinate prices in lack of an explicit agreement. Algorithms can generate innovative automatic processes that implement a common policy and monitor the

[28] «Even though market transparency as a facilitating factor for collusion has been debated for several decades now, it gains new relevance due to technical developments such as sophisticated computer algorithms. For example, by processing all available information and thus monitoring and analysing or anticipating their competitors' responses to current and future prices, competitors may easier be able to find a sustainable supra-competitive price equilibrium which they can agree on» (Autorité de la Concurrence, Bundeskartellamt, *Competition Law and Data*, 10 May 2016, p. 14, available at: http://bundeskartellamt.de/SharedDocs/Publikation/DE/Berichte/Big%20Data%20Papier.pdf?__blob=publicationFile&v=2. Last accessed 3 Dec 2020.

[29] A. Ezrachi, M.E. Stucke, *Artificial Intelligence & Collusion: When Computers Inhibit Competition*, in *University of Illinois Law Review*, 2017, p. 1775. doi: http://dx.doi.org/10.2139/ssrn.2591874.

[30] OECD, *Algorithms and Collusion – Background Note by the Secretariat*, cit.

behaviour of competing companies without any human interaction. This way, they substitute explicit collusion with tacit co-ordination.

Algorithms that facilitate tacit collusion might include monitoring and pricing, as well as Machine Learning and Deep Learning technologies.

Monitoring algorithms gather and screen information about competing firms' commercial behaviours searching for deviations from collusion and eventually programming retaliations[31].

Pricing algorithms reduce the costs of collusion and the risk of detection by competition authorities since they let companies update prices automatically to variations in market conditions without any need for renegotiating the terms of collusion continuously via meetings, phone calls, and e-mails. While showing pricing algorithms with competitors can ease the proof of a competition law infringement, more discreet ways to implement tacit collusion include the co-ordination based on the fact that the same ICT service providers develop the same algorithms for rival companies ('hub and spoke' scenario)[32]. Likewise, competitors can use pricing algorithms to follow a market leader in real-time which is in charge of setting supra-competitive prices ('tit-for-tat' strategy or equivalent retaliation)[33]. Indeed, algorithms might reduce the costs of signalling, which consists in unilateral price announcements to other firms. In principle, if the signalled firms do not perceive the signal or do not adapt to it, the signalling company loses profits. Algorithms can reduce such a risk in several ways, e.g. by setting abrupt price changes overnight, which do not affect purchases but are identified as signals by the algorithms of competitors. Alternatively, algorithms can disclose data used as a code to offer and contract increases in price[34].

Finally, Machine Learning and Deep Learning technologies might ensure the most discreet ways to obtain a collusive result. Powerful predictive algorithms can learn to react to other firm's behaviours (either human or artificial) and collude without human interactions. Game theory studies have investigated the capacity of Machine Learning to reach cooperative results[35]. Deep Learning may implement collusion without business operators even being aware of it.

[31] Id.

[32] The spoke and hub paradigm is an organisation model where routes are like "spokes" connecting a central "hub" (id., p. 27).

[33] This is a way to solve the prisoner dilemma (id.).

[34] See the US case Airline Tariff Publishing Company (A.M. Miller, *Did the Airline Tariff Publishing Case Reduce Collusion?*, in *The Journal of Law & Economics*, Vol. 53, No. 3 (August 2010), pp. 569-586.

[35] P. Hingston, G. Kendall, *Learning Versus Evolution in Iterated Prisoner's Dilemma*, in *Proceedings of the Congress on Evolutionary Computation* (CEC'04), 2004, available at: http://www.cs.nott.ac.uk/~pszgxk/papers/cec2004ph.pdf. Last accessed 3 Dec 2020.

While some scholars call for more incisive public intervention to regulate algorithms, e.g. by establishing an independent agency with regulatory powers[36], most governments have adopted a more market-oriented approach. This approach has prevailed since the very beginning of the Internet era, ensuring a fast growth of e-commerce and innovative development.
As shown below, both scholars and supranational policymakers are questioning the ability of existing regulatory and competition tools to tackle the challenges of the digital economy, including those related to algorithmic pricing.

