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Algorithmic Pricing

The Current State of Affairs from a Law and Economics Perspective

Abstract

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The rise of algorithmic pricing has transformed perfect price discrimination from a theoretical concept into a real possibility. Through self-learning pricing algorithms, a strategy can be developed that approximates consumers' reservation prices with ever-improving accuracy. This paper analyzes algorithmic pricing from a law and economics perspective to identify the efficiency and equity effects that the practice could cause and determine to which extent it is regulated under the current legal framework. This paper finds that under competitive market conditions, algorithmic pricing could be welcomed from an efficiency perspective, but from an equity and ethical perspective serious concerns need to be raised. If these concerns are to be taken seriously, the legal framework provides only a partially functional approach to address algorithmic pricing. Additional appropriate remedies are, therefore, needed to protect consumers adequately and effectively against exploitation that reduces their welfare.

Sumario

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El auge de los precios algorítmicos ha transformado la discriminación de precios perfecta de un concepto teórico a una posibilidad real. La fijación de precios a través de algoritmos de aprendizaje automático ha facilitado el desarrollo de una tecnología que se aproxime a los precios de reserva de los consumidores con una precisión que constantemente mejora. Este artículo analiza la fijación algorítmica de precios desde una perspectiva de derecho y economía para identificar los efectos que la práctica podría causar en términos de eficiencia y equidad, y para determinar en qué medida está regulada bajo el marco legal actual. Este artículo revela que, en mercados competitivos, los precios algorítmicos podrían ser oportunos desde una perspectiva de eficiencia, pero desde una perspectiva de equidad y ética es necesario expresar serias preocupaciones. Si estas preocupaciones se toman en serio, el marco legal proporciona solo un enfoque parcialmente funcional para abordar la fijación algorítmica de precios. Por consiguiente, se necesitan remedios apropiados adicionales para proteger a los consumidores de manera adecuada y efectiva contra la explotación que reduce su bienestar.

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1. Introduction[*]

The New Consumer Agenda of the European Commission (EC) for the period 2020-2025 explicitly mentions the digital transformation as one of its five key areas of interest. More specifically, the Commission aims to ensure that consumers are as protected online as offline, whereby protecting consumer rights in relation to *artificial intelligence* is one of its specific objectives[1]. The digital transition poses new challenges to consumer protection laws for which concrete action needs to be taken[2]. Innovative data-processing techniques have enabled the development of state-of-the-art marketing strategies that are specifically focused on *personalization*. This allows companies to segment online markets more successfully. One of these strategies is *personalized pricing*. By collecting data about consumers and creating individualized consumer profiles, it becomes possible to offer different people different prices for the same good or service[3]. This makes it a refined form of *price discrimination*, which is a well-known business practice of adapting prices based on *consumer heterogeneity*[4].

The process of personalization is constantly being improved by technological advances in *data analytics* and *machine learning*. The emergence of *Big Data* has facilitated the use of algorithmic techniques, which are extraordinarily effective and efficient at setting, monitoring, and correcting prices in the face of continuous market changes. Algorithms are becoming increasingly prevalent in online markets and their precision is continuously evolving[5]. Accordingly, the personalization of services, among which personalized pricing, is experiencing exponential growth, whereby the retail industry is leading in terms of adopting data-driven technologies. In particular, the application of personalization services in B2C markets is a profitable practice that is expected to become more pervasive in the course of the years[6].

The developments in algorithmic technologies have made personalized pricing more accurate and more profitable[7]. Personalized pricing that is enabled by algorithms is more popularly called *algorithmic pricing*[8].

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[1] Communication from the Commission to the European Parliament and the Council: New Consumer Agenda Strengthening Consumer Resilience for Sustainable Recovery. COM/2020/696 final.

[2] ID.

[3] Consumer market study on online market segmentation through personalized pricing/offers in the European Union Request for Specific Services 2016 85 02 for the implementation of Framework Contract EAHC/2013/CP/04, Final report. Hereinafter called EU REPORT.

[4] OFT, «The Economics of Online Personalised Pricing», 2013, retrieved from https://docplayer.net/9529539-The-economics-of-online-personalised-pricing.html.

[5] GRAEF, «Algorithms and fairness: What role for competition law in targeting price discrimination towards ends consumers», *Columbia Journal of European Law,* vol. 24, num. 3, 2018, pp. 541 ss.

[6] EU REPORT.

[7] ID.

[8] The concept of algorithmic pricing will be further discussed in section 2.

Consequently, consumer concerns are arising, and numerous consumer organizations are issuing reports analyzing the potential dangers of personalized prices[9]. Consumer concerns are exacerbated by the lack of transparency concerning the working of these data-driven personalization techniques. There is a lack of knowledge and awareness among consumers regarding the collection and processing of their data, which raises more suspicion. This is mainly caused by two factors. On the one hand, it is particularly burdensome for consumers to observe and understand the data-driven techniques that are employed by a specific firm. Overall, consumers have a general awareness that their data is collected and processed, yet it is excessively onerous for consumers to actually investigate if an individual firm is collecting their data, in what manner, and what the effects of it will be[10]. On the other hand, the provision of information by firms to consumers regarding the processing of their data is far from being transparent. It is common practice that consumer information is made available, but in a manner that is inconspicuous and hardly intelligible[11]. Hence, there is a twofold problem, namely a lack of transparency and a lack of information. For this reason, the EC has tried to regulate the disclosure of information to consumers and the use of certain commercial practices that allow for personalization[12].

Nonetheless, in the existing literature, it is heavily debated to what extent these regulations have been sufficient and to what extent they are desirable. When it comes to the merits of algorithmic pricing, several aspects make the desirability of the practice difficult to determine. There is a constant tension between its economic, legal, and ethical properties. In this paper, algorithmic pricing is analyzed from a law and economics perspective, whereby efficiency, distributive, fairness, and ethical considerations are taken into account.

The structure of the paper is as follows. First, an introduction to algorithmic pricing is given to understand its working and applications. Next, the role of marketing is highlighted, and the economic analysis of algorithmic pricing is conducted. In addition, the ethical concerns are investigated with a specific focus on fairness-based arguments. Thereafter, the legal challenges will be reviewed to see if the current legal framework is satisfactory. Consequently, the current state of affairs is discussed, and the corresponding conclusion and policy recommendation are presented.

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[9] See, for example, CONSUMERS INTERNATIONAL, «A Consumer Investigation into Personalised Pricing», 2022, retrieved from https://www.consumersinternational.org/news-resources/news/releases/new-research-consumers-worldwide-concerned-by-opaque-online-pricing/. The report states that: «*97% of surveyed consumers registered some level of concern about personalised pricing, with a lack of transparency and potential for unfairness identified as greatest risks*». The Dutch Authority for Consumers and Markets also conducted an official study on personalized pricing, ACM, *Leidraad Bescherming Online Consument*, 2020, retrieved from https://www.acm.nl/sites/default/files/documents/2020-02/acm-leidraad-bescherming-online-consument.pdf.

[10] LI *et al.,* «Transparency of behavior-based pricing», *Journal of Marketing Research,* vol. 57, num. 1, 2020, pp. 78 ss.

[11] ID.

[12] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). Hereinafter called GDPR; Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/EEC, Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council ('Unfair Commercial Practices Directive'). Hereinafter called UCPD.

2. Algorithmic pricing: an exploration

Algorithms have been subject to numerous studies and a multiplicity of definitions for artificial intelligence technologies have been given in the existing literature[13]. This section aims to briefly introduce the concept of *algorithmic pricing* and subsequently focus on its applications and effects. This allows for an in-depth analysis rather than a recompilation of the existing literature on artificial intelligence. In essence, algorithms are used by companies to personalize their services to consumers' preferences and characteristics. AI-based technologies allow for the processing of vast amounts of data which contributes to the improvement of consumer profiling. As a result, the personalization of online transactions can take place. This can take a variety of forms, such as personalized advertisements, personalized contracts, and personalized prices. In this paper, the focus will lie on the pricing dimension of personalization.

2.1. Concept and definitions

Algorithmic pricing is receiving notable attention in the economic and legal literature, and large organizations, such as the OECD, issued extensive reports on the subject[14]. CHAPDELAINE defines the practice as follows: «*Algorithmic personalized pricing, as a specific form of discriminatory pricing, comprises any commercial practice setting prices according to consumers' personal characteristics to target as closely as possible their willingness to pay*»[15]. The goal of the seller is to discover the maximum amount of money that a consumer is willing to pay for a specific product or service. This is also called the *reservation price*, which indicates the subjective value that an individual attaches to a good[16].

The reservation price is also the benchmark with which *consumer surplus* is measured. Consumer surplus is «*the difference between the market price for a good and the maximum price consumers would be willing to pay for that good*»[17]. Through algorithmic pricing, the seller aims to ask for a price that accurately reflects consumers' reservation price. If the market price equals the reservation price of the consumer, the seller captures the entire consumer surplus. To determine the consumer's reservation price, considerable amounts of data need to be collected and processed. Algorithms form the basis of this pricing technique, which explains the use of the term algorithmic pricing. Under algorithmic pricing, it would become possible to ask consumers different prices for the same good or service, whereby the production costs do not justify the difference. For this reason, algorithmic pricing has been deemed a form of *discriminatory pricing*[18].

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[13] MCCARTHY *et al.,* «A proposal for the Dartmouth summer research project on artificial intelligence», *AI Magazine,* vol. 27, num. 4, 2006, pp. 12 ss.; NILSSON, *The quest for artificial intelligence*, Cambridge University Press, Cambridge, 2009; AGHION *et al.,* «Artificial intelligence and economic growth», in AGRAWAL *et al*. (eds.), *The economics of artificial intelligence: An agenda*, University of Chicago Press, Chicago, 2019, pp. 237 ss.; COCKBURN *et al.,* «The impact of artificial intelligence on innovation», in AGRAWAL *et al.* (eds.), *The economics of artificial intelligence: An agenda*, University of Chicago Press, Chicago, 2019, pp. 115 ss.

[14] See, for example, OECD, «Personalized Pricing in the Digital Era», 2018, retrieved from https://www.oecd.org/ competition/personalised-pricing-in-the-digital-era.html.

[15] CHAPDELAINE, «Algorithmic Personalized Pricing»*, New York University Journal of Law and Business,* vol. 17, num. 1, 2020, p. 3.

[16] PARISI, *The language of law and economics*, Cambridge Books, Cambridge, 2013, p. 256.

[17] ID., p. 60.

[18] ID., p. 229.

2.2. Conditions

To realize algorithmic pricing strategies, three conditions need to be fulfilled[19]. If one of the conditions does not hold, the ability to discriminate prices is severely limited. First, consumers differ in their levels of demand. If consumers have identical demands, their *willingness to pay* (WTP) and the quantity demanded will be the same, which impedes any form of price discrimination. Second, the firm has *market power*, which means that it can set prices above marginal costs. Price discrimination arises in accordance with the theory of monopoly and oligopoly. If the firm is a price-taker, the feasibility of charging different prices is limited since under perfect competition consumers would switch to competitors. This is in line with the *law of one price* under perfect competition. Nonetheless, the rigidity of this condition is debatable since in practice firms do have the ability to set prices rather than take them in the absence of market power[20]. Third, the firm can limit *arbitrage*. If consumers can resale the goods and arbitrage price differences, charging higher prices is largely restricted since the prices will converge to one price.

An extension of the arbitrage condition is related to *fairness*[21]. If consumers can discover, without incurring significant *transaction costs*, that they are paying more for a certain good than others, this will likely cause consumer outrage, which can be detrimental to the reputation of the firm[22]. Hence, the seller needs to be active in a market or adopt a specific pricing strategy whereby it becomes too costly for consumers to directly observe the prices that other consumers are paying for the same product[23]. In other words, price comparison needs to be particularly onerous for consumers in order to conceal potential price discrimination. If price comparison can take place at a relatively low cost, consumers will switch to competitors, and it could cause damage to the reputation and the profitability of the firm. The firm should, therefore, be able to conceal the personalized prices to a certain extent. In theory, three conditions need to be fulfilled, but in practice, it seems that four requirements need to be met to make price discrimination possible.

2.3. Degrees of price discrimination

Price discrimination was first categorized by PIGOU[24]. There are three degrees of price discrimination. *First-degree price discrimination*, which is also called *perfect price discrimination*, occurs when a seller can charge each consumer a price that is equal to their maximum WTP, i.e., the reservation price. This can take place when a firm can observe all relevant heterogeneity among consumers, related to their WTP and adapt prices accordingly[25]. In this way, individual prices can be charged and all the consumer surplus can be taken by the seller.

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[19] PIGOU, *The economics of welfare*, Macmillan, London, 1920; McAfee, «Price discrimination», *Issues in Competition Law and Policy*, vol. 1, 2008, pp. 465 ss.

[20] MOTTA, *Competition policy: Theory and practice*, Cambridge University Press, Cambridge, 2004.

[21] KAHNEMAN *et al.,* «Fairness as a constraint on profit seeking: Entitlements in the market», *The American Economic Review*, vol. 76, num. 4, 1986, pp. 728 ss.

[22] BAR-GILL, «Algorithmic Price Discrimination: When Demand Is a Function of Both Preferences and (Mis)perceptions», *University of Chicago Law Review,* vol. 86, num. 2, 2018, pp. 1 ss.

[23] ID.

[24] PIGOU, *The economics of welfare*, part 2, chapter 14.

[25] OFT, «The Economics of Online Personalised Pricing», p. 14.

Second-degree price discrimination occurs when a seller offers a menu of options with different versions (i.e., *versioning*) of a good or service, and the consumer self-selects which version she wants to have according to her preferences[26]. The variety of options can depend on various factors such as the quantity demanded, product features, and quality levels[27].

Third-degree price discrimination is also referred to as *group pricing*. The prices are set differently for different groups of consumers[28]. In contrast to first-degree pricing, the price depends on group characteristics rather than individual characteristics[29]. Third-degree price discrimination is seen as an imperfect form of price discrimination since it depends on observable group characteristics and in this case, it is practically not possible to perfectly observe the heterogeneity between individual consumers[30].

In terms of information, the three degrees of price discrimination can be classified as follows. Under the first degree, the seller has perfect information about the consumer, whereas, under the third degree, the seller has imperfect information about the consumer. In both scenarios, the seller has some or full ex-ante information about the consumer. Conversely, under second-degree price discrimination, the seller has no ex-ante information. By letting the consumer self-select, relevant information becomes available to the seller on an ex-post basis[31].

The first and third degrees of price discrimination show a close resemblance to each other since both methods are dependent on information about the characteristics of the consumer. Pursuant to the ex-ante information that the seller has, consumers can be charged different prices. For this reason, a modern alternative to the classification by PIGOU is to call the first and third degrees of price discrimination, *direct price discrimination*. The second degree falls under *indirect price discrimination* since all consumers are offered the same menu of options, regardless of their characteristics, but based on the choice of the consumer, the seller can obtain information about the consumer and discriminate accordingly[32].

Although the terms direct and indirect price discrimination are more commonly used in the economic literature, most consumer reports adhere to the original classification by PIGOU[33]. In this paper, the classification of price discrimination in three degrees is followed because the focus lies on the shifts between the degrees of price discrimination that algorithmic pricing causes.

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[26] OECD, «Personalized Pricing in the Digital Era», p. 9.

[27] MILLER, «What do we worry about when we worry about price discrimination? The law and ethics of using personal information for pricing», *Journal of Technology Law & Policy,* vol. 19, num. 1, 2014, p 55.

[28] OECD, «Personalized Pricing in the Digital Era», p. 9.

[29] EU REPORT, p. 34.

[30] OFT, «The Economics of Online Personalised Pricing», p. 14.

[31] TOWNLEY *et al.,* «Big data and personalized price discrimination in EU competition law», *Yearbook of European Law,* vol. 36, num. 1, 2017, p. 689.

[32] MCAFEE, *Issues in Competition Law and Policy*, vol. 1, 2008, pp. 468-469.

[33] OECD, «Personalized Pricing in the Digital Era»; OFT, «The Economics of Online Personalised Pricing»; EU REPORT; CONSUMERS INTERNATIONAL, «A Consumer Investigation into Personalised Pricing».

2.4. Price discrimination in the digital age

In his description of the three types of price discrimination, PIGOU states that all forms of price discrimination are theoretically possible, yet they are not all of equal importance[34]. Third-degree price discrimination is most likely to be found in practice, whereas first-degree price discrimination is regarded as an unattainable ideal[35] or a theoretical benchmark in models of discriminatory pricing[36]. This line of thought has been followed for a considerable time in modern economic theory[37].

The rationale behind the dismissal of first-degree price discrimination as a real-life possibility has been reasonable to accept in the last decades. In traditional brick-and-mortar shops, it was practically impossible to obtain all relevant information about a consumer to match her reservation price. There was a situation of *information asymmetry* between the seller and the buyer and, therefore, third-degree price discrimination was a more feasible pricing strategy. By obtaining sufficient information about the common characteristics concerning the group to which the consumer belongs (e.g., gender, age, employment), an estimation of the consumer's WTP can be made.

Nevertheless, the advent of Big Data has caused significant shifts in discriminatory pricing. TOWNLEY states: «*The technological capacities of Big Data substantially enhance the ability of digital retailers to engage in much more precise, targeted, and dynamic forms of price discrimination that were not previously possible.*»[38]. By virtue of large-scale data extraction, firms can improve the predictability of consumer behavior[39]. Increasing amounts of data about consumers are collected, processed, and used. Not only data about the characteristics of consumers can be obtained, but also about their behavior. Accordingly, the firm can segment the population optimally for pricing purposes[40].

Traditionally, the collection of this data took place under the umbrella of product and service improvement. However, it is argued that the data is used for more than service improvement only. It can be highly profitable for companies to use the data for personalization purposes, which leads to a so-called *behavioral surplus*. In other words, employing data analytics to accurately predict consumer behavior and steer it in a certain direction in order to obtain more revenue[41].

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[34] PIGOU, *The economics of welfare*, p. 201.

[35] ODLYZKO, «Privacy, economics, and price discrimination on the internet», *Proceedings of the 5th international conference on electronic commerce*, 2003, pp. 355 ss.

[36] EU REPORT, p. 34.

[37] See, for example, VARIAN, *Intermediate microeconomics: A modern approach,* 8th edn, WW Norton & Company, 2010. This is confirmed by OECD, «*Personalized Pricing in the Digital Era*», p. 5; EU REPORT, p. 34.

[38] TOWNLEY, *Yearbook of European Law,* vol. 36, num. 1, 2017, p. 684.

[39] ZUBOFF, «Surveillance capitalism and the challenge of collective action», *New labor forum,* vol. 28, num. 1, 2019, pp. 10 ss.

[40] ACQUISTI *et al.,* «The economics of privacy», *Journal of Economic Literature,* vol. 54, num. 2, 2016, p. 460.

[41] ID.

The ability of firms to predict consumer behavior has been quickly improving due to the developments in machine learning. Algorithms are self-improving and self-updating through the continuous collection of new data. Based on incoming data regarding consumers' preferences, profiles, and choices, it becomes possible to constantly enhance the personalization of transactions[42]. A clear ramification of the use of algorithms is that the theoretical first-degree type of price discrimination is closer to becoming reality than one might think. As ACQUISTI confirms: «*Tracking and measurability, in addition to websites' ability to dynamically update and personalize prices for each visitor, are bringing online markets closer to the theoretical scenario of first-degree price discrimination.*»[43].

2.5. The role of standard forms

General terms and conditions form an integral part of all transactions that consumers perform on a daily basis, yet virtually no one reads the standard form when clicking «I agree». The relationship between online terms and conditions (i.e., standard forms/privacy notices/terms of services) and algorithmic pricing is particularly relevant.

To perform algorithmic pricing strategies, firms require vast amounts of personal data. Based on this data, consumer profiles can be made, and subsequently, more accurate targeting can take place. When a firm can accurately predict consumers' WTP, the way to perfect price discrimination has been opened. Nonetheless, the collection and processing of data in the European Union (EU) are regulated by the GENERAL DATA PROTECTION REGULATION (GDPR)[44]. This regulation sets a body of rules that regulate the manner in which firms extract data for business purposes. One of the rules is that under the GDPR firms are only permitted to gather data for profiling purposes if it is necessary for business activities, authorized by law, or if it is based on explicit *consumer consent*[45]. It is the latter part that seems to be the Achilles heel of the system. Through standard notices and consent mechanisms, such as general terms and conditions, privacy policies, and end-user agreements, firms can easily obtain the consent of consumers to collect and process personal and behavioral data[46]. In addition, companies can also obtain data from third-party data providers, such as marketing companies and data aggregators, which help them to optimize their marketing strategies[47].

CHAPDELAINE describes it as follows: «*Under the guise of convoluted standard terms of use nobody reads but "agrees to", and often soft privacy laws with limited regulatory oversight, the collection of Big Data has quickly become one of the largest forms of extraction with the lowest public regulatory oversight.*»[48].

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[42] GOLOBARDES, «Algorithmic personalization of consumer transactions and the limits of contract law», *Journal of Law, Market & Innovation,* vol. 1, num. 1, 2022, p. 21.

[43] ACQUISTI, *Journal of Economic Literature,* vol. 54, num. 2, 2016, p. 466.

[44] GDPR.

[45] OECD, «Personalized Pricing in the Digital Era», p. 39.

[46] ZUBOFF, *New labor forum,* vol. 28, num. 1, 2019, p 18.

[47] BUJLOW *et al.,* «Web tracking: Mechanisms, implications, and defenses», *arXiv preprint, arXiv:1507.07872*, 2015, pp. 1 ss.; CHRISTL *et al.,* «Corporate surveillance in everyday life», *Cracked Labs,* vol. 6, num. 1, 2017, pp. 1 ss.

[48] CHAPDELAINE, *New York University Journal of Law and Business*, vol. 17, num. 1, 2020, p. 10.

There is a significant *signing-without-reading* problem, which causes consumers to be practically unaware of the contents of a standard form contract[49]. Consequently, there is a discrepancy between consumers' expectations regarding the processing of their data and the actual practice. In essence, there is a lack of control on the side of consumers regarding their personal data, which is maintained, perhaps exacerbated, by the use of standard terms and conditions that provide firms with the necessary consent to collect and process the data. The consent provided by consumers could be a valid instrument if it would be given freely, genuinely, and in an informed manner[50]. Since this is currently not the case, consumers are giving consent during a transaction while being unaware of the consequences that the processing of their data will have on their future position in digital markets[51].

2.6. Algorithmic pricing in practice

Hitherto algorithmic pricing has been discussed as a theoretical phenomenon, yet there is substantial evidence that algorithmic pricing is also taking place in practice. The first time the general public became acquainted with more sophisticated price discrimination occurred in 2000 when it was discovered that Amazon was charging regular returning customers a higher price for the same DVDs. By deleting the cookie history, the price would drop significantly. This caused public outrage and Amazon reacted by stating an apology and explaining that it was part of a price experiment, however, the apology was not well-received. Since then, the media, scholars, and consumers have been particularly skeptical of personalized pricing[52]. In the existing literature, there is widespread consensus that price discrimination is becoming increasingly pervasive in digital markets and the underlying technologies rely increasingly more on consumers' personal information[53].

Nonetheless, the empirical evidence is not unequivocal when it comes to identifying the effects of price discrimination in practice. There are two principal reasons for this. First, as the Amazon case demonstrated, there is a real danger for businesses of suffering reputational damage by engaging in price discrimination techniques. Therefore, it could be less risky for businesses to engage in alternative marketing strategies, such as targeted advertising, which evoke less public backlash. Second, it is highly likely that because of this potential threat of negative publicity, firms make the pricing strategies intentionally non-transparent. Through sophisticated pricing strategies, firms could be able to reap the benefits of personalized pricing while minimizing the probability of getting exposed by the public[54].

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[49] DE GEEST, «Signing without reading», in MARCIANO/RAMELLO (eds.), *Encyclopedia of Law and Economics: Basic areas of law,* 1st edn, Springer, 2015.

[50] GIL GONZÁLEZ/DE HERT, «Understanding the legal provisions that allow processing and profiling of personal data—an analysis of GDPR provisions and principles», *Era Forum,* vol. 19, num. 4, 2019, pp. 597 ss.