4. Challenges for and potentials of EU competition law

As stated by the OECD report on algorithms and collusion,[37] algorithms pose different kinds of challenges to EU competition law.[38] In some instances, algorithms only magnify behaviours competition law rules already address. In this case, algorithms pose enforcement problems only because legal doctrines already exist that tackle algorithm-driven anticompetitive conducts. Although it might be hard for agencies to detect and prove such conducts, agencies can rely on the current legal framework about agreements and concerted practices.
In other instances, as the previous paragraph pointed out, algorithms can pose anticompetitive risks the current legal framework is not well-suited to tackle, including the grey area (between explicit agreements and mere market parallelism) of tacit collusion, where algorithms can reach an anticompetitive outcome without any human interaction between rival firms. As seen in the previous paragraph, algorithms can magnify the oligopoly problem and make tacit collusion more frequent. Algorithms are increasing market transparency, the velocity of commercial decisions, and the capacity of firms to retaliate rapidly to competitors' behaviours. Therefore, algorithms may render companies' conducts interdependent without any explicit communication, inflating prices up to anticompetitive levels.

4.1. Algorithmic collusion as an agreement (Article 101 TFEU)

As shown below, both scholars and enforcers approach the issue of algorithmic collusion mainly as a matter of anticompetitive agreement. In the EU, these practices are addressed by Article 101(1) TFEU, which prohibits:

[36] M.U. Scherer, *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies*, in *Harvard Journal of Law & Technology*, 2016, 29(2), pp. 353-400, available at: http://jolt.law.harvard.edu/articles/pdf/v29/29HarvJLTech353.pdf. Last accessed 3 Dec 2020.

[37] OECD, *Algorithms and Collusion - Background Note by the Secretariat*, cit.

[38] A. Capobianco, A. Nyeso, *Challenges for Competition Law Enforcement and Policy in the Digital Economy*, in *Journal of European Competition Law & Practice*, 2018, 9(1), p. 19.

> all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the internal market, and in particular those which:
> (a) directly or indirectly fix purchase or selling prices or any other trading conditions;
> (b) limit or control production, markets, technical development, or investment;
> (c) share markets or sources of supply;
> (d) apply dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
> (e) make the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.

In essence, Article 101 TFEU prohibits anticompetitive agreements and concerted practices. The term agreement covers any arrangement, be it legally binding or not, in written or verbal form (like so-called gentlemen's agreements)[39]. Therefore, an exchange of correspondence or phone calls may be sufficient to establish an agreement for the purposes of Article 101 TFEU. Algorithm-driven coordination clearly falls under this definition when algorithms are used to implement or monitor a prior, explicit agreement between competitors. In cases like this, algorithms are just the tools for the execution of an illicit agreement. In essence, this was the case the U.S. Department of Justice brought in 2015 against David Topkins[40]. Topkins and other online sellers of posters had coordinated their prices and programmed common dynamic pricing algorithms to act according to their agreement. A similar case caught the attention of the UK Competition and Markets Authority (CMA) in 2016[41]. In that case, the CMA found that two competing online sellers of posters and frames online coordinated their pricing first manually and then using automated repricing software. Finally, the European Commission dealt with similar cases, where the undertakings in several different sectors made use of sophisticated monitoring algorithms to track resale price setting in distribution and intervene quickly in case of price reductions[42]. All

[39] F. Ghezzi, G. Olivieri, *Diritto antitrust*, Torino, 2013, Ch. III.

[40] *United States v. Topkins*, No. CR 15-00201 (N.D. Cal. 2015), available at: https://www.justice.gov/atr/case-document/file/513586/download. Last accessed 3 Dec 2020.

[41] Competition and Markets Authority, decision of 12 August 2016, case 50223 – *Online sales of posters and frames*, available at: https://assets.publishing.service.gov.uk/media/57ee7c2740f0b606dc000018/case-50223-final-non-confidential-infringement-decision.pdf. Last accessed 3 Dec 2020.

[42] EU Commission, case AT.40469 – *Denon & Marantz*, available at: https://ec.europa.eu/competition/antitrust/cases/dec_docs/40469/40469_329_3.pdf. Last accessed 3 Dec 2020; Id., case AT.40465-*Asus*, available at: https://ec.europa.eu/competition/antitrust/cases/dec_docs/40465/40465_337_3.pdf. Last accessed 3 Dec 2020; Id., case AT.40182 – *Pioneer*, available at: https://ec.europa.eu/competition/antitrust/cases/dec_docs/40182/40182_370_3.pdf. Last accessed 3 Dec 2020; Id., case AT.40181 *Philips*, available at: https://ec.europa.eu/competition/antitrust/cases/dec_docs/40181/40181_417_3.pdf. Last accessed 3 Dec 2020. Interestingly, in the *Pioneer* and *Philips* cases, the Commission found that the undertakings put in place anticompetitive agreements also to neutralize the 'pro-competitive' effects of pricing algorithms: the undertakings would deal with the lowest pricing retailers to avoid the possibility that the other retailers would automatically adjust their prices through their pricing algorithms (so-called spiders).

these applications of pricing algorithms are fundamentally unproblematic since they are ancillary to autonomous illicit agreements, which fall under the prohibition of Article 101 TFEU.

Things get trickier when pricing algorithms act in lack of a prior explicit agreement among competitors. As shown below, scholars proposed different ways to tackle such (more subtle) forms of algorithmic collusion through an alternative doctrine under Article 101 TFEU, i.e. the concerted practice doctrine. According to the European Court of Justice (ECJ) case law[43], a concerted practice is in place when two or more undertakings co-operate informally, in lack of any agreement. This notion allows competition authorities to deal with practices that do not represent an agreement but replace competition with co-operation between competitors.

In principle, parallel behaviours among different undertakings may signal a concerted practice. This may be the case when algorithms of competing firms fix prices or other trading conditions. Naturally, rational adaptation to changes in market condition is not *per se* unlawful. Since parallel conducts are usually normal in the marketplace, courts held that these amount to an anticompetitive infringement if they are accompanied by so-called 'plus factors' that indicate that such a parallelism is due to a 'conscious coordination' between competing firms, rather than to a unilateral adaptation to changing market conditions. The plus factors *par excellence* include exchanges of strategic information, which replaces the uncertainty of market-based competition with forms of coordination between competitors[44].

Algorithms may perform this strategic information exchange function through several different means, e.g. the use of the same pricing algorithms by competitors, the hub and spoke scenario or a signalling strategy[45]. However, to be considered as plus factors indicative of a tacit collusion, algorithms must enable 'conscious coordination'. While algorithms do not have any form of consciousness, their code ultimately reflects the intent of the programmer and user to create coordination. This plainly applies to algorithms that include coordination-facilitating elements, i.e. algorithms where the anticompetitive strategy is written in their code (expected coordination)[46]. Accordingly, competition law liability

[43] ECJ, 4 Jun 2009, case C-8/08, *T-Mobile Netherland B.V. v Raad van Bestuur*, para 23; ECJ, 14 Jul 1972, case C-48/69, *Imperial Chemical Industries Ltd v Commission*, paras 64-65.

[44] A. Albors-Llorens, *Horizontal Agreements and Concerted Practices in EC Competition Law: Unlawful and Legitimate Contacts between Competitors*, in *The Antitrust Bulletin*, 2006, 51(4), pp. 837-876. doi: https://doi.org/10.1177/0003603X0605100404.

[45] P.G. Picht, G.T. Loderer, *Framing algorithms: competition law and (other) regulatory tools*, in *World Competition*, 2019, 42(3), pp. 403-404.

[46] M.S. Gal, *Algorithms as Illegal Agreements*, in *Berkeley Technology Law Journal*, 2019, Vol. 34, pp. 67 ff.

could be established when companies adopt algorithms that, based on an expert's examination, actually support supra-competitive prices[47].

More complex is the case of algorithms based on Machine Learning. These are not programmed to act in a certain way. Rather, they are programmed to achieve a general purpose (e.g. maximise profits) but autonomously determine the means to achieve that purpose via self-learning. This may lead the algorithm to adopt a strategy of conscious parallelism (learned coordination). Coordination here is not the result of human conscious decisions but rather the outcome of an autonomous agent. Some scholars[48] claim that, in any case, programmers retain a certain degree of control over the algorithm and, in particular, they can prevent the algorithm from producing such outcomes. Therefore, albeit a Machine Learning algorithm creates anticompetitive coordination independently, this is ultimately the result of conscious human acts[49]. It can be reasonably argued, however, that, in terms of consciousness, one thing is to deliberately program an algorithm to create coordination and another thing is not to foresee and prevent all the possible ways in which an autonomous agent may create such outcomes. This is at the basis of the so-called Paradox of Proof: algorithms «make it easier to coordinate, and at the same time make it more difficult to prove the existence of an explicit agreement given that explicit inter-firm communication may be less essential. This suggests that, while the danger of harm might increase, it might also be less likely to find strong evidentiary inferences of an agreement»[50].