[51] GOLOBARDES, *Journal of Law, Market & Innovation,* vol. 1, num. 1, 2022, p. 41.

[52] See for a further discussion of the Amazon case MILLER, *Journal of Technology Law & Policy,* vol. 19, num. 1, 2014, p. 48.

[53] ACQUISTI/VARIAN, «Conditioning prices on purchase history», *Marketing Science,* vol. 24, num. 3, 2005, pp. 367 ss.; TAYLOR, «Consumer privacy and the market for customer information», *RAND Journal of Economics*, vol. 35, num. 4, 2004, pp. 631 ss.; TUROW *et al.,* «Open to Exploitation: America's Shoppers Online and Offline», *A Report from the Annenberg Public Policy Center of the University of Pennsylvania,* 2005; DEWAN *et al.,* «Product customization and price competition on the internet», *Management Science*, vol. 49, num. 8, 2003, pp. 1055 ss.

[54] EU REPORT, p. 43.

Finding empirical evidence for the practice is, therefore, particularly onerous. In table 1, a non-exhaustive list of recent academic studies and journal articles on personalized pricing (the term is used interchangeably with algorithmic pricing) is presented. The studies were focused on the effects of algorithmic/personalized pricing from a consumer perspective. For the sake of conciseness, the studies that analyze the effects of algorithmic pricing on competition have been excluded from the list. It must be noted, however, that in competition research, there is substantial evidence that indicates that algorithmic pricing is taking place and that it could potentially have significant effects on competition through (tacit) collusion, reinforced dominant positions, and supracompetitive profits[55].

Based on the table, it can be concluded that not all empirical evidence conclusively indicates that algorithmic pricing strategies consistently cause significant price differences. However, the overall tendency that can be identified is that algorithmic pricing is effectively being employed as a strategy by companies.

Table 1: Personalized pricing in practice

Study	Focus	Results	Overall
HANNAK *et al.*[56]	Personalized pricing on e-commerce websites	9 out of 16 e-commerce websites employed personalization	Significant evidence of price discrimination
CHEN *et al.*[57]	Algorithmic pricing on the Amazon marketplace	More than 500 sellers have been detected that employ AI-based price discrimination	Evidence of AI-based price discrimination
MIKIANS *et al.*[58]	Price and search discrimination on the internet	Evidence of geographical price discrimination, but not of personal price discrimination	No evidence of algorithmic price discrimination based on consumer data

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[55] STUCKE/EZRACHI, «Antitrust, algorithmic pricing and tacit collusion», in BARFIELD/PAGALLO (eds.), *Research Handbook on the Law of Artificial Intelligence*, Edward Elgar Publishing, 2018, pp. 624 ss.; CALVANO *et al.,* «Artificial intelligence, algorithmic pricing, and collusion», *American Economic Review*, vol. 110, num. 10, 2020, pp. 3267 ss.; ASSAD *et al.,* «Algorithmic pricing and competition: Empirical evidence from the German retail gasoline market», *CESifo Working Paper, No. 8521, Center for Economic Studies and Ifo Institute (CESifo),* 2020, pp. 1-76 ss.; MUSOLFF, «Algorithmic Pricing Facilitates Tacit Collusion: Evidence from E-Commerce», *Proceedings of the 23rd ACM Conference on Economics and Computation*, 2022, pp. 1 ss.; SANCHEZ-CARTAS/KATSAMAKAS, «Artificial Intelligence, algorithmic competition and market structures», *IEEE Access*, vol. 10, num. 1, 2022, pp. 10575 ss.

[56] HANNAK *et al.,* «Measuring price discrimination and steering on e-commerce web sites», *Proceedings of the 2014 conference on internet measurement conference*, 2014, pp. 305 ss.

[57] CHEN *et al.,* «An empirical analysis of algorithmic pricing on amazon marketplace», *Proceedings of the 25th international conference on World Wide Web*, 2016, pp. 1339 ss.

[58] MIKIANS *et al.,* «Detecting price and search discrimination on the internet», *Proceedings of the 11th ACM workshop on hot topics in networks*, 2012, pp. 79 ss.

MIKIANS *et al.*[59]	Price discrimination on the internet – based on a crowdsourced dataset	10%–30% of price variations could neither be attributed to operating costs, nor personal information	Inconclusive, further research is needed
HOGAN[60]	AI implementation for personalized consumer experience	40% of surveyed companies use AI for personalized pricing and advertising	Evidence demonstrating the use of AI-based price discrimination
SCHLEUSENER/HOSELL[61]	Personalized pricing in online markets	Personalized pricing in the tourism sector based on user-related features	Evidence for AI-based pricing
NEWCOMER[62] and **MAHDAWI**[63]	Case study Uber	Uber publicly admits third-degree price discrimination, serious allegations of first-degree price discrimination	Anecdotal evidence of personalized pricing
VALENTINO-DEVRIES[64]	Varying prices based on consumer information	Several real-life examples of personalized pricing in retail, financial, and educational industries	Anecdotal evidence of personalized pricing based on consumer information
CLIFFORD[65]	Personalized pricing in supermarkets	Higher prices for loyal customers than switching customers	Anecdotal evidence of personalized pricing

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[59] MIKIANS *et al.,* «Crowd-assisted search for price discrimination in e-commerce: First results», *Proceedings of the ninth ACM conference on Emerging networking experiments and technologies,* 2013, pp. 1 ss.

[60] HOGAN, «Consumer Experience in the Retail Renaissance: How Leading Brands Build a Bedrock with Data», 2018, retrieved from https://www.deloittedigital.com/us/en/blog-list/2018/consumer-experience-in-the-retail-renaissance--how-leading-brand.html.

[61] SCHLEUSENER/HOSELL, «Expertise zum Thema "Personalisierte Preisdifferenzierung im Online-Handel"», *SVRV, Sachverständigenrat für Verbraucherfragen,* 2016, pp. 1 ss.

[62] NEWCOMER, «Uber Starts Charging What It Thinks You're Willing to Pay», *Bloomberg,* 2017, retrieved from https://www.bloomberg.com/news/articles/2017-05-19/uber-s-future-may-rely-on-predicting-how-much-you-re-willing-to-pay.

[63] MAHDAWI, «Is Your Friend Getting a Cheaper Uber Fare Than You Are?», *The Guardian*, 2018, retrieved from https://www.theguardian.com/commentisfree/2018/apr/13/uber-lyft-prices-personalized-data.

[64] VALENTINO-DEVRIES *et al.,* «Websites Vary Prices, Deals Based on Users' Information», *The Wall Street Journal*, 2012, retrieved from https://www.wsj.com/articles/SB10001424127887323777204578189391813881534.

[65] CLIFFORD, «Shopper Alert: Price May Drop for You Alone», *The New York Times*, 2012, retrieved from https://www.nytimes.com/2012/08/10/business/supermarkets-try-customizing-prices-for-shoppers.html.

In addition, research has been conducted on the attitudes of consumers toward personalized pricing. It has been found that, overall, consumer awareness of personalized pricing has a significant negative impact on purchase intentions[66]. After experiencing personalized pricing, consumers also express less trust in the seller, which notably holds for both the consumers that lost and benefitted from the pricing strategy[67]. The EU REPORT on personalized pricing found that 12% to 20% of consumers have had negative experiences with regard to personalized pricing[68]. In the US, a survey among American households found that between 64% and 91% of respondents registered aversion to price discrimination[69].

3. The role of marketing

Pricing is an integral part of marketing[70]. In the field of marketing, the pricing strategy constitutes one of the major critical tasks that needs to be faced[71]. A marketing plan is incomplete without an appropriate pricing strategy[72]. For this reason, the topic of pricing received and still keeps receiving (i.e., constantly growing literature) substantial attention in the area of marketing research[73]. Accordingly, when discussing pricing strategies, among which algorithmic pricing, the role of marketing cannot be dismissed.

Traditionally, *pricing strategy research (PSR)* from the marketing perspective has been more consumer-oriented, whereas in economics it has been more market-oriented[74]. Nonetheless, in the course of the years, the two perspectives have become more intertwined, whereby there is a persistent focus on consumer markets and economic theories and an increasing consideration for the demand-side (i.e., consumers). It must be noted that this has been to a certain extent at the expense of less research on the supply side[75].

An integrated view of the economic and marketing literature on PSR is particularly useful to explain the advent of new pricing strategies such as personalized and dynamic pricing. The emergence of these strategies poses challenges that under conventional economic theory could only be regarded as theoretical. One of these challenges is, for example, the possibility that algorithmic pricing enables firms to fully extract all the consumer surplus. Through algorithmic pricing prices can be discriminated both dynamically over time and personally depending on

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[66] PAVLOU *et al.,* «Understanding and mitigating uncertainty in online exchange relationships: A principal-agent perspective», *MIS quarterly,* vol. 31, num. 1, 2007, pp. 105 ss.

[67] GARBARINO/LEE, «Dynamic pricing in internet retail: Effects on consumer trust», *Psychology & Marketing*, vol. 20, num. 6, 2003, pp. 495 ss.

[68] EU REPORT, p. 169.

[69] TUROW, *A Report from the Annenberg Public Policy Center of the University of Pennsylvania,* 2005*,* p. 24.

[70] BORDEN, «The concept of the marketing mix», *Journal of advertising research,* vol. 4, num. 2, 1964, pp. 2 ss.

[71] MORRIS, «Separate prices as a marketing tool», *Industrial marketing management*, vol. 16, num. 2, 1987, pp. 79 ss.

[72] GIJSBRECHTS, «Prices and pricing research in consumer marketing: Some recent developments», *International journal of research in marketing,* vol. 10, num. 2, 1993, pp. 115 ss.

[73] KIENZLER/KOWALKOWSKI, «Pricing strategy: A review of 22 years of marketing research», *Journal of Business Research,* vol. 78, num. 1, 2017, pp. 101 ss.

[74] SKOURAS *et al.,* «Economics and marketing on pricing: How and why do they differ?», *Journal of Product and Brand Management,* vol. 14, num. 6, 2005, pp. 362 ss.

[75] KIENZLER, *Journal of Business Research,* vol. 78, num. 1, 2017, pp. 101 ss.

individual consumer information[76]. In other words, artificial intelligence is opening the way for perfect price discrimination.

Through sophisticated marketing techniques, firms can make consumers pay higher prices than they would be able to charge in a perfectly competitive market. In the existing economic literature, pricing is a market-based outcome that is mainly driven by production costs[77]. If a firm decides to charge prices that are higher than the equilibrium price, consumers will switch to firms that offer the same good for a lower price. This theory assumes that consumers have perfect knowledge, in other words, they know how much the price of a certain good should be. Marketers have found, however, that if firms create *fog* regarding the price, consumers will be hampered in determining the correct price[78]. This fog can be created in numerous ways, among which: enlarging information asymmetries, subtle concealment of prices, and making products incomparable[79]. As a consequence, firms are in a position to apply differential pricing to extract the majority of the consumer surplus or overprice all consumers for a substantial aggregate gain[80]. In addition, prices can be framed in such a way that negative consumer perceptions are transformed into positive perceptions. This can, for example, be done by highlighting higher external prices which make the stated price more attractive after price comparison[81], by providing product-specific discount codes[82], or by offering cashbacks[83].

Algorithmic pricing has given sellers the possibility to take full advantage of the internet's capacity to set prices with precision, adapt to changing circumstances, and segment consumers accurately[84]. An example of a marketing strategy that creates synergy effects with algorithmic pricing concerns *hidden prices*[85]. Through hidden prices, the costs of knowing the real price of a good or service become significantly higher. This can be done by revealing the true price of a good after a consumer has arrived at the final stage of the buying process. They also exist in the form of *hidden fees*, which are mandatory surcharges that are tacked on the final price when the time comes to check out and purchase the goods. Notably, this marketing technique circumvents the benefits of search engine machines[86].

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[76] GRAEF, *Columbia Journal of European Law,* vol. 24, num. 3, 2018, pp. 541 ss.

[77] SKOURAS, *Journal of Product and Brand Management,* vol. 14, num. 6, 2005, pp. 362 ss.

[78] DE GEEST, *Rents: How Marketing Causes Inequality,* Beccaria Books, 2018, p. 23.

[79] ID., p. 145.

[80] ID., p. 146.

[81] LEE/MONROE, «Dynamic pricing on the internet: A price framing approach», in LEE/SOMAN (eds.), *Advances in Consumer Research,* vol. 35, num. 1, Association for Consumer Research, Duluth, 2008, pp. 637 ss.

[82] WEISSTEIN *et al.,* «Effects of price framing on consumers' perceptions of online dynamic pricing practices», *Journal of the Academy of Marketing Science*, vol. 41, num. 5, 2013, pp. 501 ss.

[83] HO *et al.,* «Online cash-back shopping: Implications for consumers and e-businesses», *Information Systems Research,* vol. 28, num. 2, 2017, pp. 250 ss.

[84] BAKER *et al.,* «Price smarter on the net», *Harvard business review,* vol. 79, num. 2, 2001, pp. 122 ss.

[85] DE GEEST, *Rents*, p. 127.

[86] It must be noted that according to the COMMISSION NOTICE – Guidance on the interpretation and application of Directive 2005/29/EC of the European Parliament and of the Council concerning unfair business-to-consumer commercial practices in the internal market, 2016, retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52016SC0163, hereinafter called COMMISSION NOTICE UCPD, the adding of hidden fees during the purchase process, also called *drip pricing*, can be regarded as a practice that may amount to a misleading action or omission in breach of the UCPD.

3.1. Marketing and the conditions for price discrimination

A closer inspection of the three conditions that need to be fulfilled to perform price discrimination demonstrates that data-driven marketing strategies can easily satisfy or circumvent them. First, as described above, access to vast amounts of data enables firms to improve their predictive power and come closer to identifying the WTP of each consumer individually. The different levels of demand can, therefore, be targeted accurately.

The second condition describes that the firm must have some level of market power. In perfectly competitive markets prices will go down to marginal cost for all companies and if a firm with a lack of market power raises prices, it will price itself out of the market[87]. Nonetheless, through a wide variety of marketing strategies, firms can substitute market power in the form of monopolies or oligopolies with market power in the form of customer retention[88]. For example, through fidelity programs, customer relationship management, and trust-building, firms can retain consumers by increasing *switching costs.* In addition, through *network effects,* consumers can be captured, and substantial influence can be exercised even though the firm has not formally reached a dominant position yet[89]. Accordingly, price discrimination can also take place in competitive markets where a firm does not have monopoly power[90].

The third condition emphasizes that arbitrage should be limited for price discrimination to work. This means that consumers need to have limited resell possibilities. If consumers can detect the difference in prices, arbitrage possibilities emerge. Through sophisticated algorithms, firms can make it excessively onerous for consumers to compare prices. Besides, the uniform price can be concealed in a way that the consumer only sees her individual price. This can be done by altering the price offerings and presenting them in a more complex manner. Consequently, with the help of data-driven pricing strategies that monitor prices in real-time, arbitrage becomes practically unfeasible, thereby making the condition less burdensome for companies[91].

The ability of a firm to conceal the personalized pricing strategy is relevant to consumers' *fairness considerations*. Consumers should have the feeling that they are paying a fair price. If the consumer finds out that she is paying more than others, this could cause outrage, which could be damaging the reputation of the firm. For this reason, the firm needs to be certain that it can conceal the difference in prices or else it risks losing part of its clientele, which could be more costly than the increase in revenue from personalized pricing[92]. Analogous to the case of arbitrage, complex-designed pricing schemes can minimize the chance of exposure. In case the discriminatory pricing scheme cannot fully be concealed, the firm can use marketing techniques to frame the difference in an alternative more positive manner (i.e., *framing effect*). For example, a price difference can be described as a limited offer or a personalized discount[93].

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[87] VARIAN, *Intermediate microeconomics.*

[88] Townley, *Yearbook of European Law,* vol. 36, num. 1, 2017, pp. 683 ss.

[89] CHAPDELAINE, *New York University Journal of Law and Business*, vol. 17, num. 1, 2020, p. 17.

[90] LEVINE, «Price discrimination without market power», *Yale Journal on Regulation,* vol. 19, num. 1, 2002, p. 74.

[91] CHAPDELAINE, *New York University Journal of Law and Business*, vol. 17, num. 1, 2020, p. 16.

[92] ODLYZKO, *Proceedings of the 5th international conference on electronic commerce*, 2003, pp. 49-50.

[93] EZRACHI/STUCKE, «The Rise of Behavioural Discrimination», *European Competition Law Review,* vol. 37, num. 2, 2016, 485-492.

3.2. Value-based pricing

Data-driven marketing strategies have enabled firms to improve the identification of consumers' valuation of goods and services. The COUNCIL OF ECONOMIC ADVISORS of the US stated it as follows: «*Big Data has lowered the costs of collecting customer-level information, making it easier for sellers to identify new customer segments and to target those populations with customized marketing and pricing plans. The increased availability of behavioral data has also encouraged a shift from third-degree price discrimination based on broad demographic categories towards personalized pricing.*»[94].

The ability to identify consumers' valuation of goods and services is of particular relevance to marketing research. There is a multiplicity of marketing studies that describes the most effective methods to charge higher prices without consumers knowing it[95]. It falls under the umbrella of *value-based pricing* that replaces the *cost-plus pricing* method that is normally found in economic literature. Under value-based pricing, prices are based on consumers' perceived value of a product rather than the cost price of the product with an included markup. In practice, a shift from cost-based pricing to value-based pricing is visible[96].

In the marketing literature, the profitability of several pricing strategies has been extensively analyzed. These include cost-based pricing, markup pricing, gross-margin pricing, and competition-based pricing[97]. Each of them provides a useful starting point for the development of a pricing strategy, yet consumer-based pricing is regarded as the better alternative[98]. This type of pricing is dependent on the valuation of consumers (i.e., value-based pricing), which is affected by the other elements of the marketing strategy, such as the product, the distribution, and the promotion[99]. Accordingly, the price-setting element cannot be seen separately from the marketing strategy[100].

The approaches to determining customer value are highly dependent on customer data and a comprehensive system of analysis. The measurement can be improved through more sophisticated technologies to collect and analyze the data[101]. Yet, due to the complexity of this pricing strategy, in comparison with the other pricing strategies, still a substantial part of firms

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[94] COUNCIL OF ECONOMIC ADVISERS, «Big Data and Differential Pricing», *The White House*, 2015, retrieved from https://obamawhitehouse.archives.gov/sites/default/files/whitehouse_files/docs/Big_Data_Report_Nonembargo_v2.pdf.

[95] For example, ADAVAL/WYER Jr, «Conscious and nonconscious comparisons with price anchors: Effects on willingness to pay for related and unrelated products», *Journal of Marketing Research,* vol. 48, num. 2, 2011, pp. 355 ss.; GABAIX/LAIBSON, «Shrouded attributes, consumer myopia, and information suppression in competitive markets», *The Quarterly Journal of Economics,* vol. 121, num. 2, 2006, pp. 505 ss.; ELLISON/ELLISON, «Search, obfuscation, and price elasticities on the internet», *Econometrica,* vol. 77, num. 2, 2009, pp. 427 ss.

[96] GALE/SWIRE, «Value-based marketing & pricing», *Jthenal of Professional Pricing,* vol. 15, num. 3, 2006, pp. 30 ss.

[97] See for an extensive analysis SCHINDLER, *Pricing strategies: A marketing approach*, Sage Publications, 2012.

[98] INGENBLEEK *et al.,* «Successful new product pricing practices: A contingency approach», *Marketing Letters,* vol. 14, num. 4, 2003, pp. 289 ss.

[99] SCHINDLER, *Pricing strategies,* chapter 2.

[100] ID., chapter 16; FOXALL, «A descriptive theory of pricing for marketing», *European Journal of Marketing,* vol. 6, num. 3, 1972, pp. 190 ss.

[101] GALE, *Jthenal of Professional Pricing,* vol. 15, num. 3, 2006, pp. 30 ss.

is reluctant to switch to value-based pricing[102]. Especially in the absence of Big Data technologies, it is particularly onerous to determine accurately consumers' valuation of a product or service. The AI-developments are, therefore, of significant value to the development of pricing strategies. The advent of Big Data analytics, among which machine learning algorithms, has enabled marketers to implement data-driven marketing strategies with enhanced accuracy, cost savings, and increasing revenues[103].

3.3. Dynamic pricing – the more accepted alternative

Algorithmic pricing is the focus of this paper, however, there is another algorithm-based pricing strategy that is currently employed more frequently and that has become increasingly feasible with the growth of internet marketing[104], namely *dynamic pricing*. The COMMISSION NOTICE UCPD describes it as follows: «*Dynamic pricing (also called real-time pricing) means changing the price for a product in a highly flexible and quick manner in response to market demands.*»[105]. Traders can, in principle, freely engage in dynamic pricing and set their prices as they see fit as long as they adequately inform consumers about the costs of the products or services, and how they are calculated[106].

The definition of dynamic pricing has been further elaborated by the OFT: «*Online retailers use fluctuations in demand to change the prices of their products depending on availability. Products which are likely to be priced dynamically are those which may be perishable, time-sensitive (airline or travel tickets), those with a depreciating value (technology-based goods), or if they are scarce (event tickets).*»[107]. As can be deduced from this definition, it is more likely that dynamic pricing will be prevalent in the service sectors, which is also the case in practice[108]. A prominent example of dynamic pricing has been found in France. In the travel sector, significant price variations were found that were caused by the number of places that were left in the concerned means of transport and the time of day when the tickets were purchased[109].

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[102] HINTERHUBER, «Customer value-based pricing strategies: Why companies resist», *Journal of business strategy,* vol. 29, num. 4, 2008, pp. 41 ss.; LIOZU, «State of value-based-pricing survey: Perceptions, challenges, and impact», *Journal of Revenue and Pricing Management*, vol. 16, num. 1, 2017, pp. 18 ss.; KIENZLER, «Value-based pricing and cognitive biases: An overview for business markets», *Industrial Marketing Management,* vol. 68, num. 1, 2018, pp. 86 ss.

[103] DAVENPORT *et al.,* «How artificial intelligence will change the future of marketing», *Journal of the Academy of Marketing Science*, vol. 48, num. 1, 2020, pp. 24 ss.; HAGEN *et al.,* «How can machine learning aid behavioral marketing research?», *Marketing Letters*, vol. 31, num. 4, 2020, pp. 361 ss.; HUANG/RUST, «Artificial intelligence in service», *Journal of Service Research*, vol. 21, num. 2, 2018, pp. 155 ss.

[104] HAWS/BEARDEN, «Dynamic pricing and consumer fairness perceptions», *Journal of Consumer Research,* vol. 33, num. 3, 2006, pp. 304 ss.

[105] COMMISION NOTICE UCPD, section 5.2.11.

[106] ID., in accordance with Articles 6(1)(d) and 7(4)(c) of the UCPD.

[107] OFT, «Personalised Pricing: Increasing Transparency to Improve Trust», 2013, retrieved from https://webarchive.nationalarchives.gov.uk/ukgwa/20140402165101/http:/oft.gov.uk/shared_oft/markets-work/personalised-pricing/oft1489.pdf.

[108] EU REPORT, p. 197, 260.

[109] La Commission nationale de l'informatique et des libertés (CNIL) et la Direction générale de la Concurrence, de la Consommation et de la Répression des Fraudes (DG CCRF), «IP Tracking: conclusions de l'enquête conjointe menée par la CNIL and la DGCCRF», 2014, retrieved from https://www.economie.gouv.fr/dgccrf/ip-tracking-conclusions-lenquete-conjointe-menee-par-cnil-et-dgccrf.

Dynamic pricing is seen in an increasing number of markets, even markets that were traditionally regulated by posted prices, such as electronics and apparel[110]. Marketers are more frequently resorting to dynamic pricing as a result of the lower *menu costs* of changing prices on the internet[111].

Despite the benefits of dynamic pricing, there is also a significant threat to sellers. Dynamic pricing leads to reduced levels of trust among consumers. Consumers do regard dynamic pricing as unfair and for the sake of maintaining the trusting relationship between the seller and the consumer, the adoption of this strategy should be carefully considered[112].

Nonetheless, dynamic pricing is overall more accepted by consumers than personalized pricing. The OECD states: «*While personalised pricing involves charging a different price to consumers based on their personal characteristics, dynamic pricing involves adjusting prices to changes in demand and supply, often in real-time, not implying any kind of discrimination between consumers. Therefore, from a policy perspective, dynamic pricing tends to pose fewer concerns, enabling price mechanisms to operate more effectively without implying any form of discrimination*.»[113].

However, the non-discriminatory nature of dynamic pricing is debatable. VARIAN demonstrates that dynamic pricing remains a form of price discrimination because it allows firms to differentiate between informed and uninformed buyers[114]. Consequently, the firm can strategically price the products in such a way that uninformed consumers are exploited, and profits are increased. Although dynamic pricing is a more commonly employed pricing strategy, it raises fewer concerns regarding consumer welfare since it is a form of third-degree price discrimination. Algorithmic pricing, on the contrary, has the potential to achieve a state of perfect price discrimination (i.e., first-degree price discrimination), which poses significant challenges to consumer welfare.

4. Economic analysis of algorithmic pricing

In the existing literature, the practice of algorithmic pricing is regarded as a trade-off problem between efficiency and equity[115]. In this section, an efficiency-based analysis will be conducted first with a focus on *static* and *dynamic efficiency* effects. Thereafter, an equity-based analysis will take place which will look at the distributional effects of algorithmic pricing on consumer and total welfare. In addition, ethical and fairness-based arguments will be considered. Lastly, the trade-off that regulators must face if they want to regulate algorithmic pricing will be discussed. In this way, the paper strives to provide a comprehensive picture of algorithmic pricing and its implications.

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[110] KANNAN/KOPALLE, «Dynamic pricing on the Internet: Importance and implications for consumer behavior», *International Journal of Electronic Commerce*, vol. 5, num. 3, 2001, pp. 63 ss.

[111] ID.

[112] GARBARINO, *Psychology & Marketing*, vol. 20, num. 6, 2003, pp. 495 ss.; HAWS, *Journal of Consumer Research,* vol. 33, num. 3, 2006, pp. 304 ss.

[113] OECD, «Personalized Pricing in the Digital Era», p. 9.

[114] VARIAN, «A model of sales», *The American Economic Review*, vol. 70, num. 4, 1980, pp. 651 ss.

[115] See, for example, WEISS/MEHROTRA, «Online dynamic pricing: Efficiency, equity and the future of e-commerce», *Virginia Journal of Law & Technology,* vol. 6, num. 2, 2001, pp. 1 ss.

4.1. Efficiency perspective

The first step of the efficiency analysis is defining the concept of *efficiency*. This helps to concretize the positive (descriptive/explanatory), but also the normative (evaluating) analysis of algorithmic pricing. The concept of efficiency, however, has been the subject of many studies in the field of *welfare economics*. There are various definitions and a full elaboration on the concept of efficiency falls outside of the scope of this paper. For this reason, a brief overview of the four most commonly used definitions of efficiency is provided and subsequently, the adopted definition for this paper is presented.

The first definition is called *Pareto-efficiency* and pursuant to the Pareto criterion a change is an improvement when it makes one person better off without making another person worse off[116]. An allocation of resources is *Pareto-efficient* or *Pareto-optimal* when no further *Pareto improvements* can be made[117]. Second, *Kaldor-Hicks efficiency* means «*that state A is to be preferred to state B if those who gain from the move to A gain enough to compensate those who lose*»[118]. The compensation is hypothetical and the preferred alternative is chosen by comparing aggregate payoffs of the various alternatives and choosing the optimizing option (i.e., the biggest difference between gains and losses)[119]. The third one is the *Nash criterion of welfare*[120]. According to this criterion, the grand product of the utility of all members of society needs to be taken. This accounts for distributional inequalities since the total product will be dependent on the factor of the «weakest» members of society[121]. Fourth, the *Rawlsian maximin principle*, also known as the *difference principle*[122]. Pursuant to this principle: «*Social policy should pursue the maximization of the minimum gain to be achieved so that social and economic inequalities can be "of the greatest benefit to the least-advantaged members of society."*»[123].

As can be seen, the definitions vary and can lead to contradicting results. In the existing law and economics literature, the emphasis lies on determining if a certain practice or law is efficient, whereby efficiency denotes the maximization of *social welfare*. Accordingly, there is an efficient allocation of goods when total wealth is maximized in society. However, what object is maximized, and the corresponding methodology are dependent on the context of the analysis, practical aspects, and technological considerations[124]. A relevant concept for the efficiency analysis of algorithmic pricing is *allocative efficiency*. Allocative efficiency indicates where goods and services are distributed optimally, which means that they go to the highest valuing user and an output level is achieved where the marginal benefits equal marginal costs[125].

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[116] COOTER/ULEN, *Law and Economics,* 6th edn, Pearson, Boston, 2016, p. 14.

[117] ID.

[118] PARISI, The *language of law and economics*, p. 162.

[119] ID., p. 163.

[120] NASH JR, «The bargaining problem», *Econometrica: Journal of the econometric society,* 1950, pp. 155 ss.

[121] PARISI, *The language of law and economics*, pp. 191-192.

[122] RAWLS, *A Theory of Justice*, Belknap Press, 1971.

[123] PARISI, *The language of law and economics*, p. 248.

[124] ID., p. 319.

[125] ID., p. 8, 218.

In this paper, the concept of efficiency relates to the maximization of the sum of wealth of all relevant parties. In this regard, it follows POSNER'S *wealth maximization paradigm* when speaking of efficiency[126]. The question then arises of what can be regarded as social welfare since this is the objective to maximize. Social welfare is defined as the sum of *consumer* and *producer surplus*[127]. Accordingly, to analyze the desirability of algorithmic pricing in terms of efficiency, the effects need to be placed in the context of changes in the size of the total surplus, which equals *social welfare*.

a. Positive efficiency effects

Several efficiency effects of algorithmic pricing have been found in the existing literature and they can be classified into positive and negative effects. First, a non-exhaustive overview of the positive efficiency effects will be presented.

In terms of *static efficiency* (i.e., allocative efficiency), algorithmic price discrimination could lead to an increase in social welfare. The reason for this is that in contrast to uniform pricing, whereby part of the consumer population is excluded from the market since the price of the good is higher than their WTP, firms would be able to lower prices under algorithmic pricing for the low-end consumers, while preserving high prices for high-end consumers, thereby safeguarding profitability[128]. An important consideration is that there is a lack of empirical evidence that supports the static efficiency of algorithmic pricing due to its novelty and secrecy, yet there is substantial evidence that supports the static efficiency of traditional price discrimination[129]. Algorithmic pricing should, therefore, in theory, improve static efficiency even further since it is an enhanced form of price discrimination whereby the output is maximized. It must be noted, however, that further empirical evidence is needed that can corroborate that firms are offering their products to the lower end of the market in practice. In other words, are consumers with a low WTP actually benefitting from algorithmic pricing, or is the static efficiency argument mainly used to justify the practice?

Furthermore, algorithmic pricing can have a positive effect on *dynamic efficiency*. This means that the pricing mechanism allows firms to raise revenues without sacrificing sales, which enables them to invest in innovation and differentiation[130]. Subsequently, innovation and differentiation can lead to product and service improvements, and cost savings, which could benefit the consumer. To elaborate, through personalized prices, the innovating firm can recuperate its investments more effectively, which enlarges the incentive to innovate. Consequently, an increase in product quality or enhanced personalized services can be expected[131].

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[126] POSNER, «Utilitarianism, economics, and legal theory», *Journal of Legal Studies,* vol. 8, num. 1, 1979, pp. 103 ss.; POSNER, *The Economics of Justice*, Harvard University Press, Cambridge MA, 1981; POSNER, «Wealth maximization revisited», *Notre Dame Journal of Law, Ethics & Public Policy,* vol. 2, num. 1, 1985, pp. 85 ss.

[127] PARISI, *The language of law and economics*, p. 278.

[128] OECD, «Personalized Pricing in the Digital Era», p. 18.

[129] See OECD, «Personalized Pricing in the Digital Era», p. 19, for an extensive description of the relevant literature.

[130] OECD, «Price Discrimination - Background note by the Secretariat», 2016, retrieved from https://one.oecd.org/document/DAF/COMP(2016)15/en/pdf.

[131] CHOE/WU, «Customer perceptions toward dynamic pricing for wireless data service», *International Journal of Mobile Communications,* vol. 13, num. 2, 2015, pp. 172 ss.; RAYNA *et al.,* «Pricing music using personal data: Mutually advantageous first-degree price discrimination», *Electronic Markets,* vol. 25, num. 2, 2015, pp. 139 ss.

If the market is sufficiently competitive, the innovation will not lead to a monopoly and the pricing practice could benefit consumer welfare[132]. In fact, algorithmic pricing could lead to an *intensified competition effect*[133], which is also known as the *customer poaching effect*[134]. In essence, this means that if a seller knows that a consumer has a higher WTP for a competitor's product, then it will be able to offer the consumer a personalized price that is lower than the competitor's price, which will attract the consumer. If more competitors do this to attract clientele, this could lead to intensified competition, which is beneficial for the consumer[135].

Moreover, algorithmic pricing can lead to the growth of certain industries that face high fixed costs. This argument is best explained with the airline industry as an example[136]. Airlines operate on high fixed costs and relatively low variable costs[137]. In the late 70s and early 80s, the airline industry was characterized by heavy regulation and limited competition. Since this hindered the growth of the industry, deregulation was advocated[138]. Nonetheless, the boom in competition sparked price wars, which forced airlines to price themselves into bankruptcy[139]. The main problem was that with uniform pricing, the demand for flights was limited and there was *cross-subsidization*. Business travelers paid relatively little in relation to their WTP, and part of the price-sensitive consumer market was not served (prices were too high for this group). The advent of internet technologies allowed the industry to experiment with segmentation and dynamic pricing. This proved to be a highly successful strategy to optimize profits, which over the years was continuously improved[140]. With this example in mind, it is straightforward to envisage the benefits that algorithmic pricing could bring to other ailing industries with high fixed costs and relatively low variable costs.

Lastly, in the economic literature, it has been found that (algorithmic) price discrimination leads to increased output[141]. This result holds for different markets since, on the whole, price discrimination allows firms to serve a greater part of the market[142]. Higher output levels enable the firm to increase production and optimize production capacity[143].

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[132] OECD, «Personalized Pricing in the Digital Era», p. 22.

[133] OFT, «The Economics of Online Personalised Pricing», p. 25.

[134] ARMSTRONG/VICKERS, «Competitive price discrimination», *The RAND Journal of economics*, vol. 32, num. 4, 2001, pp. 579 ss.

[135] OFT, «The Economics of Online Personalised Pricing», pp. 25-28.

[136] See, for an extensive analysis of price discrimination in the airline industry, WEISS, *Virginia Journal of Law & Technology,* vol. 6, num. 2, 2001, p. 2.

[137] ID., p. 4.

[138] ID.

[139] GESELL/FARRIS, «Airline deregulation: An evaluation of goals and objectives», *Transportation Law Journal,* vol. 21, num. 1, 1992, pp. 105 ss.

[140] MCGILL/VAN RYZIN, «Revenue management: Research overview and prospects», *Transportation Science,* vol. 33, num. 2, 1999, pp. 233 ss.

[141] SCHMALENSEE, «Output and welfare implications of monopolistic third-degree price discrimination», *The American Economic Review,* vol. 71, num. 1, 1981, pp. 242 ss.; VARIAN, «Price discrimination and social welfare», *The American Economic Review,* vol. 75, num. 4, 1985, pp. 870 ss.; SCHWARTZ, «Third-degree price discrimination and output: Generalizing a welfare result», *The American Economic Review*, vol. 80, num. 5, 1990, pp. 1259 ss.; TIROLE, *The theory of industrial organization*, MIT Press, 1988.

[142] HAUSMAN /MACKIE-MASON, «Price discrimination and patent policy», *The RAND Journal of Economics,* vol. 19, num. 2, 1988, pp. 253 ss.; WEISMAN/KULICK, «Price discrimination, two-sided markets, and net neutrality regulation», *Tulane Journal of Technology and Intellectual Property,* vol. 13, num. 1, 2010, pp. 81 ss.

[143] EZRACHI, *European Competition Law Review,* vol. 37, num. 2, 2016, pp. 485 ss.

In addition, inventory management can be improved, which leads to substantial savings[144]. In short, increased output means more access, extra choices, cost-efficiencies, and more demand satisfied. As a result, it will lead to overall increased welfare[145].

b. Negative efficiency effects

There are, however, also several negative efficiency effects. First, the practice of algorithmic pricing is costly. Although the advent of Big Data technologies has significantly reduced the costs of segmentation for a firm, the cost is not zero. Regardless of whether the firm collects the consumer data itself or buys the data from a data broker, costs need to be incurred. As a result, operating costs (i.e., fixed costs) and marginal costs (i.e., variable costs) will increase[146]. These costs need to be offset against the additional revenues that algorithmic pricing brings. Rather than investing in additional product or service improvements, the firm is compelled to invest in data analytics and artificial intelligence.

Second, inefficient competition can emerge that wastes resources and is disadvantageous for the firm[147]. It could lead to an arms race between the seller and the consumer, whereby both invest valuable resources to finance technologies and counter-technologies that, respectively, pierce the veil of consumer anonymity or warrant it[148]. Consumers will incur additional costs for the sake of circumventing the algorithmic pricing mechanism. A parallel can be drawn to consumer behavior concerning cookie tracking. If consumers know that their cookies are being tracked and they will be targeted based on the cookies, they can take anonymizing measures, such as deleting the cooking history or opening the same website in incognito mode. This will increase transaction costs for consumers which leads to efficiency losses[149]. Even though transaction costs rise, there will be an incentive for consumers to engage in anonymizing practices as long as the marginal benefit of doing so is greater than the marginal cost[150]. Firms, however, can counteract these practices by virtue of sophisticated tracking techniques[151].

Third, an essential mechanism to keep markets competitive is that consumers can compare prices and decide accordingly. Algorithmic pricing inhibits price comparison by making comparison tools less effective through personalized offers, constantly changing prices, opaque pricing schemes, and the avoidance of publicly posted prices[152]. This also increases switching

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[144]LI *et al.,* «Dynamic pricing, production, and channel coordination with stochastic learning», *Production and Operations Management,* vol. 24, num. 6, 2015, pp. 857 ss.; TAN *et al.,* «Mitigating inventory overstocking: Optimal order-up-to level to achieve a target fill rate over a finite horizon», *Production and Operations Management,* vol. 26, num. 11, pp. 1971 ss.

[145] VARIAN, *The American Economic Review,* vol. 75, num. 4, 1985, pp. 870 ss.; HAUSMAN, *The RAND Journal of Economics,* vol. 19, num. 2, 1988, pp. 253 ss.; WEISMAN, *Tulane Journal of Technology and Intellectual Property,* vol. 13, num. 1, 2010, pp. 81 ss.

[146] OFT, «The Economics of Online Personalised Pricing», pp. 74-78.

[147] PASQUALE, «Technology, Competition, and Values», *Minnesota Journal of Law, Science & Technology,* vol. 8, num. 1, 2007, pp. 607 ss.

[148] MILLER, *Journal of Technology Law & Policy,* vol. 19, num. 1, 2014, p. 67.

[149] ACQUISTI, *Marketing Science*, vol. 24, num. 3, 2005, pp. 367-369.

[150] CONITZER *et al.,* «Hide and seek: Costly consumer privacy in a market with repeat purchases», *Marketing Science,* vol. 31, num. 2, 2012, pp. 277 ss.

[151] ID.

[152] KANNAN, *International Journal of Electronic Commerce*, vol. 5, num. 3, 2001, pp. 63-68.

costs because it becomes more onerous for consumers to decide if a change of seller is profitable. Accordingly, consumers can be locked-in, and the threat is present that loyal customers will be exploited since price differences that normally would induce a switch are more difficult to detect[153].

Fourth, algorithmic pricing could lead to collusion. The algorithmic pricing mechanism learns autonomously through experimentation. By observing the prices of competitors, it can choose the optimizing pricing strategy. It is not likely that the algorithm will choose a strategy that causes a price war that dissipates profits. Conversely, it will tend to keep prices high to generate high-profit margins. It is more likely that AI systems will explore profit-enhancing collusive pricing possibilities[154]. Besides, algorithms can check competitors' actions in real-time and react instantly. Thus, cheating the collusive agreement can be punished immediately, which takes away the incentive to defect. Accordingly, the emergence and the continuance of higher prices through collusive practices can be assisted by the instantaneous monitoring of competitors' prices[155]. There is experimental[156] and empirical[157] evidence showcasing collusive behavior by algorithmic pricing mechanisms.

Fifth, since algorithmic pricing can lead to the transferal of consumer surplus, there is an incentive for firms to invest in improved *rent extraction*. This could lead to wasteful *rent-seeking activities*. Incurring costs for the sake of rent extraction does not increase productive output but decreases social welfare[158]. An example of these rent-seeking activities could be lobbying. Through political actions, firms can pressure legislators to introduce regulations that will shield incumbents' position in the market or oppose regulations that negatively affect their position, which leads to so-called *regulatory incumbency*[159]. This would be positive for the incumbents, yet it would be detrimental to consumers. With respect to algorithmic pricing, it is conceivable that it could be highly beneficial for companies that profitably employ the strategy to lobby against further regulation.

Finally, BAR-GILL makes a compelling case that algorithmic pricing is not solely based on preferences, but also on *misperceptions*[160]. If price discrimination targets demand-inflating misperceptions, it could decrease efficiency and lead to more consumer harm[161]. The basic notion of an individual's WTP is based on the idea that optimal consumption levels are determined by preferences and budget constraints[162]. BAR-GILL argues that this view of WTP is too limited since it is also influenced by misperceptions, which are defined as mistakes that affect consumers'

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[153] SEELE *et al.,* «Mapping the ethicality of algorithmic pricing: A review of dynamic and personalized pricing», *Journal of Business Ethics,* vol. 170, num. 4, 2021, pp. 697 ss.

[154] CALVANO *et al.,* «Protecting consumers from collusive prices due to AI», *Science,* vol. 370, num. 6520, 2020, pp. 1040 ss.

[155] ID.

[156] CALVANO *et al., American Economic Review*, vol. 110, num. 10, 2020, pp. 3267 ss.

[157] ASSAD, *CESifo Working Paper, No. 8521, Center for Economic Studies and Ifo Institute (CESifo),* 2020, pp. 1 ss.

[158] EZRACHI, *European Competition Law Review,* vol. 37, num. 2, 2016, pp. 485 ss.

[159] OECD, «Personalized Pricing in the Digital Era», p. 22.

[160] BAR-GILL, *University of Chicago Law Review,* vol. 86, num. 2, 2018, pp. 1 ss.

[161] ID.

[162] MAS-COLELL *et al., Microeconomic theory.* Oxford University Press, New York, 1995, pp. 6-9, 45-65.

WTP[163]. The rationale behind the efficiency loss of algorithmic pricing is based on the *overestimation bias*. To specify, overestimation can induce marginal consumers to buy a certain product because the perceived benefit exceeds the product cost, however, in reality, the cost of the product exceeds the actual benefit to the consumer[164].

The role of misperceptions can be seen across multiple consumer markets. For example, consumers tend to overestimate the benefits that they will gain from getting a gym subscription (i.e., the amount of visits is grossly overestimated)[165] and they underestimate the costs that are associated with credit cards, mortgages, and cell phone plans[166]. Accordingly, there can be cases in which consumers buy products based on misperceptions, which lead to efficiency losses that substantially harm consumers since they will have to bear the entire loss[167]. This is particularly relevant to the practice of algorithmic pricing since the price-setting mechanism is unclear to consumers and price comparison is made exceptionally onerous. Consumers need to base their decisions on perceived benefits and costs, thereby opening the way for decisions based on misperceptions.

Increased consumption based on misperceptions can make supracompetitive priced goods look like reasonably priced goods, which induces consumption that otherwise should not have taken place. If this consistently occurs, the disposable income of consumers is predominantly spent on consumer goods, whereas it decreases for other purposes that would increase their well-being. This raises wealth inequality concerns, in particular, if low-income consumer groups suffer more from misperception-based overconsumption than high-income groups[168].

The efficiency analysis demonstrates that there are various upsides and downsides to algorithmic pricing. The extent to which the positive effects outweigh the negative effects, or vice versa, depends on the magnitude of the effects. This is, however, the problematic part of the analysis. There is scarce empirical evidence on the static and dynamic efficiency effects, but there is even less on the overall effects (i.e., taking all efficiency effects into account) due to the difficulty of measuring the net effect of algorithmic price discrimination[169]. Nevertheless, it is argued that ultimately the impact of algorithmic pricing on consumer welfare will depend on the market structure and the degree of competition in the market. It is expected that in monopolistic markets with little price competition, the dominant position will likely be exploited, with the help of algorithmic pricing, to the detriment of the consumer. Conversely, in more competitive markets, algorithmic pricing could lead to more intense competition, which incentivizes firms to

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[163] BAR-GILL, *University of Chicago Law Review,* vol. 86, num. 2, 2018, p. 2.

[164] ID., p. 3.

[165] DELLAVIGNA/MALMENDIER, «Paying not to go to the gym», *American Economic Review,* vol. 96, num. 3, 2006, pp. 694 ss.

[166] BAR-GILL, *Seduction by Contract: Law, Economics and Psychology in Consumer Markets*, Oxford University Press, Oxford, 2012.

[167] BAR-GILL, *University of Chicago Law Review,* vol. 86, num. 2, 2018, p. 11. Bar-Gill proves this by providing an extensive behavioral model that depicts the changes in surplus, the loss in efficiency, and the harm to the consumer. Four combinations of misperceptions and price discrimination are constructed (2x2 matrix) and analyzed.

[168] EZRACHI, *European Competition Law Review,* vol. 37, num. 2, 2016, p. 491.

[169] WAGNER/EIDENMÜLLER, «Down by algorithms: Siphoning rents, exploiting biases, and shaping preferences: Regulating the dark side of personalized transactions», *University of Chicago Law Review,* vol. 86, num. 2, 2019, pp. 586-588.

lower prices, thereby benefitting consumers[170]. In imperfectly competitive markets, the effects on aggregate consumer welfare are estimated to be ambiguous, dependent on how the pricing techniques are employed, the type of price discrimination, and the market conditions[171]. In such markets, a case-by-case assessment is required[172].

In summary, under a monopoly, algorithmic price discrimination will most likely reduce consumer welfare in comparison with uniform pricing. In imperfectly competitive markets the net effect is expected to be ambiguous, whereas in competitive markets algorithmic pricing will not necessarily be detrimental to consumer welfare. In the presence of competitive market conditions, algorithmic pricing could be welcomed from an efficiency perspective.

4.2. Equity perspective

WEISS and MEHROTRA state: «*Price discrimination may not be all bad. Indeed, economic theory suggests price discrimination may perhaps promote the efficient use of a society's resources. In many cases, however, efficiency must be balanced against the need to achieve equitable treatment of individual consumers. In such cases, government regulation, either through existing laws or new ones, may be necessary to ensure that the logic of efficiency does not overwhelm the need for fairness.*»[173]. This statement demonstrates that the analysis cannot stop at the assessment of the efficiency effects. To obtain a comprehensive picture of the effects of algorithmic pricing, further attention needs to be devoted to the equity side of the practice.

The notion of efficiency as a determinative normative paradigm to evaluate legal changes has been predominant in the law and economics literature. Wealth-maximization was advocated to be the goal since a focus on fairness (in this sense the equivalent of equity) could lead to adverse effects on welfare[174]. However, several prominent law and economics scholars have stated that efficiency cannot be the only relevant factor in the social welfare function. In other words, a change is only a social improvement if additional social goals are also furthered, such as *equality* or *justice*[175]. The tendency to care about the equitableness or fairness of a policy, which diverges from self-interested *rational choice theory*, has, among others, been explored by behavioral (law and) economics scholars. For example, FEHR and SCHMIDT demonstrated that individuals can be predominantly concerned with cooperation and be strongly averse to inequity[176]. The role of fairness can, therefore, not be underestimated[177].