The OECD, therefore, called for a "new definition" of agreement to reduce uncertainty and address the potential algorithm-related competition concerns in digital markets[51]. The proposals of the OECD are essentially two-fold. On the one hand, the traditional concept of plus factors could be refined using economic analysis as an evidentiary tool. For instance, although information is not exchanged, companies always setting the same prices as the market leader could amount to a plus factor indicative of a tacit collusion[52]. On the other hand, the concept of anticompetitive agreement could be reformulated according to

[47] J.E. Harrington, Jr., P.T. Harker, *Developing Competition Law for Collusion by Autonomous Price-Setting Agents*, 22 August 2017, available at: https://ssrn.com/abstract=3037818 or http://dx.doi.org/10.2139/ssrn.3037818. Last accessed 3 Dec 2020.

[48] M.S. Gal, *Algorithms as Illegal Agreements*, cit.

[49] The argument that programmers cannot control pricing algorithms because they are 'black boxes' is rejected by F. Beneke, M.O. Mackenrodt, *Artificial Intelligence and Collusion*, in *IIC – International Review of Intellectual Property and Competition Law*, 2019, vol. 50, pp. 109-134, doi: 10.1007/s40319-018-00773-x: «Firms that offer AI-powered pricing software solutions have developed their products so as to make the predictions transparent. This is because of the fact that the users of the software value the market insights they can derive from the prediction».

[50] M.S. Gal, *Algorithms as Illegal Agreements*, cit., pp. 67 ff.

[51] OECD, *Algorithms and Collusion – Background Note by the Secretariat*, cit.

[52] M. Filippelli, *Il problema dell'oligopolio nel diritto antitrust europeo: evoluzione, prospettive e implicazioni sistematiche*, in *Rivista delle Società*, 2018, pp. 567 ff.

modern game theory to include tacit collusion, assessing the overall market behaviour of the undertakings[53].

The issue of algorithmic collusion has also been the subject of the European Commission public consultation on the New Competition Tool (NCT), which strives to improve EU competition law rules[54]. While a number of contributors claim that existing competition law enforcement can adequately address algorithmic pricing, others put forth several different proposals to better tackle this issue, including «clarifying how and to what extent the parallel use of algorithms can lead to collusive outcomes when there is no prior or ongoing contact between firms»[55].

It is worth noting that facilitating the proof of algorithmic collusion would not practically result in an outright prohibition of pricing algorithms. This is because, under certain conditions, companies are entitled to obtain an individual exemption under Article 101(3) TFEU if, in essence, the algorithmic collusion:

1. Ensures efficiency gains that offset its anticompetitive effects.
2. Allows consumers a fair share of the resulting benefits.
3. Is indispensable to obtain such objectives.
4. Does not eliminate competition in respect of a substantial part of the relevant market.

This was confirmed by the Luxembourg Competition Authority in the *Webtaxi* case of 2018[56]. On that occasion, the Luxembourg Competition Authority found that the prices algorithmically set by a platform bridging users and taxi drivers amounted to a horizontal cartel among competitors. However, such price-fixing agreement was exempted because it produced not only efficiency gains (in terms of reduced empty runs and wating times) but also benefitted consumers (in terms of price reductions). The Competition Authority also found that such benefits could not be obtained but through the price-fixing algorithms of the platform.

4.2. Algorithmic collusion as a collective abuse of dominant position (Article 102 TFEU)

In light of the difficulties inherent in enforcing Article 101 TFEU, and waiting for innovative regulatory or competition law tools to be developed, we contend that, as a complementary

[53] Id.

[54] See https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12416-New-competition-tool/public-consultation. Last accessed 3 Dec 2020.

[55] See *Contributions*, available at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12416-New-competition-tool/public-consultation. Last accessed 3 Dec 2020.

[56] Conseil de la Concurrence du Grand-Duché du Luxembourg, 7 June 2018, case 2018-FO-01 – *Webtaxi – Marché de la réservation préalable des taxis*, available at: https://concurrence.public.lu/dam-assets/fr/decisions/ententes/2018/decision-n-2018-fo-01-du-7-juin-2018-version-non-confidentielle.pdf. Last accessed 3 Dec 2020.

path, the prohibition of abuse of dominant position under Article 102 TFEU[57] could help tackle certain types of algorithm-driven tacit collusion. Article 102 TFEU provides that:
Any abuse by one or more undertakings of a dominant position within the internal market or in a substantial part of it shall be prohibited as incompatible with the internal market in so far as it may affect trade between Member States.
Any dominant position refers to a certain reference market. The latter notion was first introduced by the case law of the ECJ[58], and was then considered by a European Commission Communication[59]. This Communication, followed by the subsequent ECJ case law[60], states that the relevant market is made up of two different dimensions: the product market and the geographic market. The former includes all goods and services that are interchangeable by consumers. The latter consists of the area in which the good or service is marketed, provided that competitive conditions are comparable.
An undertaking holds a dominant position in the relevant market when it has market power, i.e. is able to behave independently of competitors and consumers because these latter do not provide competitive constraints on the former[61]. Competition authorities usually assess market power by referring to such variables as concentration ratios, market shares, or profit margins[62]. In digital markets, however, firms constantly create and reshape markets. This makes the traditional approach unsuitable. Since digital markets continuously change nature, market power cannot be based exclusively on high markets shares because newcomers often challenge incumbents. This, however, does not necessarily imply that first comers have no market power. Since dominance is the ability of behaving independently, based on existing competitive constraints, competition authorities should assess the strength of these latter, such as buying and selling power, the degree of vertical integration, and the level of entry barriers[63]. Alternative sources of market power might include data and analytical capacity. These variables may help identify potential competitors, as well as the competitive pressure that might come more from disruptive entry and innovation[64].

---

[57] F. Ghezzi, G. Olivieri, *Diritto antitrust*, cit.

[58] ECJ, 9 Nov 1983, C-322/81, *Michelin v Commission*, in *Racc.*, 1983, p. 3461.

[59] EU Commission, *Notice on the definition of relevant market for the purposes of Community competition law*, in *Off. Bull. EC*, C 372, 9 Dec 1997, p. 5.

[60] ECJ, 16 May 2000, C-344/98, *Masterfood HB v Commission*; in *Racc.*, 2000, p. 11369; ECJ, 24 Oct 2002, C-82/01, *Aéroport de Paris v Commission*, in *Racc.*, 2002, p. 9297; ECJ, 15 Feb 2005, C-12/03, *Commission v Tetra Laval*, in *Racc.*, 2005, p. 987; ECJ, 14 Oct 2010, C-280/08, *Deutsche Telekom v Commission*, in *Racc.*, 2010, p. 9555.

[61] ECJ, 14 Feb 1978, C-27/76, *United Brands Company and United Brands Continental BV v Commission*, in *Racc.* 1978, p. 207, n. 65.

[62] *Commission notice on the definition of relevant market for the purposes of Community competition law,* in *Off. Bull.* EC, C 372, 9th December 1997, p. 5.

[63] A. Streel, P. Larouche, *Disruptive Innovation and Competition Law Enforcement*, in *SSRN Electronic Journal*, 2015, available at: 10.2139/ssrn.2678890. Last accessed 3 Dec 2020.

[64] Id.

Holding a dominant position is not *per se* illegal. Article 102 TFEU only prohibits its abuse, e.g. by setting unfair prices, limiting production, or refusing to innovate to the detriment of consumers. Business behaviours that would be fully legitimate under competitive conditions could be sanctioned under competition law if carried out by a dominant undertaking. This is why dominant undertakings are said to have a "special responsibility"[65].
As the EU Court of First Instance (CFI) held in the case *Società Italiana Vetro SpA, Fabbrica Pisana SpA and PPG Vernante Pennitalia SpA v Commission* (1992), two or more independent, competing firms share a collective dominant position when, in a specific market, they are united by such 'economic links' as, for instance, agreements or licenses granting them a technological lead[66].
Therefore, for a collective dominant position to arise, three cumulative conditions must be met:

1. the competing companies are independent economic and legal entities;
2. they share market power; and
3. they are united by economic links enabling strategic alignment.