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[170] OFT, «*The Economics of Online Personalised Pricing*», pp. 8-11; OECD, «*Personalized Pricing in the Digital Era*», p. 20; CHEN *et al.,* «Competitive Personalized Pricing», *The Institute of Social and Economic Research, Osaka University, Discussion Paper No. 1023*, 2018, pp. 1 ss.

[171] TOWNLEY, *Yearbook of European Law,* vol. 36, num. 1, 2017, p. 702.

[172] ID.

[173] WEISS, *Virginia Journal of Law & Technology,* vol. 6, num. 2, 2001, p. 2.

[174] KAPLOW/SHAVELL, «Fairness versus welfare», *Harvard Law Review,* vol. 114, num. 4, 2001, pp. 961 ss.

[175] CALABRESI, «An exchange about law and economics, letter to Dworkin», *Journal of Legal Studies,* vol. 9, num. 2, 1980, pp. 553 ss.; NUSSBAUM/SEN (eds.), *The quality of life*, Clarendon Press, 1993.

[176] FEHR/SCHMIDT, «A theory of fairness, competition, and cooperation», *The Quarterly Journal of Economics*, vol. 114, num. 3, 1999, pp. 817 ss.

[177] RABIN, «Incorporating fairness into game theory and economics», *The American Economic Review,* vol. 83, num. 1, 1993, pp. 1281 ss.

The main problem when it comes to analyzing policies from an equity perspective is that a variety of terms come to mind that should be considered, such as fairness, (distributive) justice, and ethicality. In the field of economics, when justice is considered, the type of justice in question is *distributive justice*, which «*is applied in the allocation of benefits by the state. On this principle, rights are distributed to the people in accordance with their honour, i.e. according to their social status and their merit to the community.*»[178].

The concept of distributive justice, however, has been studied to a much greater extent. For example, there is a significant difference between the static concept of distributive justice (i.e., the ideal type of distribution) and the dynamic concept (i.e., the establishment of institutions that aid individuals in the fulfillment of their potential, whereby the outcome of the distribution is less relevant)[179].

For the scope of this paper, the definition of equity as it has been put forward by POLINSKY «*Efficiency corresponds to the "size of the pie", while equity has to do with how it is sliced*»[180] will be adopted as the starting point of the equity analysis. In other words, the manner in which algorithmic pricing impacts the distribution of welfare will be analyzed. Several other aspects, however, such as equality of treatment, transparency, autonomy, and privacy will also be considered.

a. Positive effects on equity

Algorithmic pricing would primarily lead to greater access for consumers. Certain groups of consumers, mainly consumers with a low WTP, are excluded from the market under uniform pricing. Through algorithmic pricing, special discount prices could be offered to these groups, which makes certain products and services to them available that would otherwise not be[181]. Rather than increasing prices to target consumers with a higher WTP, firms could selectively vary prices and offer consumers with a low reservation price a special timely coupon[182]. The cross-subsidization that takes place under uniform pricing can be counteracted by making high-value consumers pay more, which opens the market for low-value consumers.

Furthermore, it has been found that in certain cases personalized pricing can lead to an increase in consumer surplus[183]. Firms can decide to share the efficiency gains with consumers through overall lower prices, which benefits total consumer welfare. Tailored prices can also be used to generate positive consumer feedback[184]. Companies would then share part of the revenue increases (e.g., in the form of customer benefits) to build a good reputation and prevent public outrage.

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[178] MATHIS, *Efficiency instead of justice? Searching for the philosophical foundations of the economic analysis of law,* vol. 84, Springer Science & Business Media, 2009, p. 186.

[179] ID., p. 189.

[180] POLINSKY, *An Introduction to Law and Economics,* 2nd edn, Little Brown & Co, 1989, p. 7.

[181] STRAHILEVITZ, «Reputation nation: Law in an era of ubiquitous personal information», *Northwestern University Law Review,* vol. 102, num. 4, pp. 1667 ss.

[182] EZRACHI, *European Competition Law Review,* vol. 37, num. 2, 2016, p. 490.

[183] CHEN/GALLEGO, «Welfare analysis of dynamic pricing», *Management Science,* vol. 65, num. 1, 2019, pp. 139 ss.

[184] FARUQUI/PALMER, «Dynamic pricing and its discontents», *Regulation,* vol. 34, num. 3, 2011, pp. 16 ss.

Lastly, on a macro level, algorithmic pricing can be useful to solve other social problems, which will in the end benefit consumers and society as a whole. For example, it has been found that personalized pricing can remedy problems of over- and underconsumption by more accurately responding to changes in demand[185]. Other examples are the ability of pricing algorithms to reduce food waste and improve water conservation while increasing revenue[186]. If the firms' efficiency gains that are obtained through algorithmic pricing are used for socially beneficial goals, then consumers would ultimately also benefit. SEELE *et al.* go as far as saying that the efficiency gains can be utilized to reduce carbon footprints, which will benefit both the environment and society as a whole[187].

b. Negative effects on equity

First and foremost, algorithmic pricing can fully transfer consumer surplus to the seller. If each consumer is charged her reservation price, no consumer welfare remains. Consumer welfare is measured as the difference between consumers' valuation of the product and the actual price[188]. This evokes concerns among competition and consumer protection authorities because safeguarding consumer welfare is one of their primary goals[189]. One of the biggest problems that these authorities are facing with regard to intervention is that the current body of empirical literature is unable to unequivocally demonstrate the effects of algorithmic pricing on consumer welfare. It has been found that personalized pricing in its current form leads to ambiguous effects, dependent on the market structure[190]. The practice of algorithmic pricing, however, is constantly being perfected and it is predicted that it will likely approximate perfect price discrimination in the near future, which will enable the complete capture of consumer surplus, thereby causing substantial negative consumer welfare effects[191].

Second, algorithmic pricing has the potential to decrease consumer trust in online markets[192]. As a consequence, demand can be significantly reduced. This would amount to a loss of consumer surplus in comparison to a situation without price discrimination. The rationale behind this is that if consumers lose trust, demand goes down which reduces output levels and leads to a lower

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[185] FARUQUI/SERGICI, «Household response to dynamic pricing of electricity: A survey of 15 experiments», *Journal of Regulatory Economics,* vol. 38, num. 2, 2010, pp. 193 ss.

[186] SEELE, *Journal of Business Ethics,* vol. 170, num. 4, 2021, p. 711.

[187] ID.

[188] OECD, «Glossary of Industrial Organisation Economics and Competition Law», *Commissioned by the Directorate for Financial, Fiscal and Enterprise Affairs*, 1993, retrieved from http://www.oecd.org/dataoecd/8/61/2376087.pdf, p. 28.

[189] ID.

[190] BECKERT *et al.,* «Competitive price discrimination in a spatially differentiated intermediate goods market», *International Journal of Industrial Organization*, vol. 25, num. 5, 2015, pp. 884 ss.; GRENNAN, «Price discrimination and bargaining: Empirical evidence from medical devices», *American Economic Review,* vol. 103, num. 1, 2013, pp. 145 ss.; NEVO/WOLFRAM, «Why do manufacturers issue coupons? An empirical analysis of breakfast cereals», *RAND Journal of Economics*, vol. 33, num. 2, 2002, pp. 319 ss.; SHILLER/WALDFOGEL, «Music for a song: An empirical look at uniform pricing and its alternatives», *The Journal of Industrial Economics,* vol. 59, num. 4, 2011, pp. 630 ss.

[191] SHILLER, «First Degree Price Discrimination Using Big Data», *Brandeis University, Department of Economics and International Business School, Working Paper No. 58,* 2014, pp. 1 ss.

[192] OFT, «The Economics of Online Personalised Pricing», pp. 84-87.

level of welfare[193]. It must be noted that it would also decrease firm profits in case the loss of demand is significant.

Finally, price discrimination will most likely be more harmful to naïve consumers than to sophisticated consumers[194]. The rationale behind this is that sophisticated consumers will be more effective in anticipating the effects of price discrimination and adapting themselves accordingly. Consequently, naïve consumers will end up paying higher prices, thereby making them lose a more substantial part of their welfare[195]. This would not take place if firms could adapt their behavior to prevent this discrimination based on sophistication, but it would require an advanced and deliberate segmentation of consumers into naïve and sophisticated groups[196]. If this segmentation is imperfect, naïve consumers will be worse off in any case[197]. Overall, it is expected that naïve consumers will be worse off as a result of price discrimination than sophisticated consumers[198]. To the extent naïve consumers reflect poorer, less educated, and more vulnerable consumers in practice, it is highly questionable, in the light of distributive justice, if algorithmic pricing is desirable[199].

c. Ethical concerns

Apart from the distributive concerns, several ethical concerns should be considered that are relevant to the fairness assessment of algorithmic pricing. Principally, algorithmic price discrimination can transcend the price dimension and lead to *algorithmic discrimination*. To work accurately, the algorithm is fed with consumer data that allows companies to target specific consumers or consumer groups with tailored prices[200]. The price directly or indirectly reflects consumer demographics since these are essential elements that constitute an individual's WTP[201]. Consequently, it is conceivable that the algorithm will have a discriminatory element towards certain groups of consumers. Although anti-discrimination laws are in place which guide the programming of the algorithms, the machine learning element can (unintentionally) circumvent them and lead to practically the same result, namely algorithmic discrimination[202].

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[193] ID.

[194] HEIDHUES/KŐSZEGI, «Naivete-based discrimination», *The Quarterly Journal of Economics,* vol. 132, num. 2, 2017, pp. 1019 ss.

[195] SALOP/STIGLITZ, «Bargains and ripoffs: A model of monopolistically competitive price dispersion», *The Review of Economic Studies,* vol. 44, num. 3, 1977, pp. 493 ss.; VARIAN, *The American Economic Review,* vol. 75, num. 4, 1985, pp. 870 ss.; ARMSTRONG, «Recent Developments in the Economics of Price Discrimination», in BLUNDELL *et al.* (eds.), *Advances in Economics and Econometrics: Theory and Applications: Ninth World Congress,* vol. 2, Cambridge University Press, Cambridge, 2006, pp. 97 ss.

[196] FUDENBERG/TIROLE, «Customer Poaching and Brand Switching», *Rand Journal of Economics,* vol. 31, num. 4, 2000, pp. 634 ss.

[197] ID.

[198] OFT, «The Economics of Online Personalised Pricing», p. 83.

[199] See HELBERGER *et al.,* «Choice Architectures in the Digital Economy: Towards a New Understanding of Digital Vulnerability», *Journal of Consumer Policy,* vol. 45, num. 2, 2022, pp. 175 ss., for a further elaboration on the importance of considering consumer vulnerability in the digital economy.

[200] CHEN/CHEN, «Recent developments in dynamic pricing research: Multiple products, competition, and limited demand information», *Production and Operations Management,* vol. 24, num. 5, 2015, pp. 704 ss.

[201] HUANG, «Equilibrium market segmentation for targeted pricing based on customer characteristics», *Available at SSRN 1292508*, 2010, pp. 1 ss.

[202] BOCK, «Preserve personal freedom in networked societies», *Nature,* vol. 537, num. 7618, 2016, p. 9.

In other words, artificial intelligence applications can still discriminate against groups of people that are legally protected by anti-discrimination laws[203].

Also, the desirability of algorithmic pricing will likely be determined by what it does for overall social welfare. In practice, this means that the aggregate benefits and harms to consumers will be compared and subsequently the necessity for regulation will be determined[204]. The danger that lures, in this case, is that the practice of algorithmic pricing will benefit some parts of society, whereas other parts will lose, albeit the consumer population as a whole benefits. If certain groups of consumers, for example, low-value consumers, are consistently harmed (i.e., they are always on the losing side), there is a case of perpetuated injustice. This phenomenon is also called *social sorting*, whereby consumers are divided into a strong market (high-value consumers) and a weak market (low-value consumers). Subsequently, the latter market will experience different treatment from the former. It is feared that this will exacerbate existing biases, reflect power disparities, and lead to more divided markets[205].

Furthermore, algorithmic pricing could lead to *pricing unfairness*. The concept of unfairness is defined as: «*A judgment of whether an outcome and/or the process to reach an outcome is reasonable, acceptable, or just.*»[206]. In the context of pricing, it means that the buyer feels that she received an unfair price in comparison to other buyers in a similar situation[207]. In other words, the degree of similarity is essential for price fairness judgments[208]. Under algorithmic pricing, consumers would get an individualized price that could be different from other consumers, even though they are in a similar situation. The feeling of unfair pricing can result in negative feelings among consumers, which could damage trust in the market, cause consumer dissatisfaction, and lead to bad publicity[209].

Moreover, algorithmic pricing could lead to an unequal distribution of power[210]. The bargaining position of the consumer vis-à-vis the seller could be debilitated as a result of the enlarged information asymmetries. By virtue of accumulating and analyzing individual behavioral data, detailed behavioral patterns can be predicted and the power asymmetries between the consumer and the seller can be reinforced[211]. Accordingly, it is argued that algorithmic pricing further detracts the market from a level playing field. The competition for the surplus that is generated by the transaction is fair when both parties are on somewhat equal footing, but that is not the

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[203] HACKER, «Teaching fairness to artificial intelligence: Existing and novel strategies against algorithmic discrimination under EU law», *Common Market Law Review*, vol. 55, num. 4, 2018, pp. 1143 ss.

[204] EDWARDS, «Price and prejudice: The case against consumer equality in the information age», *Lewis & Clark Law Review,* vol. 10, num. 3, 2006, pp. 559 ss.

[205] MILLER, *Journal of Technology Law & Policy,* vol. 19, num. 1, 2014, pp. 92-96; TUROW, *Niche envy: Marketing discrimination in the digital age*, MIT Press, 2008; NISSENBAUM, *Privacy in Context,* Stanford University Press, 2009.

[206] XIA *et al.,* «The price is unfair! A conceptual framework of price fairness perceptions», *Journal of Marketing,* vol. 68, num. 4, 2004, pp. 1 ss.

[207] ID., pp. 2-3.

[208] ID.

[209] ID., pp. 6-8.

[210] SEELE, *Journal of Business Ethics,* vol. 170, num. 4, 2021, p. 706.

[211] MARTIN/MURPHY, «The role of data privacy in marketing», *Journal of the Academy of Marketing Science,* vol. 45, num. 2, 2017, pp. 135 ss.

case[212]. It is hard to bargain if one party already has all, or practically all, relevant information about the other party. There is no leverage on the side of consumers since the seller can adequately predict the reservation price of the consumer and the possibility of bargaining is virtually ruled out. In essence, the parties are competing for the surplus based on unfair terms[213]. Based on data analytics, sellers can build accurate consumer profiles and obtain so-called *superior knowledge*[214]. This means that a situation is approximated wherein the seller, allegedly, is better able to understand consumer needs than the consumers themselves[215].

Lastly, the role of privacy cannot be overlooked. The practice of algorithmic pricing is only possible through the collection and processing of consumer data. To a certain extent, firms need to intrude on consumers' personal integrity and intimacy to collect the data, which could be seen as problematic in terms of privacy[216]. Consumers have expectations regarding the treatment of their privacy and these are molded by social norms[217]. Accordingly, there could be a considerable fairness problem if consumers' privacy expectations are consistently transgressed[218]. The privacy problem is exacerbated by the lack of transparency that surrounds algorithmic pricing[219] and algorithms in general[220].

In short, from an equity perspective, the practice of algorithmic pricing seems to be problematic. The discrepancy is that from an efficiency perspective, the practice can be desirable under competitive market conditions. This creates a trade-off that should carefully be considered.

4.3. Efficiency-equity trade-off

With respect to algorithmic pricing, there is a continuous tension between equity and efficiency. The relevance of the trade-off and its inherent contrariety has made it a subject of extensive study[221]. Nonetheless, the apparent ambivalence that is associated with the trade-off depends on the type of relationship between the two goals of efficiency and justice[222]. Three types of relationships are possible: goal harmony, goal neutrality, and goal conflict[223]. In the first case, efficiency would also bring a just outcome, whereas in the third case, the opposite is true. In the second case, the pursuit of one goal does not detract from the other.

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[212] MORIARTY, «Why online personalized pricing is unfair», *Ethics and Information Technology,* vol. 23, num. 3, 2021, pp. 495 ss.

[213] ID.

[214] XU/DUKES, «Product line design under preference uncertainty using aggregate consumer data», *Marketing Science,* vol. 38, num. 4, 2019, pp. 669 ss.

[215] ID.

[216] CHAPDELAINE, *New York University Journal of Law and Business*, vol. 17, num. 1, 2020, p. 33.

[217] NISSENBAUM, *Privacy in Context*; TOWNLEY, *Yearbook of European Law,* vol. 36, num. 1, 2017, p. 711.

[218] ID.

[219] ID., p. 712.

[220] PASQUALE, *The black box society*, Harvard University Press, Cambridge MA, 2015.

[221] See, for example, OKUN, *Equality and efficiency: The big tradeoff*, Brookings Institution Press, Washington D.C., 2015.

[222] The terms equity and justice are used interchangeably, see MATHIS, *Efficiency instead of justice?,* chapter 9.

[223] ID., p. 185.

The idea of regulating the equity-efficiency trade-off concerning algorithmic pricing would be to achieve a state of *Rawlsian justice*[224]. This state is achieved when a system is in place that leads to efficient and fair outcomes. According to RAWLS, this outcome can be achieved when individuals would choose an arrangement of society under a *veil of ignorance*[225]. This is a thought experiment whereby individuals need to select the principles for the structure of society, but without knowing which position in the world they would take. In light of individuals' distaste for risk and uncertainty, they would most likely choose the allocation of rights and entitlements that would be efficient and fair. A relevant observation is that inequality could be accepted, but only to the degree that it creates necessary incentives that increase social welfare. In the field of law and economics, this trade-off is often modeled with the *Nash social welfare function*[226].

In contrast to the proposition that efficiency and justice should be separated[227], whereby private exchanges should be guided by the efficiency objective, and tax and social law should pursue distributive justice goals, this paper advocates an integrated approach. In other words, a joint objective of optimizing efficiency and justice in terms of policymaking.

The concepts of allocative efficiency and distributive justice are inextricably linked[228]. In particular, in terms of the political feasibility of proposals for legal reforms, it is inconceivable that a legal change would be accepted based on allocative efficiency while fully disregarding distributive justice. Furthermore, in certain cases, low-cost and effective redistribution can take place equally well by virtue of private law as by means of taxation[229]. Accordingly, the possibility of redistribution through law should also be explored[230]. Besides, the desirability of regulation that is solely focused on efficiency is debatable. In the field of civil litigation, for example, the notion of justice is of particular relevance to the parties and cannot be subordinated to the notion of efficiency[231]. Consequently, the separation between efficiency and justice as objectives should be abandoned.

As MATHIS puts it: «*It is rather the role of the legislator, and the courts in their turn, to strike a subtle balance between conflicting rights in all areas of the law. In doing so, the multiple interdependencies between efficiency and justice must be borne in mind.*»[232].

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[224] RAWLS, *A Theory of Justice*.

[225] ID.

[226] PARISI, *The language of law and economics*, p. 248.

[227] POSNER, *The problems of jurisprudence,* Harvard University Press, Cambridge MA, 1990; KAPLOW, *Harvard Law Review,* vol. 114, num. 4, 2001, pp. 961 ss.; POLINSKY, *An Introduction to Law and Economics*.

[228] MATHIS, *Efficiency instead of justice?*, p. 201.

[229] ID.

[230] It must be noted that taxation is normally preferred to combat distributional injustices. This theory has been formally developed by KAPLOW/SHAVELL, «Why the legal system is less efficient than the income tax in redistributing income», *The Journal of Legal Studies*, vol. 23, num. 2, 1994, pp. 667 ss. They argue that only taxation is a good remedy to combat wealth inequality since alternative methods will lead to a double distortion. Although the soundness of this argument is severely criticized in the existing literature, see, for example, MARKOVITS, «Why Kaplow and Shavell's double-distortion argument articles are wrong», *George Mason Law Review*, vol. 13, num. 3, 2005, pp. 511 ss., it also underestimates the problem-solving power of the law.

[231] MATHIS, *Efficiency instead of justice?*, p. 201.

[232] ID.

In conclusion, the practice of algorithmic pricing could be defended on efficiency grounds, but distributional concerns have evoked a call for regulation. Considering the efficiency-equity trade-off, it is valuable to see how the current legal framework could be used to address algorithmic pricing in a manner that would contribute to a state of Rawlsian justice.

5. Legal framework

Traditionally, the freedom of enterprise is held in high regard, which means that businesses should be able to conduct their activities as freely as possible. This includes the freedom to set prices and the autonomy to enter into contracts as they see fit. The fair market value of a good or service is determined by the subjective judgments of the parties. Regulation of prices will, therefore, interfere with supplier freedom, parties' autonomy, and market efficiency. The pricing mechanism is regarded to work best when it can operate freely. Thus, the free-market principle prevails unless there are substantive reasons to regulate it[233].

Based on the previous sections, it could be argued that the potential harms to social welfare, in particular consumer welfare, and the ethical concerns, present a cogent argument for regulation. Although it could be the case that algorithmic pricing leads to efficiency benefits, it is problematic on equity grounds. In such a scenario the need for legal intervention depends on the relative weights that are given to the concepts of efficiency and distributive justice in the social welfare function[234]. Since it is plausible to assume that an outcome, which is efficiency-enhancing but significantly decreases consumer welfare, leads to distributive injustice, and evokes ethical concerns, will not be politically acceptable, it could be argued that the possibility of regulation should at least be explored[235]. For this reason, in the next sections, different laws of the current legal framework are analyzed to see if they provide a functional approach to regulating algorithmic pricing.

5.1. Contract law

Contract law provides various ex-post remedies to address, *inter alia*, duress, fraud, undue influence, misrepresentation, and unconscionable dealing. In particular, the latter case has been advocated to be a useful remedy to tackle algorithmic pricing, in particular since the other doctrines do not seem to apply in the realm of price discrimination[236]. It is argued that *price unconscionability* should include price discrimination without a cost justification, whereby charging different prices to consumers based on their identity should be prohibited[237]. Nonetheless, this price unconscionability doctrine, which is also called the *theory of a just price* (*iustum pretium*), is regarded as the Achilles heel of the legal system[238].

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[233] HAYEK, *Road to Serfdom,* The University of Chicago Press, Chicago, 1944.

[234] SHAVELL, *Foundations of economic analysis of law*, Harvard University Press, Cambridge MA, 2009, p. 597.

[235] MILLER, *Journal of Technology Law & Policy*, vol. 19, num. 1, 2014, p. 69.

[236] ID.; KLOCK, «Unconscionability and price discrimination», *Tennessee Law Review,* vol. 69, num. 2, 2001, pp. 317 ss.

[237] ID., p. 367.

[238] ID., p. 338.

The legal doctrine of price unconscionability tries to counteract excessive forms of overpricing[239]. A price is excessive when it is grossly disproportionate to the cost or value of the good or service received in exchange[240]. The practice of determining a just price, however, has been abandoned by its infeasibility[241]. Apart from the practical difficulties that come with determining a just price, the doctrine is also redundant from a law and economics perspective. Legally, if the contract has been concluded validly (e.g., no fraud, duress, or undue influence), it means that the contract parties expect to benefit from it. It is a welfare-enhancing transaction. There is no need to intervene. Economically speaking, market forces will prevent sellers from grossly overcharging consumers because they will lose clientele to competitors. Hence, the price unconscionability doctrine is only useful in specific cases, whereas in normal practice it is superfluous[242].

Moreover, as the definition of price unconscionability states, there must be a case of grossly disproportionate overcharging. Historically, the threshold that could be found in Roman law was the *laesio enormis*, whereby the buyer was overcharged for 100% of the price[243]. This idea of gross discrepancies remained the guiding principle when determining the degree of unfairness in pricing[244]. A modern approach would be based on prices that would cause a significant imbalance in the parties' rights and obligations that is to detriment of the consumers and contrary to good faith and fair dealing[245]. In the case of algorithmic pricing, this grossly disproportionate overcharging does not seem to be applicable. Regulating algorithmic pricing based on the price unconscionability doctrine would, therefore, be based on a fragile foundation[246].

5.2. Competition law

In the traditional economic literature, it is argued that the ability to price discriminate is largely dependent upon the market power that a firm has[247]. Solely through a position of *market dominance* would it be possible to charge consumers different prices for the same product without losing a substantial part of the clientele to the competitors. It is asserted that the degree to which consumer welfare is impacted depends on the competition in the market[248]. In markets that have a monopoly structure, it is expected that algorithmic pricing will be employed to exploit consumers since no threat of switching to a competitor is present. In a competitive market, however, algorithmic pricing could lead to fierce price competition, which could be beneficial for consumers. Accordingly, the market structure is a determinative factor to assess the welfare effects of algorithmic pricing.

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[239] DARR, «Unconscionability and price fairness», *Houston Law Review,* vol. 30, num. 5, 1994, pp. 1819 ss.

[240] ID.

[241] ZIMMERMANN, *The law of obligations: Roman foundations of the civilian tradition*, Clarendon Press, 1996, pp. 255-270.

[242] DARR, *Houston Law Review,* vol. 30, num. 5, 1994, p. 1823.

[243] EIDENMÜLLER, «Justifying fair price rules in Contract Law», *European Review of Contract Law,* vol. 11, num. 3, 2015, pp. 220 ss.

[244] ID.

[245] European Parliament legislative resolution of 26 February 2014 on the proposal for a regulation of the European Parliament and of the Council on a Common European Sales Law (COM[2011]0635 – C7-0329/2011 – 2011/0284[COD]) (Ordinary legislative procedure: first reading), Amendments 153 and 155.

[246] WAGNER, *University of Chicago Law Review,* vol. 86, num. 2, 2019, pp. 589-590.

[247] See, for example, VARIAN, *Intermediate microeconomics.*

[248] CHEN, *The Institute of Social and Economic Research, Osaka University, Discussion Paper No. 1023*, 2018, pp. 1 ss.

It must be noted that through, for example, *network effects,* consumers can be captured, and substantial influence can be exercised even though the firm has not formally reached a dominant position yet[249]. Price discrimination can, therefore, also take place in competitive markets where a firm does not have monopoly power[250].

It could be argued that if the practice is undertaken by a dominant firm, it creates *exclusionary* and *exploitative effects*. Exclusionary and exploitative effects can be defined as follows: «*'Exclusionary' abuses refer to those practices of a dominant undertaking which seek to harm the competitive position of its competitors or to exclude them from the market, whereas 'exploitative' abuses can be defined as attempts by a dominant undertaking to use the opportunities provided by its market strength in order to harm customers directly.*»[251]. An alternative wording is that there can be *primary line injury* and *secondary line injury*. Primary line injury «*occurs where the supplier's conduct produces effects against competitors in the market in which it operates*»[252] and secondary line injury concerns «*discrimination exercised by a supplier against some of its customers compared to one or more of its customers*»[253].

The abuse of a dominant position is regulated by Article 102 of the TREATY ON THE FUNCTIONING OF THE EUROPEAN UNION (TFEU). To date, no case law in competition law has specifically dealt with algorithmic pricing[254]. This is understandable since the technology emerged recently and the empirical evidence of its ubiquity in business practice is still lacking. Nonetheless, it can already be theorized if algorithmic pricing would fall within the definition of abuse under Article 102 TFEU and if competition law can provide adequate remedies.

Article 102(c) TFEU states that there is an abuse when a dominant firm applies «*dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage.*» Thus, for a successful recourse to Article 102(c) TFEU, four conditions need to be fulfilled: (1) Equivalent transactions; (2) dissimilar conditions; (3) competitive disadvantage; (4) no objective justifications for different treatment[255]. The third condition makes the application of Article 102 TFEU particularly onerous since the European Court of Justice (ECJ) has not provided clear-cut answers on how to interpret the competitive disadvantage[256]. As regards the scope of Article 102(c) TFEU, it seems that the provision is targeting customers of a dominant firm who compete with one another on a downstream market, not the final consumers[257]. The relevant question is then if the final consumers should also be protected against exploitative abuses based on Article 102 TFEU. In EU case law, Article 102(c) TFEU has been interpreted broadly to deal with forms of price discrimination that are regarded as anti-competitive. This is

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[249] CHAPDELAINE, *New York University Journal of Law and Business*, vol. 17, num. 1, 2020, p. 17.

[250] LEVINE, *Yale Journal on Regulation,* vol. 19, num. 1, 2002, pp. 1 ss.; OECD, «Personalized Pricing in the Digital Era», p. 13; MILLER, *Journal of Technology Law & Policy*, vol. 19, num. 1, 2014, p. 74.

[251] AKMAN, «Exploitative Abuse in Article 82EC: Back to Basics?», *Cambridge Yearbook of European Legal Studies*, vol. 11, num. 1, 2009, p. 4.

[252] GRAEF, *Columbia Journal of European Law*, vol. 24, num. 3, 2018, p. 542.

[253] ID., p. 543.

[254] TOWNLEY, *Yearbook of European Law*, vol. 36, num. 1, 2017, p. 723.

[255] A full analysis with the corresponding case law is provided by VAN DEN BERGH, *Comparative competition law and economics*, Edward Elgar Publishing, 2017, section 7.5.3.

[256] ID.; O'DONOGHUE/PADILLA, *The law and economics of Article 102 TFEU,* 2nd edn, Hart Publishing, 2013, p. 789.

[257] GRAEF, *Columbia Journal of European Law,* vol. 24, num. 3, 2018, p. 543.

relevant to the regulation of algorithmic pricing since the practice is not specifically covered by the provision. Article 102(c) TFEU covers unequal treatment between intermediate consumers, whereas algorithmic price discrimination targets final consumers[258]. A broader interpretation is, therefore, a prerequisite for intervention based on competition law.

Although there is no specific case law on algorithmic pricing, there is one case that supports the idea that discrimination between final consumers also falls within the working sphere of Article 102(c) TFEU. In the DEUTSCHE POST – INTERCEPTION OF CROSS-BORDER MAIL case[259], the Commission decided that: «*In any event, the Court of Justice has stated that the list of abuses mentioned in Article 82 itself is not exhaustive and thus only serves as examples of possible ways for a dominant firm to abuse its market power. Article 82 may be applied even in the absence of a direct effect on competition between undertakings on any given market. This provision may also be applied in situations where a dominant undertakings behaviour causes damage directly to consumers.*»[260]. Consequently, the Commission concluded that such a practice can be classified as an abuse of Article 102 TFEU, and, in particular subparagraph c of the second paragraph[261].

Nonetheless, this case never went to the ECJ, which keeps the interpretation of Article 102(c) TFEU in relation to price discrimination that harms final consumers unclear. Since there is no legal standard for exploitative pricing that harms final consumers, it is uncertain if invoking Article 102 TFEU will be successful for cases of algorithmic pricing. In practice, Article 102 TFEU is more commonly applied (93% of the cases) to enforce cases against exclusionary abuses rather than exploitative abuses (7% of the cases)[262]. This makes it dubious if the remediation of exploitative abuses will be a priority of the EC. It is, therefore, argued that consumer protection law would be more suitable to tackle price discrimination practices[263].

Moreover, the EC will scrutinize the abuse in the light of its competitive effects (i.e., effects-based approach), which means that on a case-by-case basis, it must be decided if algorithmic price discrimination is beneficial or detrimental to competition[264]. For this consideration, the precise objective of competition law becomes relevant. If competition law enforcement is concerned with total welfare, algorithmic pricing will most likely not be considered anti-competitive, however, if the goal is maintaining consumer welfare, it will most likely be regarded as anti-competitive[265]. Although the consumer welfare standard has not been clearly defined and openly endorsed by the EC[266], there are various indications that modern EU competition policy

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[258] ID., p. 548.

[259] 2001/892/EC: Commission Decision of 25 July 2001 relating to a proceeding under Article 82 of the EC Treaty (COMP/C-1/36.915 — Deutsche Post AG — Interception of cross-border mail).

[260] ID., paragraph 133.

[261] ID., paragraph 134.

[262] OECD, «Personalized Pricing in the Digital Era», p. 27. Statistics are based on the article by DETHMERS/BLONDEEL, «EU enforcement policy on abuse of dominance: Some statistics and facts», *European Competition Law Review,* vol. 38, num. 4, 2017, pp. 147 ss.

[263] O'DONOGHUE, *The law and economics of Article 102 TFEU*, pp. 846-849.

[264] ID., pp. 27-28.

[265] MAGGIOLINO, «Personalized prices in European competition law», *Bocconi Legal Studies Research Paper,* 2017, p. 22.

[266] VAN DEN BERGH, *Comparative competition law and economics*, chapter three provides an extensive analysis on the goals of EU competition law.

is focused on protecting consumer welfare[267]. It would then be possible to address algorithmic pricing through EU competition policy since it does investigate exploitative abuses and applies a consumer welfare standard[268].

Lastly, it is worth mentioning that the concept of fairness is also becoming relevant in competition law. Several authors argue that fairness should be part of the consumer welfare standard[269]. For instance, TOWNLEY *et al*. argue that if algorithmic pricing would undermine both fairness and consumer welfare, then it should be judged as unlawful under Article 102 TFEU[270]. They further state that if consumer welfare is advanced by algorithmic pricing, then fairness considerations should be a secondary goal, but when consumer welfare is reduced, fairness considerations should outweigh the efficiency benefits[271]. In this way, fairness is also accounted for in the consumer welfare standard, which would give competition authorities a greater authority to intervene.

5.3. Consumer protection law

Consumer protection law and competition law are inextricably linked. Both laws share the goal of promoting consumer welfare and improving the economic performance of markets by fostering the competition process[272]. Nonetheless, as the previous section demonstrated, it is unclear to what extent final customers can be protected from algorithmic pricing through competition law. In addition, one of the key advantages of consumer protection law in comparison with competition law is that the element of market power is irrelevant. Consumer protection law can, therefore, be a valuable instrument to address algorithmic pricing on the points where competition law falls short.

In the realm of consumer protection, the term *marketing law* is used interchangeably with the term *consumer law*[273]. The purpose of marketing law is to ensure fair commercial practices in the market in order to protect consumers and competitors from unfair practices[274]. On a European level, marketing law is subsumed in the working sphere of consumer protection law through the harmonization of Directive 2005/29/EC concerning unfair business-to-consumer commercial practices in the internal market, which, *inter alia*, prohibits misleading and aggressive commercial practices (the UCPD). The Directive aims to protect the economic interests of consumers[275].

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[267] ALBÆK, «Consumer welfare in EU competition policy», *Aims and values in competition law*, 2013, pp. 67 ss.

[268] OECD, «Personalized Pricing in the Digital Era», p. 30.

[269] See, for example, KALIMO/MAJCHER, «The concept of fairness: Linking EU competition and data protection law in the digital marketplace», *European law review,* vol. 42, num. 2, 2017, pp. 210 ss.; EZRACHI, «Sponge», *Journal of Antitrust Enforcement,* vol. 5, num. 1, 2017, pp. 49 ss.; TOWNLEY, *Yearbook of European Law,* vol. 36, num. 1, 2017, pp. 683 ss.; GRAEF, *Columbia Journal of European Law*, vol. 24, num. 3, 2018, pp. 541 ss.

[270] TOWNLEY, *Yearbook of European Law,* vol. 36, num. 1, 2017, p. 731.

[271] ID., p. 743.

[272] OECD, «Personalized Pricing in the Digital Era», p. 32.

[273] NIELSEN, *Harmonisation of EU Marketing Law: Analysis of Advantages and Disadvantages Regarding Regulating of Marketing Law in EU*, Nordic Council of Ministers, Copenhagen, 2002.

[274] TRZASKOWSKI, «Behavioural economics, neuroscience, and the unfair commercial practises directive», *Journal of Consumer Policy,* vol. 34, num. 3, 2011, p. 386.

[275] NIELSEN, *Harmonisation of EU Marketing Law.*

Misleading commercial practices relate to the provision of information (or its omission) and *aggressive commercials practices* refer to the conduct of traders in the course of business (i.e., impairing the freedom of choice or conduct of the consumer)[276]. Pursuant to Article 5(2) UCPD, a commercial practice is deemed unfair when: (1) «*it is contrary to the requirements of professional diligence*», and (2) «*it materially distorts or is likely to materially distort the economic behaviour with regard to the product of the average consumer whom it reaches or to whom it is addressed, or of the average member of the group when a commercial practice is directed to a particular group of consumers.*» With the term *average consumer*, the Directive means a consumer «*who is reasonably well-informed and reasonably observant and circumspect, taking into account social, cultural and linguistic factors*»[277].

In accordance with Articles 6(1)(d) and 7(4)(c) UCPD, an unfair price is not by definition an unfair commercial practice as long as the price or the manner in which the price is calculated is communicated to the consumer transparently and intelligibly. Personalized pricing is also not mentioned as one of the blacklisted practices of Annex 1 of the Directive. Hence, there is no *per se* prohibition of algorithmic (personalized) pricing under the UCPD.

Analogous to the UCPD, there is no *per se* prohibition of unfair prices under the UNFAIR CONTRACT TERMS DIRECTIVE (UCTD)[278]. Article 4(2) UCTD states: «*Assessment of the unfair nature of the terms shall relate neither to the definition of the main subject matter of the contract nor to the adequacy of the price and remuneration, on the one hand, as against the services or goods supplies in exchange, on the other, in so far as these terms are in plain intelligible language.*» Thus, apart from the fact that prices must be communicated in plain intelligible language, they cannot be addressed based on the Directive.

Notably, in the CAJA DE AHORROS case[279], the ECJ ruled that Articles 4(2) and 8 of the UCTD must be interpreted as not precluding national legislation that authorizes a judicial review regarding «*the unfairness of contractual terms which relate to the definition of the main subject-matter of the contract or to the adequacy of the price and remuneration, on the one hand, as against the services or goods to be supplied in exchange, on the other hand, even in the case where those terms are drafted in plain, intelligible language*»[280]. This does not mean, however, that new legal obligations can be created, for example additional disclosure duties or *per se* prohibitions, that would complement existing consumer protection laws[281].

In addition, the scope of the exclusion remains uncertain and further guidance by the ECJ concerning the interpretation is lacking[282]. For this reason, a successful invocation of the UCTD to address algorithmic pricing is not straightforward.

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[276] Articles 7 and 8 UCPD.

[277] Recital 18 UCPD.

[278] Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts.

[279] Case C-484/08 Caja de Ahorros y Monte de Piedad de Madrid v Asociación de Usuarios de Servicios Bancarios (Ausbanc).

[280] ID., paragraph 44.

[281] GROCHOWSKI *et al*., «Price Discrimination and Consumer Protection: A Digital Arms Race?», *Technology and Regulation,* 2022, p. 44.

[282] STUYCK, «Case C-484/08 Caja de Ahorros y Monte de Piedad de Madrid v Asociación de Usuarios de Servicios Bancarios (Ausbanc)», *Case Note*, 2010, pp. 449 ss.

Nevertheless, algorithmic pricing can be tackled under the UCPD in two alternative ways. First, personalized pricing could be classified as unfair due to a lack of transparency. The UCPD requires that the price or the calculation of it must be communicated transparently and intelligibly, which in the case of algorithmic pricing is highly dubious[283]. Second, according to the COMMISSION NOTICE UCPD[284], personalized pricing can breach the UCPD if it leads to an unfair commercial practice. For instance, if the firm can exert undue influence on consumers through the collection of personal data (i.e., profiling), it constitutes an aggressive commercial practice case[285].

Marketing practices, *inter alia* personalized pricing, can also be classified as an aggressive commercial practice when «*in its factual context, taking account of all its features and circumstances, by harassment, coercion, including the use of physical force, or undue influence, it significantly impairs or is likely to significantly impair the average consumer's freedom of choice or conduct with regard to the product and thereby causes him or is likely to cause him to take a transactional decision that he would not have taken otherwise.*»[286].

In light of these considerations, «*consumer protection law could be used to tackle unfair practices that can have the effect of reinforcing the negative impact of personalised pricing, i.e. those practices that facilitate effective personalised pricing*»[287].

Of note is that Article 6(1)(ea) of the CONSUMER RIGHTS DIRECTIVE (CRD), which was added by Directive (EU) 2019/2161[288] puts an obligation on traders, in case of distance and off-premises contracts, to inform consumers about the fact that the offered price has been personalized on the basis of automated decision-making[289]. However, the obligation does not entail the disclosure of the parameters that are being used, potential benchmark prices, or any other additional information that could be relevant to consumers[290]. It is, therefore, questionable if this provision will effectively aid consumers in their decision-making process.

In sum, to tackle algorithmic pricing by virtue of consumer protection law, a substantive case needs to be made that proves that the practice is unfair (misleading or aggressive). Furthermore, there is no *per se* prohibition of (algorithmic) personalized pricing under the UCPD and the other consumer law instruments, such as the CRD, mainly focus on establishing transparency through disclosure duties. Although the CAJA DE AHORROS case does offer the possibility for Member States to adopt legislation that authorizes judicial reviews of prices, it does not transform the UCTD into a potent instrument to tackle algorithmic pricing.

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[283] OECD, «Personalized Pricing in the Digital Era», p. 35.

[284] COMMISSION NOTICE UCPD, section 4.2.8.

[285] Article 8 UCPD.

[286] ID.

[287] OECD, «Personalized Pricing in the Digital Era», p. 36.

[288] Directive (EU) 2019/2161 of the European Parliament and of the Council of 27 November 2019 amending Council Directive 93/13/EEC and Directives 98/6/EC, 2005/29/EC and 2011/83/EU of the European Parliament and of the Council as regards the better enforcement and modernisation of Union consumer protection rules. Hereinafter called the MODERNISATION DIRECTIVE.

[289] COMMISSION NOTICE UCPD, section 4.2.8.

[290] GROCHOWSKI, *Technology and Regulation,* 2022*,* p. 42.

It can, thus, be argued that although consumer protection law offers various tools to address algorithmic pricing, they will likely not suffice to regulate the practice adequately and independently of the other legal regimes.

5.4. Data protection law

The practice of algorithmic pricing is solely possible through the collection and processing of vast amounts of personal data that allow firms to build consumer profiles and offer them prices that are as close as possible to their reservation price[291]. In other words, personal data is an essential source of information for algorithmic pricing to work. The more consumers are active on the internet, the more data the algorithms can observe, test, recalibrate, and refine. Thus, the more data the firm can collect, the better the algorithm will work[292]. In this sense, it is predictable that firms will push the boundaries of what data can be collected from individuals. Since firms operate in the capacity of data controllers, data protection law becomes highly relevant.

If the data is anonymized or it concerns non-personalized data, the GDPR is not applicable[293]. In this case, however, algorithmic pricing is based on personal data, which enables the invocation of the GDPR. In accordance with Articles 5(1)(a) and 5(1)(b) GDPR, personal data shall be «*processed lawfully, fairly and in a transparent manner in relation to the data subject ('lawfulness, fairness and transparency')*» and «*collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes*».

Article 6 GDPR provides legitimate grounds for processing, such as the consent of the data subject, the necessity for the performance of a contract, compliance with a legal obligation, protection of the vital interests of the data subject, and the performance of a task in the public interest. The GDPR provides consumers with control over their data, and it sets limits on the collection and processing of personal data. When applying these provisions to algorithmic pricing, it becomes clear that a firm could engage in this practice if it has a legitimate purpose to collect and process personal data. A firm could argue that it collects the data to offer personalized services to consumers, which will improve consumer experience, satisfaction, and welfare. It is expected, however, that the firms' legitimate purpose argument will fail in most cases because the necessity of processing the personal data to perform the contract is questionable and the data subject's interests will likely override the legitimate interests of the data controller[294].

Pursuant to Article 21(2) GDPR, a data subject could object to the collection and processing of personal data for algorithmic pricing purposes. The provision states: «*Where personal data are processed for direct marketing purposes, the data subject shall have the right to object at any time to processing of personal data concerning him or her for such marketing, which includes profiling to the extent that it is related to such direct marketing*». Algorithmic pricing is based on profiling, which enables the personalization of services. Article 22(1) GDPR reinforces Article 21(2) by stating that: «*The data subject shall have the right not to be subject to a decision based solely on automated*

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[291] EZRACHI, *European Competition Law Review,* vol. 37, num. 2, 2016, p. 486.

[292] ID., p. 490.

[293] Recital 26 GDPR.

[294] STEPPE, «Online price discrimination and personal data: A General Data Protection Regulation perspective», *Computer law & security review,* vol. 33, num. 6, pp. 778-781; ZUIDERVEEN BORGESIUS/POORT, «Online price discrimination and EU data privacy law», *Journal of Consumer Policy,* vol. 40, num. 3, 2017, p. 360.

processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her». In this sense, the data subject could object to algorithmic pricing.

Nevertheless, Article 22(2)(c) GDPR is the crux of the matter, namely through *explicit consent*, firms are allowed to profile for, *inter alia*, marketing purposes. In practice, this consent is obtained through privacy notices. There is a significant signing-without-reading problem when it comes to general terms and conditions or privacy notices for that matter. Thus, obtaining consent is not particularly onerous for the seller. The effectiveness of the provision is, therefore, highly dubious[295].

It must be noted, however, that two developments are reinforcing the protective character of the GDPR. First, the necessity of a legitimate purpose is highlighted by the EUROPEAN DATA PROTECTION BOARD (EDPB), which states that data processing requires data controllers to prove that processing is compliant with the reasonable expectations of data subjects and that it would not have an unwarranted impact on them. In addition, the EDPB asserts that where processing is in fact not necessary for the performance of a contract another appropriate legal basis needs to be found[296]. If this is absent, the only option is explicit consent. This is where the second development comes into play. There is a stronger emphasis on the importance of explicit informed consent[297]. As the EDPB puts it: «*It is important to distinguish between accepting terms of service to conclude a contract and giving consent within the meaning of Article 6(1)(a), as these concepts have different requirements and legal consequences.*»[298]. In practice, this means that obtaining consent based on the current signing-without-reading practice is being increasingly contested by data protection authorities and courts[299].

Consequently, data protection law can be particularly useful to ensure that algorithmic pricing is transparent[300], and that information asymmetries are mitigated[301]. Of note is that the call for transparency of algorithms is also supported by the proposed AI Act[302].

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[295] See HELBERGER *et al.*, «EU Consumer Protection 2.0: Structural Asymmetries in Digital Consumer Markets», *A joint report from research conducted under the EUCP2.0 project*, 2021, pp. 27-40, retrieved from https://www.beuc.eu/brochure/eu-consumer-protection-20-structural-asymmetries-digital-consumer-markets-0, for a further elaboration on why the consent mechanism in its current form fails to provide adequate protection to consumers in terms of data management.

[296] Guidelines 2/2019 on the processing of personal data under Article 6(1)(b) GDPR in the context of the provision of online services to data subjects, paragraph 19.

[297] LUZAK, «Privacy notice for dummies? Towards European guidelines on how to give "clear and comprehensive information" on the cookies' use in order to protect the internet users' right to online privacy», *Journal of Consumer Policy,* vol. 37, num. 4, 2014, pp. 547 ss.

[298] Guidelines 2/2019 on the processing of personal data under Article 6(1)(b) GDPR in the context of the provision of online services to data subjects, paragraph 20.

[299] See, for example, the fine imposed by the French National Data Protection Commission in the case: Délibération de la formation restreinte n° SAN – 2019-001 du 21 janvier 2019 prononçant une sanction pécuniaire à l'encontre de la société GOOGLE LLC, and the case by the Court of Grenoble: TGI DE GRENOBLE, Ordonnance de référé du 4 juillet 2018.

[300] See, for example, recital 39 and Article 12 GDPR.

[301] ZUIDERVEEN BORGESIUS, *Journal of Consumer Policy,* vol. 40, num. 3, 2017, pp. 347 ss.

[302] Proposal for a Regulation of the European Parliament and of the Council laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain Union legislative acts.

5.5. Human rights law

Human rights law could address some of the ethical concerns that are related to the unequal treatment of individuals through algorithmic pricing. The CHARTER OF FUNDAMENTAL RIGHTS OF THE EUROPEAN UNION (CFR) and the EUROPEAN CONVENTION ON HUMAN RIGHTS (ECHR) play an important role in this regard. Various fundamental rights interface with algorithmic pricing, such as human dignity, privacy, and self-determination. A full analysis of these relationships and other relevant human rights laws falls outside the scope of this paper, but there is one human right that will be further explored in this section, namely the right to non-discrimination.