Modern economic theories about monopolies and game theory underline that, in a market with certain characteristics, such as transparency and high entry barriers, companies can collude in a sustainable way by simply observing and adapting to each other.
Accordingly, in the *Airtour* case[67], the CFI held that proof of tacit collusion can be given if:

1. the market is highly transparent;
2. deterrent mechanisms are available ensuring that collusion is sustainable; and
3. there are no external competitive pressures.

The *Airtour* conditions are the standard by which EU authorities assess the existence of a collective dominant position *ex ante* (i.e. for the purposes of mergers' control) or *ex post* (i.e. for the purposes of Art. 102 TFEU)[68].
By increasing market transparency and the speed of decision-making and retaliation, algorithms can shape a market's structure in a way that is more conducive to tacit collusion.

[65] ECJ, 9 Nov 1983, C-322/81, *NV Nederlandsche Banden Industrie Michelin v Commission*, in *Racc.* 1983, p. 3461, para 57.

[66] CFI, 10 Mar 1992, Joined cases T-68/89, T-77/89 and T-78/89, *Società Italiana Vetro SpA, Fabbrica Pisana SpA and PPG Vernante Pennitalia SpA v Commission*, in *European Court reports*, 1992, p. II-01403.

[67] EU Commission, 22 Sep 1999, case IV/M. 1524, *Airtours/First Choice*, paras 54-55.; CFI, 6 Jun 2002, case T-342/99, *Airtours plc v Commission*, para 62.

[68] EU Commission, *Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings*, *OJC 31, 5.2.2004*, available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52004XC0205%2802%29. Last accessed 3 Dec 2020.

They can increase transparency and enable immediate retaliation to any deviation from collusion. If the market has high entry barriers, parallel conducts between jointly dominant undertakings can amount to a collective abuse.

The main advantage of framing tacit collusion as a collective dominant position rather than a concerted practice is that the former is a purely objective notion, which does not require proof of intention nor consciousness, whereas the latter requires that a meeting of minds or a conscious co-operation between firms is shown. This proposal, however, is no panacea. An important limitation is that it only applies to oligopolistic markets, whereas algorithmic collusion may materialise in non-oligopolistic ones as well. However, algorithmic collusion can be expected to prove particularly harmful in oligopolistic markets. In such contexts, competition authorities could rely on the doctrine of collective abuse of dominant position as an alternative to the hurdles inherent in the concepts of agreements and concerted practices. Finally, this proposal does not deprive the undertaking from the flexibilities allowed by Article 101(3) TFEU. The undertaking is still entitled to rebut an action under Article 102 TFEU by invoking prevailing pro-competitive effects[69].

4.3. Incentivising 'compliant-by-design' algorithms and monitoring systems

As algorithms become increasingly autonomous, they will replace humans in making an increasing number of key business decisions. The OECD claims that this might question the competition law liability of the entities using algorithms since the link between principal (human) and agent (algorithm) is weak[70].

As early scholarly studies on algorithmic collusion[71] pointed out, the shift from human price-setting to automated price-setting challenges the very foundations of competition law. Competition law relies on the "anthropomorphic concepts" of intent and agreement, which makes it hard to categorize the dynamics of automated price-setting. Also, algorithms are not just tools in the hands of human agents: they can act and set prices autonomously. This raises the question of whether human agents should be liable for actions taken by autonomous agents. Proactive sector regulation, such early studies contend[72], may therefore be best suited to address the competitive concerns arising from algorithmic pricing.

However, it can be reasonably argued that a principle of functional equivalence should apply. If algorithms become ever more similar to humans thanks to AI developments, the company using them can be held liable for algorithm-caused anticompetitive infringe-

[69] ECJ, 27 Mar 2012, C-209/10, *Post Danmark A/S v Konkurrencerådet*, paras 41 ff.

[70] OECD, *Algorithms and Collusion – Background Note by the Secretariat*, cit.