Article 21(1) of the CFR states: «*Any discrimination based on any ground such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation shall be prohibited*.» This is in line with recital 75 of the GDPR. Accordingly, algorithmic price discrimination could be problematic if the personalization of prices is based on one of the above-mentioned criteria. Naturally, firms will ensure that algorithms will not be programmed based on these criteria in order to prevent direct discrimination, yet through machine learning, it is conceivable that through indirect factors the algorithm will lead to the same outcome[303].

It is debatable to what extent anti-discrimination law is able to deal with algorithmic pricing. In short, there is no specific legal prohibition of price discrimination. There are various industries, *inter alia* the flight industry, in which price discrimination is commonly applied, legally permissible, and accepted by the public[304]. As long as the algorithms behind the pricing mechanism are not varying or personalizing prices based on the criteria that are specifically prohibited by human rights laws such as the CFR or the ECHR, there is no strong case for effective intervention based on anti-discrimination law. With respect to the EU non-discrimination law regime, XENIDIS and SENDEN conclude that: «*The legal framework seems to fall short in effectively tackling algorithmic discrimination on the consumption market because of its limitation both in terms of protected grounds and areas that are excluded from its scope.*»[305].

It should be pointed out, however, that several regulations which prohibit some discriminatory elements of pricing, such as the Geo-Blocking Regulation[306] and Article 20 of the Services Directive[307] (i.e., discrimination based on nationality, place of residence, or place of establishment), have successfully been adopted by the European Union. This demonstrates that there is room for development and that in the future the scope of anti-discrimination law might be broadened to eliminate unequal treatment on arbitrary bases[308].

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[303] BOCK, *Nature,* vol. 537, num. 7618, 2016, p. 9.

[304] TUROW, *The aisles have eyes*, Yale University Press, 2017.

[305] XENIDIS/SENDEN, «EU non-discrimination law in the era of artificial intelligence: Mapping the challenges of algorithmic discrimination», in BERNITZ *et al.* (eds.), *General Principles of EU law and the EU Digital Order,* Kluwer Law International, 2020, p. 170.

[306] Regulation (EU) 2018/302 of the European Parliament and of the Council of 28 February 2018 on addressing unjustified geo-blocking and other forms of discrimination based on customers' nationality, place of residence, or place of establishment within the internal market and amending Regulations (EC) No 2006/2004 and (EU) 2017/2394 and Directive 2009/22/EC.

[307] Directive 2006/123/EC of the European Parliament and of the Council of 12 December 2006 on services in the internal market.

[308] CHAPDELAINE, *New York University Journal of Law and Business*, vol. 17, num. 1, 2020, p. 32.

5.6. Self-regulation

The focus on legal remedies tends to overlook the roles of market-based solutions and self-regulation. The market has responded to algorithmic pricing by developing technological tools that aid consumers to protect their privacy and limit their exposure to personalization techniques. Browser software or incognito modes allow consumers to delete cookies or inhibit the working of cookies. Consumers can also disable cookies in their browser settings. In this way, no or less personal and behavioral data about the consumer can be collected, which impedes exposure to personalized prices. A related tool is the use of *proxy servers*, which act as an intermediary between the user and the internet that hides the IP address of the user and safeguards anonymity[309].

Furthermore, reputation is of pivotal importance to companies. Due to the emergence of online review mechanisms and rating services, companies are exposed to the risk of causing consumer backlash if they are creating the impression that customer data is being exploited. Consumer trust is essential for firms to thrive, and reputational concerns work, therefore, as a constraint on the activities of the seller[310]. Thus, it could be in the interest of companies to adopt self-regulation voluntarily in order to maintain consumer trust in the market. For example, businesses could develop standards and best practices that are compliant with the existing legal framework. This can, for instance, be achieved with the cooperation of high-level European e-commerce organizations and associations[311].

Self-regulatory actions can take away the need for governmental intervention. Through good practice principles and strict rules of conduct, the industry can independently foster the development of pricing strategies that warrant transparency, awareness, and professional diligence. In this way, sellers can be steered into law-abiding compliant behavior and the self-regulatory framework can function as a valuable enforcement tool[312]. A strong point of self-regulation compared to public regulation is the low administrative costs involved, which makes it an attractive market-based solution[313].

The assertiveness of consumers should also not be underestimated. Through public outrage, consumers can punish firms that treated them unfairly[314]. The deterrence by consumer outrage can provide an incentive for sellers to self-regulate. Consumers have a predominantly negative attitude toward algorithmic pricing[315]. Consequently, it is conceivable that this unfavorable perception limits the further spread of price-discriminating strategies. Firms will be incentivized to self-correct in the development of the algorithms to prevent unfair outcomes[316].

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[309] KUMAR *et al.*, «Privacy Protection in Personalized Web Search using Obfuscation», *International Journal of Emerging Trends in Engineering Research,* vol. 8, num. 4, 2020, pp. 1410 ss.

[310] RAO/WANG, «Demand for "healthy" products: False claims and FTC regulation», *Journal of Marketing Research*, vol. 54, num. 6, 2017, pp. 968 ss.

[311] EU REPORT, pp. 270-271.

[312] WEBER, «The Law and Economics of Self-regulation in Advertising», *Journal of European Consumer and Market Law*, vol. 3, num. 1, 2014, p. 5.

[313] ID., p. 15.

[314] EDWARDS, *Lewis & Clark Law Review,* vol. 10, num. 3, 2006, pp. 583-585.

[315] See section 2.6.

[316] ODLYZKO, *Proceedings of the 5th international conference on electronic commerce*, 2003.

Technological tools can assist consumers in their assertiveness by enabling the monitoring of pricing strategies in the market[317]. These can be tools for consumers to oversee firms, but also to guard themselves against algorithmic pricing practices. For example, by anonymizing themselves through the incognito mode or by using several profiles to compare prices[318].

There are, however, several problems with these market-based solutions. Primarily, not all consumers are aware of the existence of these tools, or they do not know how to use them. In other words, there is a problem of awareness and skill[319]. It is questionable to what extent consumers will be in the position to effectively use the available tools. In particular, vulnerable consumers in online environments are less likely to profit from the benefits of technological tools to protect their privacy[320].

Second, data analytics companies have developed technologies that can circumvent many of the tools that consumers have at their disposal. For example, it is regarded as highly complex for consumers to disable flash cookies or avoid advanced tracking technologies[321]. With regard to the latter, *deep packet inspection* techniques (i.e., technology to open «packages of information» that are sent over the internet – e.g., email messages) that are predominantly used for personalization can bypass many of the technological defenses that are available to consumers. In addition, even if the consumer is successful in disabling all cookies and tracking mechanisms, the functionality of the websites is often lowered, which further increases transaction costs[322].

Third, the constraint that is imposed on firms by reputational concerns is not expected to fully preclude the implementation of personalized pricing strategies[323]. Due to the lack of awareness regarding tracking technologies and data analytics, the actual threat of causing consumer backlash might be lower than one would expect from a theoretical point of view. The likelihood of getting exposed by consumers is low due to this lack of awareness. The degree of sophistication that is needed to understand the mechanism behind algorithmic pricing might further lower the probability. It is, therefore, not reasonable to expect that reputational concerns would remedy all potential harms concerning algorithmic pricing.

In a sense, consumers are involved in a *digital arms race* whereby algorithmic technologies are used as market devices, but also as consumer protection tools[324]. To make the race more balanced, the development of AI-based consumer empowering tools should be fostered by policymakers. This could be done, for instance, by encouraging cooperation between researchers,

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[317] MIKIANS, *Proceedings of the 11th ACM workshop on hot topics in networks*, 2012, pp. 79 ss.

[318] ACQUISTI, *Marketing Science*, vol. 24, num. 3, 2005, pp. 367 ss.

[319] CRANOR, «Can users control online behavioral advertising effectively?», *IEEE Security & Privacy,* vol. 10, num. 2, 2012, pp. 93 ss.; UR *et al.*, «Smart, useful, scary, creepy: Perceptions of online behavioral advertising», *Proceedings of the eighth symposium on usable privacy and security*, 2012, pp. 1 ss.

[320] EU REPORT, section 4.9.

[321] SOLTANI *et al.*, «Flash cookies and privacy», *2010 AAAI Spring Symposium Series*, 2010, pp. 158 ss.; MCDONALD/CRANOR, «Survey of the use of adobe flash local shared objects to respawn http cookies», *I/S: Journal of Law and Policy for the Information Society,* vol. 7, num. 3, 2012, pp. 639 ss.

[322] ID.

[323] OFT, «*Online Targeting of Advertising and Pricing*», 2010, retrieved from https://webarchive.nationalarchives.gov.uk/ukgwa/20140402142426/http://www.oft.gov.uk/shared_oft/business _leaflets/659703/OFT1231.pdf., p. 45.

[324] GROCHOWSKI, *Technology and Regulation,* 2022, pp. 36 ss.

practitioners, and administrations. In other words, a collaboration between the public and private sectors[325]. This will, however, not fully remedy the imbalance, in particular with a view to the superior financial and technological abilities of the private sector. Accordingly, further action is warranted[326].

Lastly, concerning self-regulation, the close link to the industry might lead to *regulatory capture*, which refers to the perception that regulatory agencies do not meet public interest goals because they are «*subverted by pressure, influence, and 'bribery' to protect the interests of those who were the subjects of the regulation.*»[327]. For this reason, the self-regulatory framework needs to be designed carefully whereby the incentives of the involved parties and the optimal allocation of risks are considered. It can, thus, be asserted that self-regulation cannot be a self-sufficient enforcement mechanism and that it should be combined with public regulation and enforcement. This gives rise to so-called *co-regulation*, which integrates various enforcement mechanisms for the sake of optimal compliance rates[328].

All in all, it can be argued that market-based solutions do provide consumers with some degree of protection, but they are not sufficient to remedy all potential consumer harms. It merits, therefore, further attention to see what regulatory actions can be undertaken to improve consumer protection in the face of algorithmic pricing.

5.7. Current state of affairs

The legal analysis of algorithmic pricing raises the question: Where does the current legal framework leave us?

Competition law is dependent on a broad interpretation of Article 102(c) TFEU to tackle algorithmic pricing. At the moment, relevant case law is missing and the ECJ still needs to provide guidance. If the scope of Article 102(c) TFEU would be extended to exploitative harms to final consumers, competition law could be a useful tool. In addition, if fairness considerations are also taken into account in the analysis, the case for effective intervention becomes stronger.

Consumer protection law has the great advantage that the element of market power, which is necessary for competition law, is irrelevant to interventions based on consumer policy. Consumer protection could, therefore, target all companies that employ algorithmic pricing. However, based on the UCPD, there is no *per se* prohibition on price discrimination and, thus, neither on algorithmic pricing. Algorithmic pricing could only be classified as unfair under the UCPD when there is (1) a lack of transparency regarding the communication of the price mechanism to consumers or (2) the pricing mechanism leads to an unfair commercial practice. As a consequence, there is uncertainty concerning the ability of consumer protection law to address the practice of algorithmic pricing to a sufficient degree.

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[325] ID

[326] ID.

[327] OGUS, *Regulation: Legal form and economic theory,* Bloomsbury Publishing, London, 2004, p. 57.

[328] WEBER, *Journal of European Consumer and Market Law*, vol. 3, num. 1, 2014, p. 16.

Data protection law is an important complement to consumer protection law. Data protection law emphasizes the roles of transparency, legitimacy, and accountability. It provides, therefore, a valuable framework that supports the aims of consumer protection law, in particular the UCPD. Yet, as long as firms can make a convincing case that the data is collected for legitimate purposes and consumers' consent can easily be obtained, algorithmic pricing can take place without hindrance. In this sense, data protection law does not provide the panacea for the concerns that algorithmic pricing evokes.

Human rights law can regulate cases that deal with overt forms of discrimination against individuals based on categories protected by law. Its relevance to algorithmic price discrimination, which in principle is based on the profiling of consumer characteristics that are not subject to a specific prohibition, is, however, severely limited[329].

The role of self-regulation is also expected to be limited. The advent of internet technologies does not solely provide opportunities to sellers, but also to consumers. Yet, the degree to which technological tools and market-based solutions can sufficiently assist consumers in protecting themselves against algorithmic pricing remains questionable.

Of note is that as part of the EU's new digital strategy A EUROPE FIT FOR THE DIGITAL AGE[330], new legislative developments have taken place that appear to be relevant to the current state of affairs concerning algorithmic pricing. Two prominent regulations are the DIGITAL SERVICES ACT (DSA)[331] and the DIGITAL MARKETS ACT (DMA)[332], which together are also called the *Digital Services Package*. The goal of the DSA and DMA is to create a safer digital space, in which the fundamental rights of users are protected and a level playing field for businesses is established. The DSA focuses primarily on online intermediaries and platforms, thereby updating the E-COMMERCE DIRECTIVE[333], and the DMA governs *gatekeeper* online platforms, which refer to the digital platforms that fulfill a systemic role in the internal market as intermediaries for important digital services.

In the context of algorithmic pricing, the DSA is relevant because it imposes further transparency requirements on providers of online platforms that use recommender systems. Pursuant to Article 27 DSA, there is an obligation on these platforms to present in their terms and conditions, in plain and intelligible language, the main parameters that have been used in the recommender systems, together with any options for the recipients of the service to modify or influence those main parameters. Accordingly, consumers are provided with more information about the algorithmic mechanism behind the recommender system, and it allows them to select and modify their preferred option at any time. Nonetheless, the fact that this information is placed in the

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[329] XENIDIS, *General Principles of EU law and the EU Digital Order,* 2020, p. 170.

[330] ALBERTI *et al.*, «A Europe fit for the digital age — Tracking Europeans' Interest in EC Priorities Using Online Search Data», *Publications Office of the European Union*, Luxembourg, 2022, pp. 1 ss.

[331] Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market For Digital Services and amending Directive 2000/31/EC (Digital Services Act).

[332] Regulation (EU) 2022/1925 of the European Parliament and of the Council of 14 September 2022 on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828 (Digital Markets Act).

[333] Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market ('Directive on electronic commerce').

general terms and conditions makes it dubious to what extent consumers will be effectively aided in their decision-making process and the protection of their welfare. In particular, with the existing challenges of general mandated disclosures in mind[334].

Furthermore, two provisions of the DMA are worth mentioning. First, Article 15 DMA imposes the obligation on a gatekeeper to submit an audit to the European Commission concerning any techniques that are used for consumer profiling, which needs to be updated at least once a year. In this way, more transparency regarding profiling practices can be achieved. Second, Article 6, paragraphs 5, 11, and 12, of the DMA emphasizes algorithmic accountability by requiring the gatekeeper to apply transparent, fair, and non-discriminatory conditions to its activities. It could be argued that this targets algorithmic pricing as well, however, the provisions seem to be aimed at avoiding *self-preferencing* by gatekeepers on their core platform services, through ranking, and related indexing and crawling[335].

Besides, algorithmic pricing can also be undertaken by non-gatekeepers, which makes the scope of application of the DMA limited. Nevertheless, the DMA can inhibit the circumvention of the legal obligations of gatekeepers (Article 13) and work in a complementary manner to the UCPD, whereby UCPD provisions are applied concurrently by covering the types of platforms or practices that are not regulated by the DMA[336].

Finally, the ARTIFICIAL INTELLIGENCE ACT (AI ACT)[337] seems to be a promising legislative proposal to address algorithmic practices. However, following Article 6 in combination with Annex 3 of the AI Act, algorithmic pricing cannot be classified as a high-risk AI system and will most likely fall into the categories of limited or minimal risk[338]. This means that in accordance with paragraph 2.3 of the AI Act regarding proportionality: «*For other, non-high-risk AI systems, only very limited transparency obligations are imposed, for example in terms of the provision of information to flag the use of an AI system when interacting with humans*.»

In other words, algorithmic pricing will only be subject to the transparency obligations of Article 52. It is then questionable to what extent these general transparency requirements will improve consumer protection. Providing consumers with general information will likely be insufficient to protect consumers against algorithmic pricing practices[339].

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[334] See for an extensive analysis on the failure of mandated disclosure BEN-SHAHAR/SCHNEIDER, *More Than You Wanted to Know*, Princeton University Press, Princeton, 2014.

[335] BOUGETTE, «Self-Preferencing and Competitive Damages: A Focus on Exploitative Abuses», *The Antitrust Bulletin,* vol. 67, num. 2, 2022, pp. 190 ss.; PEITZ, «The Prohibition of Self-Preferencing in the DMA», CERRE Issue Paper, 2022, pp. 6-13.

[336] EUROPEAN COMMISSION, «Behavioural study on unfair commercial practices in the digital environment: Dark patterns and manipulative personalization», Final report, 2022, p. 83.

[337] Proposal for a Regulation laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain Union legislative acts.

[338] LI, «Affinity-based algorithmic pricing: A dilemma for EU data protection law», *Computer Law & Security Review,* vol. 46, 2022, p. 16.

[339] ID.

It is noteworthy, however, that Article 5(1)(b) of the AI Act prohibits specific artificial intelligence practices, which could arguably in some cases include algorithmic pricing, namely:

«*(b) the placing on the market, putting into service or use of an AI system that exploits any of the vulnerabilities of a specific group of persons due to their age, physical or mental disability, in order to materially distort the behaviour of a person pertaining to that group in a manner that causes or is likely to cause that person or another person physical or psychological harm;*».

The implementation of the proposed AI Act would mean that exploitative pricing techniques that target consumer vulnerabilities would be prohibited, and that effective enforcement could be undertaken against companies that employ these techniques. However, it must be emphasized that these provisions deal with physical and psychological harm and not consumer harm in terms of loss of consumer welfare[340]. Hence, although the AI Act does provide a useful starting point to combat the exploitation of consumers through AI-based technologies, it will most likely be an insufficient tool for safeguarding consumers' economic interests.

Based on the current state of affairs, it can be concluded that there is no one-size-fits-all solution with regard to the regulation of algorithmic pricing. An eclectic approach is needed whereby a combination of competition law, consumer law, data protection law, and anti-discrimination law can provide a relevant framework for regulation. To specify, the practice of algorithmic pricing is partially covered by a patchwork of different directives. Dependent on which part of algorithmic pricing needs to be addressed, different laws might be applicable. For instance, algorithmic price discrimination that is undertaken by a firm with a dominant market position or that is leading to collusion might be best remedied by competition law, whereas in cases of discrimination based on protected group characteristics anti-discrimination law might be best suited. Similarly, the data collection and processing part of algorithmic pricing can be tackled by virtue of data protection law, whereas the unfair commercial character of the practice can be addressed by consumer protection law. Accordingly, an eclectic regulatory approach is needed that amalgamates the different fields of law to assess algorithmic pricing practices on a case-by-case basis.

To ensure that the eclectic approach works effectively, cooperation between enforcement authorities is indispensable. Since different legal rules apply to algorithmic pricing, cooperation is necessary to find common aspects, organize an effective intervention, and implement consistent decisions[341]. This does not automatically imply the integration of the enforcement agencies, but rather a closer institutional cooperation whereby problems that transcend the competencies of one specific agency are jointly tackled while the benefits of differentiation between the agencies and the legal instruments are maintained. This equally applies to the cooperation between the national and European authorities[342].

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[340] JABŁONOWSKA, «Consumer Protection in the Age of Data-Driven Behaviour Modification», *Journal of European Consumer and Market Law*, vol. 11, num. 2, 2022, p. 71.

[341] DE STREEL/JACQUES, «Personalised pricing and EU law», *30th European Conference of the International Telecommunications Society (ITS): "Towards a Connected and Automated Society", Helsinki, Finland, 16th-19th June 2019, International Telecommunications Society (ITS), Calgary*, pp. 1 ss.

[342] ID.

Notwithstanding the improvements that can be made with respect to enforcement, it remains the case, however, that the current legal framework is providing only a partially functional approach to address algorithmic pricing. Additional appropriate remedies are, therefore, needed to protect consumers adequately and effectively against exploitation that reduces their welfare.

6. Conclusion and policy recommendation

The advent of Big Data technologies has enabled the development of personalized marketing strategies. The rise of algorithms has spurred the growth of these strategies to such an extent that various stakeholders, among which consumer organizations, scholars, and policymakers, are voicing their concerns. In particular, algorithmic pricing is regarded as a practice that could have significant effects on consumer welfare. The theoretical case of perfect price discrimination can become a reality due to the development of algorithmic techniques, which by virtue of machine learning can generate detailed consumer profiles and offer prices that approximate consumers' reservation prices with ever-improving accuracy. The conditions for successful price discrimination can be readily fulfilled under algorithmic pricing. In combination with other marketing techniques, such as personalized offers and targeted advertising, algorithmic pricing is expected to work even more effectively.

The economic analysis of algorithmic pricing demonstrated that from an efficiency perspective, under competitive market conditions, the practice will most likely lead to efficiency benefits. From an equity perspective, however, algorithmic pricing will most likely cause negative equity effects and it will be detrimental to consumer welfare.

Moreover, several ethical concerns can be raised such as risks of discrimination, social sorting, pricing unfairness, unequal distributions of power, and privacy intrusion. Accordingly, there is an equity-efficiency trade-off that pervades algorithmic pricing. The need for legal intervention depends, therefore, on the relative weights that are given to the concepts of efficiency and justice in the social welfare function. In the best-case scenario, algorithmic pricing will increase overall welfare, whereby the effect on consumer welfare will be ambiguous. In the worst-case scenario, algorithmic pricing will have ambiguous effects on total welfare, but consumer welfare will suffer substantially. In practice, the effects will most probably oscillate between these two scenarios depending on the market circumstances and consumer feedback. However, this remains to be seen.

Nonetheless, due to the various equity and ethical concerns that accompany algorithmic pricing as a practice, a cogent argument can be made that the regulatory avenue should at least be explored. Consequently, the current legal framework has been analyzed to see if a functional approach to algorithmic pricing is already in place or if alternative appropriate remedies are needed. In contract law, a weak foundation for intervention has been found that is contingent on the efficacy of applying the price unconscionability doctrine to algorithmic pricing. Competition law, on the other hand, has great potential to tackle algorithmic pricing because of the threats that the practice poses to competition and consumer welfare, which fall within the ambit of competition policy. Nevertheless, for successful enforcement under Article 102 TFEU, the consumer welfare standard in competition law needs to be publicly endorsed and broadened to include fairness considerations, which is currently not the case. In addition, the focus on intermediary customers rather than final customers and the requirement of market power both

lessen the vigor of competition enforcement. For these reasons, consumer protection law aided by data protection law seems to be the most promising approach.

Under the UCPD, algorithmic pricing could be tackled based on a lack of transparency and by proving the misleading or aggressive character of the practice. There is, however, no *per se* prohibition of algorithmic pricing, thus, a substantive case needs to be made that it amounts to an unfair commercial practice. Data protection law can lead to synergy benefits with consumer protection law by reinforcing the call for transparency and regulating the lawful collection and processing of personal data. It is debatable, however, to what extent consumer protection and data protection law can provide a sufficient basis to tackle algorithmic pricing when firms can demonstrate that explicit consent has been obtained, and there is no clear case of an unfair commercial practice. A scenario that does not seem to be too farfetched with a view to the gaps in the current legal framework.

Human rights law, in particular anti-discrimination law, is limited in its competence to deal with algorithmic pricing, and from a market-based perspective, it can be argued that although technological tools and self-regulatory practices can provide consumers with some degree of protection, they will not be sufficiently effective in remedying the potential harms of algorithmic pricing.

In sum, the current legal framework can only provide a partially functional approach to address algorithmic pricing. It can be stated that additional appropriate remedies are needed to protect consumers adequately and effectively against exploitation that reduces their welfare. The road to the regulation of algorithmic pricing should, therefore, be further explored. A full-fledged regulatory analysis falls outside the scope of this article. However, several ideas can nevertheless be put forward that merit further exploration in future research. In this article, a preliminary policy recommendation will be presented that aims to effectively address the challenges posed by algorithmic pricing.

The law and economics analysis has shown that a complete ban on the practice is not desirable. Hence, one must then consider less intrusive, yet effective remedies. It is thereby essential to distinguish the various actors involved and determine to what extent regulation would influence these groups. The first group consists of consumers that will most likely benefit from algorithmic pricing (i.e., the sophisticated consumers). For this group, a complete ban or highly intrusive regulation would lead to adverse effects. For the second group, the average consumer, the welfare effects are expected to be ambiguous, dependent on the market structure. Therefore, the appropriate remedies should not be too restricting, but they should provide warranties to the average consumer that her welfare is not exploited. For the third group, the vulnerable consumer, which could potentially be every individual that is susceptible to exploitation in a specific online situation[343], adequate protection is needed that supersedes the limited categories of vulnerable consumers as they are stated in the current EU consumer acquis[344]. In other words, protection that is available to every consumer that is particularly vulnerable in a specific situation (i.e., *situational vulnerability*).

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[343] HELBERGER, *Journal of Consumer Policy,* vol. 45, num. 2, 2022, pp. 175 ss.

[344] See, for example, the definition of vulnerable consumers in recital 18 and Article 5(3) UCPD.

Based on these considerations, this paper argues that more effective consumer protection against algorithmic pricing can be achieved by virtue of the following threefold policy approach. First of all, the advent of Big Data has brought about new technologies that could prove to be much more effective in satisfying the personal preferences and informational needs of consumers than general disclosures. Information technology provides the possibility to design disclosures that account for consumer heterogeneity. This gives rise to the concept of *personalized disclosure*, which means disclosure that is tailored to the individual[345]. Algorithmic pricing is enabled by the collection of vast amounts of personal and behavioral data about consumers. This data could also be used for an alternative purpose, namely informing consumers. If algorithms are developed that can target consumers individually, they can also be developed to protect consumers individually. This effectively amounts to personalized disclosure empowered by data-driven algorithms.

An economically inefficient manner of implementing personalized disclosure would be to require the government to collect all relevant information and provide consumers individually with the required information. This would lead to wasteful duplication of efforts. The value of the mechanism lies in creating an additional purpose for data that has already been collected. In other words, utilizing the efforts already undertaken by companies for the sake of informing consumers. The regulator would then only require companies to disclose the metrics that are used for personalization and decide what is authorized. This categorization is mainly a normative question that can be left to the political debate. In this way, the regulator does not need to assess or determine all individual metric scores, which will be delegated to the companies, but the regulator will know what categories have been used and if they comply with the existing legal framework[346].

Under the current consumer protection laws, traders have the obligation to disclose a variety of information to consumers. To illustrate, concerning personalized pricing, traders must inform consumers about the fact that the offered price has been personalized based on automated decision-making[347]. Effectively this amounts to a notification that the price has been personalized similar to an ad notification alongside an advertisement. In essence, with such a notification the trader complies with its duty to inform the consumers, however, the disclosure is far from generating an improved understanding of the price. More specifically, it remains a mystery to the consumer based on what information the price has been personalized, to what extent it is fully individualized or derived from group characteristics, and how much the price differs from the uniform price. Simply put, the disclosure does not add valuable information to the decision-making process of the consumer. The striking part is that the seller employing the personalized pricing mechanism possesses this information but does not disclose it. Under personalized disclosure, these key pieces of information would be disclosed to the consumer[348].

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[345] PORAT/STRAHILEVITZ, «Personalizing default rules and disclosure with big data», *Michigan Law Review,* vol. 112, num. 8, 2014, pp. 1417 ss.

[346] For an elaborate discussion of the mechanics behind this system see HACKER, «Personalizing EU private law: From disclosures to nudges and mandates», *European review of private law*, vol. 25, num. 3, 2017, pp. 651 ss.

[347] Article 6(1)(ea) CRD, added by the MODERNISATION DIRECTIVE; COMMISSION NOTICE UCPD.

[348] See, for example, the work on personalized law by BEN-SHAHAR/PORAT, *Personalized law: Different rules for different people*, Oxford University Press, Oxford, 2021; PORAT, *Michigan Law Review,* vol. 112, num. 8, 2014, pp. 1417 ss.

Consequently, the question arises: How would personalize disclosure look in practice? Under personalized price disclosures, consumers would, *inter alia*, see a brief and clear calculation of the price, the difference with the uniform price, and based on what personal information the price has been formed. In this way, the consumer receives information that can effectively assist the decision-making process. Two potential manners in which disclosure could be personalized are through a pre-selection mechanism or the utilization of *use-pattern information*[349]. Under the first mechanism, a consumer could pre-tick the boxes (e.g., through an online consumer tool) that are to her specific interest. This would mean that, for instance, the attention of privacy-conscious consumers (inferred from their choices) will be drawn to the privacy-sensitive parts of the personalized service, which will be displayed in a conspicuous and simplified manner. Under the second mechanism, information about consumers' behavior in the past is used to help consumers become aware of the aspects that are most important to them, as reflected by their actions[350]. Although the technological mechanisms underlying personalized disclosure can vary, the outcome is that consumers will get the information that can effectively assist them in their decision-making process.

A counterargument could be made that personalized disclosure will lead to prohibitively high *administration costs of differentiation*. That is to say, the costs of providing each consumer with individualized information will be higher than the potential benefits. However, this argument can be relativized on two points. First, the (economic) feasibility of personalized disclosure has greatly improved with the rise of Big Data, and the associated costs of personalization technology are expected to go down[351]. Second, the degree of granularity of the personalized disclosure can be determined based on the costs. If it turns out that personalized disclosure is relatively costly, crude forms of personalization can take place. For instance, the categorization of consumers into sophisticated, average, and vulnerable consumers. If the costs go down over time, personalization can be further developed in order to make the disclosure more tailored to the individual. Accordingly, the administration costs of differentiation do not necessarily have to be an unsurmountable obstacle for personalized disclosure.

An extension of personalized disclosure could be the use of *personalized price caps*[352]. This means that based on the information that has been collected about an individual consumer, a maximum price will be set which the personalized price of the seller may not exceed. However, three obstacles need to be overcome before such a policy can be implemented. First, personalized price caps strongly interfere with a company's freedom to set prices, which from an economic perspective is problematic. Such a decision to override the interests of the companies would need to be firmly substantiated. Second, it is unclear to what extent personalized price caps will have adverse effects by incentivizing sellers to match the cap instead of following the previously calculated personalized price, which could potentially be lower. Third, future research is vital to determine to what extent such an innovation is feasible.

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[349] BAR-GILL/FERRARI, «Informing consumers about themselves», *Erasmus Law Review,* vol. 3, num. 2, 2010, pp. 93 ss.

[350] HACKER, *European review of private law*, vol. 25, num. 3, 2017, pp. 651 ss.

[351] ID.

[352] BAR-GILL, «Price caps in multiprice markets», *The Journal of Legal Studies*, num. 44, vol. 2, 2015, pp. 453 ss.

In sum, the development of personalized disclosure seems to be a promising regulatory avenue. The regulatory avenue, however, does not end at disclosure. It would be beneficial to consumers if they would be given a genuine possibility to protect themselves against unwanted personalization. This is where the second prong of the policy recommendation comes into play. It is conceivable that after experiencing the world of personalization a consumer wants to opt out and go back to a state of *anonymity*. That is to say, receiving non-personalized offers in a non-personalized setting. Accordingly, the consumer should be granted a choice to become anonymous and withdraw from algorithmic pricing[353]. This effectively means instituting an *opt-out regime* that is aimed at giving consumers the possibility to take back control, at the lowest possible cost. In layman's terms, giving consumers a genuine possibility to *shut it off*.

Pursuant to Articles 21(2) and 22(1) GPDR, it can be argued that consumers have a right to object to algorithmic pricing purposes. In this sense, there already exists an opt-out regime. In practice, however, it has been made excessively difficult to opt out, thereby effectively undermining the opt-out regime as envisioned by the GDPR[354]. Opting out currently requires high levels of technical sophistication, the incurring of significant transaction costs, and the overcoming of various decision biases[355]. Accordingly, to make the opting-out regime effective, it is of pivotal importance to render the opt-out option readily available at any display of a personalized price. It should be made maximally conspicuous to the consumer how to withdraw from the practice. Simply put, opting out should be made as easy as liking or sharing a message on social media. Only then would the opt-out regime significantly reduce the costs of self-help and transform itself into a functional instrument for consumer protection[356].

A valuable benefit of this approach is that it prevents far-reaching paternalism. If consumers enjoy receiving personalized prices then consumers should not be protected against their will. If personalization is effectively serving consumers and they are reaping the benefits without regret, as advocated by some scholars[357], there should be no need to take away these welfare-enhancing tools. However, if consumers feel that they are harmed by the personalized prices, then it should

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[353] Cfr. GAL, «Algorithmic challenges to autonomous choice», *Michigan Technology Law Review,* vol. 25, num. 1, 2018, pp. 59 ss.

[354] See, for example, LEON *et al.*, «Why Johnny can't opt out: A usability evaluation of tools to limit online behavioral advertising», *Proceedings of the SIGCHI conference on human factors in computing systems*, 2012, pp. 1 ss.; HABIB *et al.*, «An empirical analysis of data deletion and opt-out choices on 150 websites», *Proceedings of the 15th Symposium on Usable Privacy and Security (SOUPS 2019)*, 2019, pp. 387 ss.; KUNTSMAN *et al.*, «Re-thinking Digital Health: Data, Appisation and the (im)possibility of 'Opting out'», *Digital Health*, vol. 5, 2019, pp. 1 ss.; HABIB *et al.*, «"It's a scavenger hunt": Usability of Websites' Opt-Out and Data Deletion Choices», *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 2020, pp. 1 ss.

[355] ID.; WILLIS, «When Nudges Fail: Slippery Defaults», *University of Chicago Law Review,* vol. 80, num. 3, 2013, pp. 1155 ss.

[356] WAGNER, *University of Chicago Law Review*, vol. 86, num. 2, 2019, p. 591.

[357] See, for example, SATISH/YUSOF «A Review: Big Data Analytics for enhanced Customer Experiences with Crowd Sourcing», *Procedia Computer Science*, vol. 116, 2017, pp. 274 ss.; DAWN, «Personalised Marketing: Concepts and framework», *Productivity*, vol. 54, num. 4, 2014, pp. 370 ss.; DANTAS/CARRILLAT, «The relational benefits of personalized communications in an online environment», *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, vol. 30, num. 3, 2013, pp. 189 ss.; KWON/KIM, «How to design personalization in a context of customer retention: Who personalizes what and to what extent?», *Electronic Commerce Research and Applications*, vol. 11, num. 2, 2012, pp. 101 ss.; CONSTANTINIDES, «The marketing mix revisited: Towards the 21st century marketing», *Journal of marketing management*, vol. 22, num. 3-4, 2006, pp. 407 ss.

be made as easy and clear as possible to withdraw. In this way, the opt-out mechanism functions as an effective counterbalance to algorithmic pricing.

Of note is that this opt-out mechanism does not detract from the use of privacy-preserving defaults. It could be argued that the default should be opt-in for the sake of privacy protection. Nonetheless, deciding if the default should be opt-in or opt-out remains a highly normative question as to what weights should be given to efficiency or privacy considerations. In case there is a consensus that algorithmic pricing leads to excessive privacy intrusions that should be remedied, the default could be set on non-personalization. In contrast, if the benefits of personalization seem to be economically desirable, the default could remain to be personalization. This requires a debate on a broader societal level[358]. The opt-out mechanism, however, works either way. In case the default is non-personalized prices, and the consumer decides to opt in then the opt-out should still always and readily be available. If the default is personalization, the opt-out mechanism will work likewise. In short, it is a tool that safeguards consumers' autonomy and choice, regardless of the initial default.

Finally, the thorough use of the opt-out mechanism provides the legislators and sellers indirectly with valuable information, thereby creating an automatic feedback loop. To specify, if the proponents of algorithmic pricing are correct and personalization mainly leads to the better serving of consumer interests, the opt-out mechanism will be scarcely used. This would mean that consumers with a high WTP will not be deterred by the personalized price and consumers with a low WTP will benefit from the personalized price, which results in a low opt-out rate. If the opposite is true and most consumers opt out, it will signal to the legislators that the practice is mainly beneficial to the sellers rather than the consumers. Simultaneously, consumer behavior will force sellers to react. If consumers are massively opting out of algorithmic pricing services, sellers will understand that the pricing practices will not be profitable and that they will have to scale back on personalization. In this way, further regulatory interventions such as prohibitions will be pre-empted.

The third and last prong of the policy proposal concerns enforcement. Certain cases of consumer exploitation through algorithmic pricing will inevitably take place despite the improved disclosure and the opt-out possibility. In such cases, ex-post enforcement is of utmost importance. As with many consumer problems, it is not only a question of regulation but also enforcement. To increase the potency of consumer protection enforcement, an eclectic approach based on various legal regimes is advocated whereby broad cooperation between different enforcement authorities, which can complement each other in addressing algorithmic pricing, is fostered.

Regulating algorithmic pricing is a complex balancing act. The merit of the presented policy approach is that an outright ban on algorithmic pricing can be circumvented without maintaining the status quo which is detrimental to consumers. Consequently, the danger to consumer welfare can be curtailed without losing the benefits that algorithmic pricing can offer.

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[358] TENE/POLONETSKY, «Big data for all: Privacy and user control in the age of analytics», *Northwestern Journal of Technology and Intellectual Property,* vol. 11, num. 5, 2013, pp. 239 ss.

7. Bibliography

2001/892/EC: Commission Decision of 25 July 2001 relating to a proceeding under Article 82 of the EC Treaty (COMP/C-1/36.915 — Deutsche Post AG — Interception of cross-border mail).

ACM, *Leidraad Bescherming Online Consument*, 2020, retrieved from https://www.acm.nl/sites/default/files/documents/2020-02/acm-leidraad-bescherming-online-consument.pdf

ACQUISTI, Alessandro *et al.,* «The economics of privacy», *Journal of Economic Literature,* vol. 54, num. 2, 2016, pp. 442 ss.

ACQUISTI, Alessandro/VARIAN, Hal R, «Conditioning prices on purchase history», *Marketing Science*, vol. 24, num. 3, 2005, pp. 367 ss.

ADAVAL, Rashmi/WYER Jr, Robert S, «Conscious and nonconscious comparisons with price anchors: Effects on willingness to pay for related and unrelated products», *Journal of Marketing Research,* vol. 48, num. 2, 2011, pp. 355 ss.

AGHION Philippe *et al.,* «Artificial intelligence and economic growth», in AGRAWAL, Ajay *et al.* (eds.), *The economics of artificial intelligence: An agenda*, University of Chicago Press, Chicago, 2019, pp. 237 ss.

AKMAN, Pinar, «Exploitative Abuse in Article 82EC: Back to Basics?», *Cambridge Yearbook of European Legal Studies*, vol. 11, num. 1, 2009, pp. 1 ss.

ALBÆK, Svend, «Consumer welfare in EU competition policy», *Aims and values in competition law*, 2013, pp. 67 ss.

ALBERTI, Valentina *et al.*, «A Europe fit for the digital age — Tracking Europeans' Interest in EC Priorities Using Online Search Data», *Publications Office of the European Union*, Luxembourg, 2022, pp. 1 ss.

ARMSTRONG, Mark, «Recent Developments in the Economics of Price Discrimination», in BLUNDELL*,* Richard *et al.* (eds.), *Advances in Economics and Econometrics: Theory and Applications: Ninth World Congress,* vol. 2, Cambridge University Press, Cambridge, 2006, pp. 97 ss.

ARMSTRONG, Mark/VICKERS, John, «Competitive price discrimination»*, The RAND Journal of Economics*, vol. 32, num. 4, 2001, pp. 579 ss.

ASSAD, Stephanie *et al.,* «Algorithmic pricing and competition: Empirical evidence from the German retail gasoline market», *CESifo Working Paper, No. 8521, Center for Economic Studies and Ifo Institute (CESifo),* 2020, pp. 1 ss.

BAKER, Walter *et al.,* «Price smarter on the net», *Harvard business review,* vol. 79, num. 2, 2001, pp. 122 ss.

BAR-GILL, Oren, «Algorithmic Price Discrimination: When Demand Is a Function of Both Preferences and (Mis)perceptions», *University of Chicago Law Review,* vol. 86, num. 2, 2018, pp. 1 ss.

BAR-GILL, Oren, «Price caps in multiprice markets», *The Journal of Legal Studies*, num. 44, vol. 2, 2015, pp. 453 ss.

BAR-GILL, Oren, *Seduction by Contract: Law, Economics and Psychology in Consumer Markets*, Oxford University Press, Oxford, 2012.

BAR-GILL, Oren/FERRARI, Franco, «Informing consumers about themselves», *Erasmus Law Review,* vol. 3, num. 2, 2010, pp. 93 ss.

BECKERT, Walter *et al.,* «Competitive price discrimination in a spatially differentiated intermediate goods market», *International Journal of Industrial Organization*, vol. 25, num. 5, 2015, pp. 884 ss.

BEN-SHAHAR, Omri/PORAT, Ariel, *Personalized Law: Different Rules for Different People,* Oxford University Press, Oxford, 2021.

BEN-SHAHAR, Omri/SCHNEIDER, Carl E, *More Than You Wanted to Know,* Princeton University Press, Princeton, 2014.

BOCK, Christoph, «Preserve personal freedom in networked societies», *Nature,* vol. 537, num. 7618, 2016, p. 9.

BORDEN, Neil H, «The concept of the marketing mix», *Journal of advertising research,* vol. 4, num. 2, 1964, pp. 2 ss.

BOUGETTE, Patrice, «Self-Preferencing and Competitive Damages: A Focus on Exploitative Abuses», *The Antitrust Bulletin,* vol. 67, num. 2, 2022, pp. 190 ss.

BUJLOW, Tomasz *et al.,* «Web tracking: Mechanisms, implications, and defenses», *arXiv preprint, arXiv:1507.07872,* 2015, pp. 1 ss.

CALABRESI, Guido, «An exchange about law and economics, letter to Dworkin», *Journal of Legal Studies,* vol. 9, num. 2, 1980, pp. 553 ss.

CALVANO, Emilio *et al.,* «Artificial intelligence, algorithmic pricing, and collusion», *American Economic Review*, vol. 110, num. 10, 2020, pp. 3267 ss.

CALVANO, Emilio *et al.,* «Protecting consumers from collusive prices due to AI», *Science,* vol. 370, num. 6520, 2020, pp. 1040 ss.

Case C-484/08 Caja de Ahorros y Monte de Piedad de Madrid v Asociación de Usuarios de Servicios Bancarios (Ausbanc).

CHAPDELAINE, Pascale, «Algorithmic Personalized Pricing»*, New York University Journal of Law and Business,* vol. 17, num. 1, 2020, pp. 1 ss.

CHEN, Ming/CHEN, Zhi-Long, «Recent developments in dynamic pricing research: Multiple products, competition, and limited demand information», *Production and Operations Management,* vol. 24, num. 5, 2015, pp. 704 ss.

CHEN, Le *et al.,* «An empirical analysis of algorithmic pricing on amazon marketplace»*, Proceedings of the 25th international conference on World Wide Web*, 2016, pp. 1339 ss.

CHEN, Ningyuan/GALLEGO, Guillermo, «Welfare analysis of dynamic pricing», *Management Science,* vol. 65, num. 1, 2019, pp. 139 ss.

CHEN, Zhijun *et al.,* «Competitive Personalized Pricing», *The Institute of Social and Economic Research, Osaka University, Discussion Paper No. 1023*, 2018, pp. 1 ss.

CHOE, Pilsung/WU, Jing, «Customer perceptions toward dynamic pricing for wireless data service», *International Journal of Mobile Communications,* vol. 13, num. 2, 2015, pp. 172 ss.

CHRISTL, Wolfie *et al.,* «Corporate surveillance in everyday life», *Cracked Labs,* vol. 6, num. 1, 2017, pp. 1 ss.

CLIFFORD, Stephanie, «Shopper Alert: Price May Drop for You Alone», *The New York Times*, 2012, retrieved from https://www.nytimes.com/2012/08/10/business/supermarkets-try-customizing-prices-for-shoppers.html.

COCKBURN, Iain M *et al.,* «The impact of artificial intelligence on innovation», in AGRAWAL, Ajay *et al.* (eds.), *The economics of artificial intelligence: An agenda*, University of Chicago Press, Chicago, 2019, pp. 115 ss.

COMMISSION NOTICE – Guidance on the interpretation and application of Directive 2005/29/EC of the European Parliament and of the Council concerning unfair business-to-consumer commercial practices in the internal market, 2016, retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52016SC0163.

Communication from the Commission to the European Parliament and the Council: New Consumer Agenda Strengthening Consumer Resilience for Sustainable Recovery. COM/2020/696 final.

CONITZER, Vincent *et al.,* «Hide and seek: Costly consumer privacy in a market with repeat purchases», *Marketing Science,* vol. 31, num. 2, 2012, pp. 277 ss.

CONSTANTINIDES, Efthymios, «The marketing mix revisited: Towards the 21st century marketing», *Journal of marketing management*, vol. 22, num. 3-4, 2006, pp. 407 ss.

Consumer market study on online market segmentation through personalized pricing/offers in the European Union Request for Specific Services 2016 85 02 for the implementation of Framework Contract EAHC/2013/CP/04, Final report.

CONSUMERS INTERNATIONAL, «A Consumer Investigation into Personalised Pricing», 2022, retrieved from https://www.consumersinternational.org/news-resources/news/releases/new-research-consumers-worldwide-concerned-by-opaque-online-pricing/.

COOTER, Robert/ULEN, Thomas, *Law and Economics,* 6th edn, Pearson, Boston, 2016.

Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts.

COUNCIL OF ECONOMIC ADVISERS, «Big Data and Differential Pricing», *The White House*, 2015, retrieved from https://obamawhitehouse.archives.gov/sites/default/files/whitehouse_files/docs/Big_Data_Report_Nonembargo_v2.pdf

CRANOR, Lorrie F, «Can users control online behavioral advertising effectively?», *IEEE Security & Privacy,* vol. 10, num. 2, 2012, pp. 93 ss.

DANTAS, Danilo C/CARRILLAT, François, «The relational benefits of personalized communications in an online environment», *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, vol. 30, num. 3, 2013, pp. 189 ss.

DARR, Frank P, «Unconscionability and price fairness», *Houston Law Review,* vol. 30, num. 5, 1994, pp. 1819 ss.

DAVENPORT, Thomas *et al.,* «How artificial intelligence will change the future of marketing», *Journal of the Academy of Marketing Science*, vol. 48, num. 1, 2020, pp. 24 ss.

DAWN, Suman K, «Personalised Marketing: Concepts and framework», *Productivity*, vol. 54, num. 4, 2014, pp. 370 ss.

DE GEEST, Gerrit, *Rents: How Marketing Causes Inequality,* Beccaria Books, 2018.

DE GEEST, Gerrit, «Signing without reading», in MARCIANO, Alain/RAMELLO, Giovanni B (eds.), *Encyclopedia of Law and Economics: Basic areas of law,* 1st edn, Springer, 2015.

Délibération de la formation restreinte n° SAN – 2019-001 du 21 janvier 2019 prononçant une sanction pécuniaire à l'encontre de la société GOOGLE LLC.

DELLAVIGNA, Stefano/MALMENDIER, Ulrike, «Paying not to go to the gym», *American Economic Review,* vol. 96, num. 3, 2006, pp. 694 ss.

DE STREEL, Alexandre/JACQUES, Florian, «Personalised pricing and EU law», *30th European Conference of the International Telecommunications Society (ITS): "Towards a Connected and Automated Society", Helsinki, Finland, 16th-19th June 2019, International Telecommunications Society (ITS), Calgary*, pp. 1 ss.

DETHMERS, Frances/BLONDEEL, Jonathan, «EU enforcement policy on abuse of dominance: Some statistics and facts», *European Competition Law Review,* vol. 38, num. 4, 2017, pp. 147 ss.

DEWAN, Rajiv *et al.,* «Product customization and price competition on the internet», *Management Science*, vol. 49, num. 8, 2003, pp. 1055 ss.

Directive (EU) 2019/2161 of the European Parliament and of the Council of 27 November 2019 amending Council Directive 93/13/EEC and Directives 98/6/EC, 2005/29/EC and 2011/83/EU of the European Parliament and of the Council as regards the better enforcement and modernisation of Union consumer protection rules.