[71] S.K. Mehra, *Antitrust and the Robo-Seller: Competition in the Time of Algorithms*, in *Minnesota Law Review*, 2016, 100, pp. 1323 ff.

[72] Id.

ments, to the same extent it can be responsible for the infringements provoked by a human agent. In fact, for an entity to be liable for a competition law violation there is no need to show that such a violation depended on a factor that was under the full, deterministic control of the company's legal representatives. Generally, any infringement in favour of the company might be relevant, whether it depends on human or informatic resources thereof. This might induce undertakings to do everything possible to use algorithms that are compliant by design with competition law and monitor their functioning to proactively prevent and promptly detect antitrust infringements. For instance, algorithms could be programmed to take into account average prices in the industry while neglecting price changes set by individual firms[73].

Competition law also offers additional tools to prevent anticompetitive infringements. These tools might ease the design and adoption of algorithms that stay clear from competition law issues. First, an increasing number of jurisdictions are implementing antitrust compliance programs, under which firms adopting programs to ensure compliance with competition law are granted a reduced sanction. National Competition Authorities grant a reduction of the fine to companies that implement adequate compliance programs before an investigation is started. This may represent an additional incentive for firms to use competition-law-compliant algorithms, e.g. by implementing auditing mechanisms for algorithms.

Secondly, commitments under Article 9, Regulation n. 1/2003 can facilitate the end of a competition law violation. Once an investigation has started, companies can conclude an agreement with the competent authority under which the former commit to ceasing a certain conduct to avoid suspicion of a competition law infringement. Commitments might include the reprogramming or substitution of the algorithms used by the undertaking.

Finally, algorithms could also be used to ease the detection of algorithmic collusion.[74] For instance, algorithms can help determine if, in lack of transparency of the undertaking's competitors' algorithms, the market equilibrium would have been at such a high level[75]. The EU Commission has considered this strategy. The Commissioner Vestager stated that «we would like to have our own algorithms to be out there, looking into the market, figuring out if there has been collusion taking place»[76].

[73] Id., p. 49. «Recent developments in Europe seem to indicate a similar movement to make algorithms more transparent and accountable for law infringements. In a recent speech at the Bundeskartellamt, the EU Commissioner Vestager (2017) stated that businesses have the obligation of programming algorithms to deliberately comply with data protection and antitrust laws, which can be denominated as 'compliance by design'» (Id., p. 46).

[74] A. Capobianco, A. Nyeso, *Challenges for Competition Law Enforcement and Policy in the Digital Economy*, cit.

[75] M.S. Gal, *Algorithms ss Illegal Agreements*, cit.

[76] F.Y. Chee, *EU considers using algorithms to detect anti-competitive acts*, in *Reuters*, 4 May 2018, available at: https://www.reuters.com/article/us-eu-antitrust-algorithm/eu-considers-using-algorithms-to-detect-anti-competitive-acts-idUSKBN1I5198. Last accessed 3 Dec 2020.

5. The role of civil liability

Competition law has two major limitations. First, it does not compensate damages. Secondly, competition authorities cannot exercise an all-encompassing control on the market, given the high costs of information generally imposed on centralized agencies. This is especially true in digital markets, where infringements of competition law can be both *discreet*, i.e. difficult to detect, and *discrete*, i.e dispersed over the market. Civil liability rules could fill these gaps of competition law. Civil liability has a reparatory function and can support the deterrent effects of antitrust sanctions.

Competition law does not compensate the pecuniary damages suffered by consumer because of an anticompetitive behaviour. This is civil liability's job. National competition legislations consider antitrust violations as civil wrongs entitling injured parties to compensation[77]. This kind of provisions could not be effectively enforced due to the difficulties inherent in the burden of proof. Yet, Directive 2014/104/EU promises to empower plaintiffs *vis-à-vis* those responsible for anticompetitive violations. As for damages, the directive addresses two main issues.

On the one hand, it describes damages in terms of *damnum emergens* (economic loss) and *lucrum cessans* (loss of profits) plus interests, while stating that «full compensation shall place a person who has suffered harm in the position in which that person would have been, had the infringement of competition law not been committed» (Article 3, n. 2, Directive 2014/104/EU). Therefore, punitive damages as well as any other forms of overcompensation are prohibited (Article 3, n. 3, Directive 2014/104/EU).

On the other hand, Art. 4 of the Directive provides that «Member States shall ensure that all national rules and procedures relating to the exercise of claims for damages are designed and applied in such a way that they do not render practically impossible or excessively difficult the exercise of the Union right to full compensation for harm caused by an infringement of competition law» (effectiveness principle).

Accordingly, upon the request of plaintiffs, judges can order the defendant or third parties to disclose relevant evidence (Article 5, n. 1). Moreover, Article 17(1) of the Directive provides that national courts shall have the power «to estimate the amount of harm if it is established that a claimant suffered harm but it is practically impossible or excessively difficult precisely to quantify the harm suffered on the basis of the evidence available». Eventually, national courts can ask for assistance from national competition authorities (Article 17, n. 3). In quantifying relevant damages, the competent authority ought to compare the real situation with a non-infringement scenario, with an estimation of a reference non-infringement price.

[77] In Italy, see Cons. Stato, sez. VI, 12 Feb 2014, n. 693, in *Rass. dir. farmaceutico*, 2014, p. 336; G: Alpa, *Appunti sul divieto di abuso del diritto in ambito comunitario e sui suoi riflessi negli ordinamenti degli Stati membri, in questa rivista*, 2015, p. 245); in Germany, see par. 33, Wettbewerbsbeschränkungen, 2005; in the UK, see Art. 47a, Competition Act, 1998.

Once a competition authority finds an infringement, plaintiffs can use its decision to claim damages in follow on actions. In fact, under Article 16, reg. (EC) n. 1/2003, «when national courts rule on agreements, decisions or practices under Article 81 or 82 of the Treaty [now Articles 101 and 102] which are already the subject of a Commission decision, they cannot take decisions running counter to the decision adopted by the Commission». This way, damages can magnify the deterrent effects of antitrust sanctions.
At the same time, Directive 2014/104 promises to facilitate the private enforcement of EU and national competition law in the form of stand-alone civil actions. The new legislation gives the parties the right to ask the judge to order the defendant or a third «to disclose relevant evidence which lies in their control», provided that the claimant «has presented a reasoned justification containing reasonably available facts and evidence sufficient to support the plausibility of its claim for damages» (Article 5(1), Directive 2014/104 EU). Under Article 8(2), Directive n. 2014/104, the parties that do not comply with the judicial order of disclosure may be subject to «the possibility [for the judge] to draw adverse inferences, such as presuming the relevant issue to be proven or dismissing claims and defences in whole or in part, and the possibility to order the payment of costs». These provisions are intended to make it easier for the public to prove both discrete and discreet violations of the competition law and obtain compensation. Such a widespread and bottom-up control of anti-competitive conducts can also usefully complement the centralised control by the Commission and national authorities, which are burdened with substantial information costs. Private enforcement actions may attract the attention of the antitrust authorities, giving rise to investigations following the initiatives of individuals.

6. Conclusions

Recent theoretical and empirical research suggest that algorithms could facilitate tacit collusion. Tacit collusion inhabits a grey area between anticompetitive agreements, which are prohibited, and mere market parallelism, which is perfectly normal in a competitive market. Both scholars and policymakers question the suitability of existing competition law rules (particularly Article 101 TFEU) to tackle algorithmic collusion.
While current policy initiatives, such as the Commission's NCT initiative start considering the need for regulatory and competition law innovations to better tackle algorithm-driven collusion, this article proposes to use, as an alternative to Article 101 TFEU, the purely objective notion of collective abuse of dominant position under Article 102 TFEU. This way, competing firms holding a collective dominant position in the relevant market, which is transparent and has high entry barriers, could catch the attention of competition authorities if they use pricing algorithms and show parallel conducts. As a result, firms operating in digital markets would be incentivised to use algorithms that steer clear from competition law infringements, as well as to implement adequate monitoring systems. Compliance programs and commitments could also provide such an incentive.

Finally, civil liability actions can complement the intervention of competition authorities in several ways in relation to algorithmic collusion. First, damages compensation may strengthen the deterrent effect of antitrust pecuniary sanctions. Secondly, private enforcement actions, facilitated by recent reforms, may trigger public authorities' investigations, helping these latter detect algorithm-driven competition law infringements, which are both discreet and discrete.