Directive 2006/123/EC of the European Parliament and of the Council of 12 December 2006 on services in the internal market.

Directive 84/450/EEC, Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council ('Unfair Commercial Practices Directive').

Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market ('Directive on electronic commerce').

EDWARDS, Matthew A, «Price and prejudice: The case against consumer equality in the information age», *Lewis & Clark Law Review,* vol. 10, num. 3, 2006, pp. 559 ss.

EIDENMÜLLER, Horst, «Justifying fair price rules in Contract Law», *European Review of Contract Law,* vol. 11, num. 3, 2015, pp. 220 ss.

ELLISON, Glenn/ELLISON, Sara F, «Search, obfuscation, and price elasticities on the internet», *Econometrica,* vol. 77, num. 2, 2009, pp. 427 ss.

European Commission, «*Behavioural study on unfair commercial practices in the digital environment: Dark patterns and manipulative personalization*», Final report, 2022.

European Parliament legislative resolution of 26 February 2014 on the proposal for a regulation of the European Parliament and of the Council on a Common European Sales Law (COM[2011]0635 – C7-0329/2011 – 2011/0284[COD]) (Ordinary legislative procedure: first reading), Amendments 153 and 155.

EZRACHI, Ariel, «Sponge», *Journal of Antitrust Enforcement,* vol. 5, num. 1, 2017, pp. 49 ss.

EZRACHI, Ariel/STUCKE Maurice, «The Rise of Behavioural Discrimination», *European Competition Law Review,* vol. 37, num. 2, 2016, 485-492.

FARUQUI, Ahmad/PALMER, Jennifer, «Dynamic pricing and its discontents», *Regulation,* vol. 34, num. 3, 2011, pp. 16 ss.

FARUQUI, Ahmad/SERGICI, Sanem, «Household response to dynamic pricing of electricity: A survey of 15 experiments», *Journal of Regulatory Economics,* vol. 38, num. 2, 2010, pp. 193 ss.

FEHR, Ernst/SCHMIDT, Klaus M, «A theory of fairness, competition, and cooperation», *The Quarterly Journal of Economics*, vol. 114, num. 3, 1999, pp. 817 ss.

FOXALL, Gordon, «A descriptive theory of pricing for marketing», *European Journal of Marketing,* vol. 6, num. 3, 1972, pp. 190 ss.

FUDENBERG, Drew/TIROLE Jean, «Customer Poaching and Brand Switching», *Rand Journal of Economics,* vol. 31, num. 4, 2000, pp. 634 ss.

GABAIX, Xavier/LAIBSON, David, «Shrouded attributes, consumer myopia, and information suppression in competitive markets», *The Quarterly Journal of Economics,* vol. 121, num. 2, 2006, pp. 505 ss.

GAL, Michal S, «Algorithmic challenges to autonomous choice», *Michigan Technology Law Review,* vol. 25, num. 1, 2018, pp. 59 ss.

GALE, Bradley T/SWIRE, Donald J, «Value-based marketing & pricing», *Jthenal of Professional Pricing,* vol. 15, num. 3, 2006, pp. 30 ss.

GARBARINO, Ellen/LEE, Olivia F, «Dynamic pricing in internet retail: Effects on consumer trust», *Psychology & Marketing*, vol. 20, num. 6, 2003, pp. 495 ss.

GESELL, Laurence E/FARRIS, Martin T, «Airline deregulation: An evaluation of goals and objectives», *Transportation Law Journal,* vol. 21, num. 1, 1992, pp. 105 ss.

GIJSBRECHTS, Els, «Prices and pricing research in consumer marketing: Some recent developments», *International journal of research in marketing,* vol. 10, num. 2, 1993, pp. 115 ss.

GIL GONZÁLEZ, Elena/DE HERT, Paul, «Understanding the legal provisions that allow processing and profiling of personal data—an analysis of GDPR provisions and principles», *Era Forum,* vol. 19, num. 4, 2019, pp. 597 ss.

GOLOBARDES, Mireia Artigot, «Algorithmic personalization of consumer transactions and the limits of contract law», *Journal of Law, Market & Innovation,* vol. 1, num. 1, 2022, pp. 17 ss.

GRAEF, Inge, «Algorithms and fairness: What role for competition law in targeting price discrimination towards ends consumers», *Columbia Journal of European Law,* vol. 24, num. 3, 2018, pp. 541 ss.

GRENNAN, Matthew, «Price discrimination and bargaining: Empirical evidence from medical devices», *American Economic Review,* vol. 103, num. 1, 2013, pp. 145 ss.

GROCHOWSKI, Mateusz *et al.*, «Price Discrimination and Consumer Protection: A Digital Arms Race?», *Technology and Regulation,* 2022, pp. 36 ss.

Guidelines 2/2019 on the processing of personal data under Article 6(1)(b) GDPR in the context of the provision of online services to data subjects.

HABIB, Hana *et al.*, «"It's a scavenger hunt": Usability of Websites' Opt-Out and Data Deletion Choices», *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 2020, pp. 1 ss.

HABIB, Hana *et al.*, «An empirical analysis of data deletion and opt-out choices on 150 websites», *Proceedings of the 15th Symposium on Usable Privacy and Security (SOUPS 2019)*, 2019, pp. 387 ss.

HACKER, Philipp, «Teaching fairness to artificial intelligence: Existing and novel strategies against algorithmic discrimination under EU law», *Common Market Law Review*, vol. 55, num. 4, 2018, pp. 1143 ss.

HACKER, Philipp, «Personalizing EU private law: From disclosures to nudges and mandates», *European review of private law*, vol. 25, num. 3, 2017, pp. 651 ss.

HAGEN, Linda *et al.,* «How can machine learning aid behavioral marketing research?», *Marketing Letters*, vol. 31, num. 4, 2020, pp. 361 ss.

HANNAK, Aniko *et al.,* «Measuring price discrimination and steering on e-commerce web sites», *Proceedings of the 2014 conference on internet measurement conference*, 2014, pp. 305 ss.

HAUSMAN, Jerry A/MACKIE-MASON, Jeffrey K, «Price discrimination and patent policy», *The RAND Journal of Economics,* vol. 19, num. 2, 1988, pp. 253 ss.

Haws, Kelly L/Bearden, William O, «Dynamic pricing and consumer fairness perceptions», *Journal of Consumer Research,* vol. 33, num. 3, 2006, pp. 304 ss.

Hayek, Friedrich A, *Road to Serfdom,* The University of Chicago Press, Chicago, 1944.

Heidhues, Paul/Kőszegi, Botond, «Naivete-based discrimination», *The Quarterly Journal of Economics,* vol. 132, num. 2, 2017, pp. 1019 ss.

Helberger, Natali *et al.,* «Choice Architectures in the Digital Economy: Towards a New Understanding of Digital Vulnerability», *Journal of Consumer Policy,* vol. 45, num. 2, 2022, pp. 175 ss.

Helberger, Natali *et al.*, «EU Consumer Protection 2.0: Structural Asymmetries in Digital Consumer Markets», *A joint report from research conducted under the EUCP2.0 project*, 2021, retrieved from https://www.beuc.eu/brochure/eu-consumer-protection-20-structural-asymmetries-digital-consumer-markets-0.

Hinterhuber, Andreas, «Customer value-based pricing strategies: Why companies resist», *Journal of business strategy,* vol. 29, num. 4, 2008, pp. 41 ss.

Ho, Yi-Chun *et al.,* «Online cash-back shopping: Implications for consumers and e-businesses», *Information Systems Research,* vol. 28, num. 2, 2017, pp. 250 ss.

Hogan, Kevin, «Consumer Experience in the Retail Renaissance: How Leading Brands Build a Bedrock with Data», 2018, retrieved from https://www.deloittedigital.com/us/en/blog-list/2018/consumer-experience-in-the-retail-renaissance--how-leading-brand.html.

Huang, Ke-Wei, «Equilibrium market segmentation for targeted pricing based on customer characteristics», *Available at SSRN 1292508*, 2010, pp. 1 ss.

Huang, Ming-Hui/Rust, Roland T, «Artificial intelligence in service», *Journal of Service Research*, vol. 21, num. 2, 2018, pp. 155 ss.

Ingenbleek, Paul *et al.,* «Successful new product pricing practices: A contingency approach», *Marketing Letters,* vol. 14, num. 4, 2003, pp. 289 ss.

Jabłonowska, Agnieszka, «Consumer Protection in the Age of Data-Driven Behaviour Modification», *Journal of European Consumer and Market Law*, vol. 11, num. 2, 2022, pp. 67 ss.

Kahneman, Daniel *et al.,* «Fairness as a constraint on profit seeking: Entitlements in the market», *The American Economic Review*, vol. 76, num. 4, 1986, pp. 728 ss.

Kalimo, Harri/Majcher, Klaudia, «The concept of fairness: Linking EU competition and data protection law in the digital marketplace», *European law review,* vol. 42, num. 2, 2017, pp. 210 ss.

Kannan, Pallassana K/Kopalle, Praveen K, «Dynamic pricing on the Internet: Importance and implications for consumer behavior», *International Journal of Electronic Commerce*, vol. 5, num. 3, 2001, pp. 63 ss.

Kaplow, Louis/Shavell, Steven, «Fairness versus welfare», *Harvard Law Review,* vol. 114, num. 4, 2001, pp. 961 ss.

KAPLOW, Louis/SHAVELL, Steven, «Why the legal system is less efficient than the income tax in redistributing income», *The Journal of Legal Studies*, vol. 23, num. 2, 1994, pp. 667 ss.

KIENZLER, Mario, «Value-based pricing and cognitive biases: An overview for business markets», *Industrial Marketing Management,* vol. 68, num. 1, 2018, pp. 86 ss.

KIENZLER, Mario/KOWALKOWSKI, Christian, «Pricing strategy: A review of 22 years of marketing research», *Journal of Business Research,* vol. 78, num. 1, 2017, pp. 101 ss.

KLOCK, Mark, «Unconscionability and price discrimination», *Tennessee Law Review,* vol. 69, num. 2, 2001, pp. 317 ss.

KUMAR, Krishan *et al.*, «Privacy Protection in Personalized Web Search using Obfuscation», *International Journal of Emerging Trends in Engineering Research,* vol. 8, num. 4, 2020, pp. 1410 ss.

KUNTSMAN, Adi *et al.*, «Re-thinking Digital Health: Data, Appisation and the (im)possibility of 'Opting out'», *Digital Health*, vol. 5, 2019, pp. 1 ss.

KWON, Kwiseok/KIM, Cookhwan, «How to design personalization in a context of customer retention: Who personalizes what and to what extent?», *Electronic Commerce Research and Applications*, vol. 11, num. 2, 2012, pp. 101 ss.

La Commission nationale de l'informatique et des libertés (CNIL) et la Direction générale de la Concurrence, de la Consommation et de la Répression des Fraudes (DG CCRF), «IP Tracking: conclusions de l'enquête conjointe menée par la CNIL et la DGCCRF», 2014, retrieved from https://www.economie.gouv.fr/dgccrf/ip-tracking-conclusions-lenquete-conjointe-menee-par-cnil-et-dgccrf.

LEE, Fei/MONROE, Kent B, «Dynamic pricing on the internet: A price framing approach», in LEE, Angela Y/SOMAN, Dilip (eds.), *Advances in Consumer Research,* vol. 35, num. 1, Association for Consumer Research, Duluth, 2008, pp. 637 ss.

LEON, Pedro G *et al.*, «Why Johnny can't opt out: A usability evaluation of tools to limit online behavioral advertising», *Proceedings of the SIGCHI conference on human factors in computing systems*, 2012, pp. 1 ss.

LEVINE, Michael E, «Price discrimination without market power», *Yale Journal on Regulation,* vol. 19, num. 1, 2002, pp. 1 ss.

LI, Tao *et al.,* «Dynamic pricing, production, and channel coordination with stochastic learning», *Production and Operations Management,* vol. 24, num. 6, 2015, pp. 857 ss.

LI, Xi *et al.,* «Transparency of behavior-based pricing», *Journal of Marketing Research,* vol. 57, num. 1, 2020, pp. 78 ss.

LI, Zihao, «Affinity-based algorithmic pricing: A dilemma for EU data protection law», *Computer Law & Security Review,* vol. 46, 2022, pp. 1 ss.

LIOZU, Stephan M, «State of value-based-pricing survey: Perceptions, challenges, and impact», *Journal of Revenue and Pricing Management*, vol. 16, num. 1, 2017, pp. 18 ss.

LUZAK, Joasia A, «Privacy notice for dummies? Towards European guidelines on how to give "clear and comprehensive information" on the cookies' use in order to protect the internet users' right to online privacy», *Journal of Consumer Policy,* vol. 37, num. 4, 2014, pp. 547 ss.

MAGGIOLINO, Mariateresa, «Personalized prices in European competition law», *Bocconi Legal Studies Research Paper,* 2017, pp. 1 ss.

MAHDAWI, Arwa, «Is Your Friend Getting a Cheaper Uber Fare Than You Are?», *The Guardian*, 2018, retrieved from https://www.theguardian.com/commentisfree/2018/apr/13/uber-lyft-prices-personalized-data.

MARKOVITS, Richard S, «Why Kaplow and Shavell's double-distortion argument articles are wrong», *George Mason Law Review*, vol. 13, num. 3, 2005, pp. 511 ss.

MARTIN, Kelly D/MURPHY, Patrick E, «The role of data privacy in marketing», *Journal of the Academy of Marketing Science,* vol. 45, num. 2, 2017, pp. 135 ss.

MAS-COLELL, Andreu *et al., Microeconomic theory.* Oxford University Press, New York, 1995.

MATHIS, Klaus, *Efficiency instead of justice? Searching for the philosophical foundations of the economic analysis of law,* vol. 84, Springer Science & Business Media, 2009.

MCAFEE, Randolph, «Price discrimination», *Issues in Competition Law and Policy*, vol. 1, 2008, pp. 465 ss.

MCCARTHY, John *et al.,* «A proposal for the Dartmouth summer research project on artificial intelligence», *AI Magazine,* vol. 27, num. 4, 2006, pp. 12 ss.

MCDONALD, Aleecia M/CRANOR, Lorrie F, «Survey of the use of adobe flash local shared objects to respawn http cookies», *I/S: Journal of Law and Policy for the Information Society*, vol. 7, num. 3, 2012, pp. 639 ss.

MCGILL, Jeffrey I/VAN RYZIN, Garrett J, «Revenue management: Research overview and prospects», *Transportation Science,* vol. 33, num. 2, 1999, pp. 233 ss.

MIKIANS, Jakub *et al.,* «Crowd-assisted search for price discrimination in e-commerce: First results», *Proceedings of the ninth ACM conference on Emerging networking experiments and technologies,* 2013, pp. 1 ss.

MIKIANS, Jakub *et al.,* «Detecting price and search discrimination on the internet», *Proceedings of the 11th ACM workshop on hot topics in networks*, 2012, pp. 79 ss.

MILLER, Akiva A, «What do we worry about when we worry about price discrimination? The law and ethics of using personal information for pricing», *Journal of Technology Law & Policy,* vol. 19, num. 1, 2014, pp. 41 ss.

MORIARTY, Jeffrey, «Why online personalized pricing is unfair», *Ethics and Information Technology,* vol. 23, num. 3, 2021, pp. 495 ss.

MORRIS, Michael H, «Separate prices as a marketing tool», *Industrial marketing management*, vol. 16, num. 2, 1987, pp. 79 ss.

MOTTA, Massimo, *Competition policy: Theory and practice*, Cambridge University Press, Cambridge, 2004.

MUSOLFF, Leon, «Algorithmic Pricing Facilitates Tacit Collusion: Evidence from E-Commerce», *Proceedings of the 23rd ACM Conference on Economics and Computation*, 2022, pp. 1 ss.

NASH JR, John F, «The bargaining problem», *Econometrica: Journal of the econometric society,* 1950, pp. 155 ss.

NEVO, Aviv/WOLFRAM, Catherine, «Why do manufacturers issue coupons? An empirical analysis of breakfast cereals», *RAND Journal of Economics*, vol. 33, num. 2, 2002, pp. 319 ss.

NEWCOMER, Eric, «Uber Starts Charging What It Thinks You're Willing to Pay», *Bloomberg*, 2017, retrieved from https://www.bloomberg.com/news/articles/2017-05-19/uber-s-future-may-rely-on-predicting-how-much-you-re-willing-to-pay.

NIELSEN, Anne-Dorte B, *Harmonisation of EU Marketing Law: Analysis of Advantages and Disadvantages Regarding Regulating of Marketing Law in EU*, Nordic Council of Ministers, Copenhagen, 2002.

NILSSON, Nils J, *The quest for artificial intelligence*, Cambridge University Press, Cambridge, 2009.

NISSENBAUM, Helen, *Privacy in Context,* Stanford University Press, 2009.

NUSSBAUM, Martha/SEN, Amartya (eds.), *The quality of life*, Clarendon Press, 1993.

O'DONOGHUE, Robert/PADILLA, Jorge, *The law and economics of Article 102 TFEU,* 2nd edn, Hart Publishing, 2013.

ODLYZKO, Andrew, «Privacy, economics, and price discrimination on the internet», *Proceedings of the 5th international conference on electronic commerce*, 2003, pp. 355 ss.

OECD, «Personalized Pricing in the Digital Era», 2018, retrieved from https://www.oecd.org/competition/personalised-pricing-in-the-digital-era.html.

OECD, «Price Discrimination - Background note by the Secretariat», 2016, retrieved from https://one.oecd.org/document/DAF/COMP(2016)15/en/pdf.

OECD, «Glossary of Industrial Organisation Economics and Competition Law», *Commissioned by the Directorate for Financial, Fiscal and Enterprise Affairs,* 1993, retrieved from http://www.oecd.org/dataoecd/8/61/2376087.pdf.

OFT, «The Economics of Online Personalised Pricing*,* 2013, retrieved from https://docplayer.net/9529539-The-economics-of-online-personalised-pricing.html.

OFT, «Personalised Pricing: Increasing Transparency to Improve Trust», 2013, retrieved from https://webarchive.nationalarchives.gov.uk/ukgwa/20140402165101/http:/oft.gov.uk/shared_oft/markets-work/personalised-pricing/oft1489.pdf.

OFT, «*Online Targeting of Advertising and Pricing*», 2010, retrieved from https://webarchive.nationalarchives.gov.uk/ukgwa/20140402142426/http://www.oft.gov.uk/shared_oft/business_leaflets/659703/OFT1231.pdf.

OGUS, Anthony I, *Regulation: Legal form and economic theory*, Bloomsbury Publishing, London, 2004.

OKUN, Arthur M, *Equality and efficiency: The big tradeoff*, Brookings Institution Press, Washington D.C., 2015.

PARISI, Francesco, *The language of law and economics*, Cambridge Books, Cambridge, 2013.

PASQUALE, Frank, *The black box society*, Harvard University Press, Cambridge MA, 2015.

PASQUALE, Frank, «Technology, Competition, and Values», *Minnesota Journal of Law, Science & Technology,* vol. 8, num. 1, 2007, pp. 607 ss.

PAVLOU, Paul A *et al.,* «Understanding and mitigating uncertainty in online exchange relationships: A principal-agent perspective», *MIS quarterly,* vol. 31, num. 1, 2007, pp. 105 ss.

PEITZ, Martin, «The Prohibition of Self-Preferencing in the DMA», CERRE Issue Paper, 2022, pp. 1 ss.

PIGOU, Arthur C, *The economics of welfare*, Macmillan, London, 1920.

POLINSKY, Alan M, *An Introduction to Law and Economics,* 2nd edn, Little Brown & Co, 1989.

PORAT, Ariel/STRAHILEVITZ, Lior, «Personalizing Default Rules and Disclosure with Big Data», *Michigan Law Review,* vol. 112, num. 8, 2014, pp. 1417 ss.

POSNER, Richard A, *The problems of jurisprudence,* Harvard University Press, Cambridge MA, 1990.

POSNER, Richard A, «Wealth maximization revisited», *Notre Dame Journal of Law, Ethics & Public Policy,* vol. 2, num. 1, 1985, pp. 85 ss.

POSNER, Richard A, *The Economics of Justice*, Harvard University Press, Cambridge MA, 1981.

POSNER, Richard A, «Utilitarianism, economics, and legal theory», *Journal of Legal Studies,* vol. 8, num. 1, 1979, pp. 103 ss.

Proposal for a Regulation of the European Parliament and of the Council laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain Union legislative acts.

RABIN, Matthew, «Incorporating fairness into game theory and economics», *The American Economic Review,* vol. 83, num. 1, 1993, pp. 1281 ss.

RAO, Anita/WANG, Emily, «Demand for "healthy" products: False claims and FTC regulation», *Journal of Marketing Research*, vol. 54, num. 6, 2017, pp. 968 ss.

RAWLS, John B, *A Theory of Justice*, Belknap Press, 1971.

RAYNA, Thierry *et al.,* «Pricing music using personal data: Mutually advantageous first-degree price discrimination», *Electronic Markets,* vol. 25, num. 2, 2015, pp. 139 ss.
Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market For Digital Services and amending Directive 2000/31/EC (Digital Services Act).

Regulation (EU) 2022/1925 of the European Parliament and of the Council of 14 September 2022 on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828 (Digital Markets Act).

Regulation (EU) 2018/302 of the European Parliament and of the Council of 28 February 2018 on addressing unjustified geo-blocking and other forms of discrimination based on customers' nationality, place of residence, or place of establishment within the internal market and amending Regulations (EC) No 2006/2004 and (EU) 2017/2394 and Directive 2009/22/EC.

Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation).

SALOP, Steven/STIGLITZ, Joseph, «Bargains and ripoffs: A model of monopolistically competitive price dispersion», *The Review of Economic Studies,* vol. 44, num. 3, 1977, pp. 493 ss.

SANCHEZ-CARTAS, Juan M/KATSAMAKAS, Evangelo, «Artificial Intelligence, algorithmic competition and market structures», *IEEE Access*, vol. 10, num. 1, 2022, pp. 10575 ss.

SATISH, Laika/YUSOF, Norazah, «A Review: Big Data Analytics for enhanced Customer Experiences with Crowd Sourcing», *Procedia Computer Science*, vol. 116, 2017, pp. 274 ss.

SCHINDLER, Robert M, *Pricing strategies: A marketing approach*, Sage Publications, 2012.

SCHLEUSENER, Michael/HOSELL, Sarah, «Expertise zum Thema "Personalisierte Preisdifferenzierung im Online-Handel"», *SVRV, Sachverständigenrat für Verbraucherfragen,* 2016, pp. 1 ss.

SCHMALENSEE, Richard, «Output and welfare implications of monopolistic third-degree price discrimination», *The American Economic Review,* vol. 71, num. 1, 1981, pp. 242 ss.

SCHWARTZ, Marius, «Third-degree price discrimination and output: Generalizing a welfare result», *The American Economic Review*, vol. 80, num. 5, 1990, pp. 1259 ss.

SEELE, Peter *et al.,* «Mapping the ethicality of algorithmic pricing: A review of dynamic and personalized pricing», *Journal of Business Ethics,* vol. 170, num. 4, 2021, pp. 697 ss.

SHAVELL, Steven, *Foundations of economic analysis of law*, Harvard University Press, Cambridge MA, 2009.

SHILLER, Benjamin R, «First Degree Price Discrimination Using Big Data», *Brandeis University, Department of Economics and International Business School, Working Paper No. 58,* 2014, pp. 1 ss.

SHILLER, Benjamin R/WALDFOGEL, Joel, «Music for a song: An empirical look at uniform pricing and its alternatives», *The Journal of Industrial Economics,* vol. 59, num. 4, 2011, pp. 630 ss.

SKOURAS, Thanos *et al.,* «Economics and marketing on pricing: How and why do they differ?», *Journal of Product and Brand Management,* vol. 14, num. 6, 2005, pp. 362 ss.

SOLTANI, Ashkan *et al*., «Flash cookies and privacy», *2010 AAAI Spring Symposium Series*, 2010, pp. 158 ss.

STEPPE, Richard, «Online price discrimination and personal data: A General Data Protection Regulation perspective», *Computer law & security review,* vol. 33, num. 6, pp. 768 ss.

STRAHILEVITZ, Lior, «Reputation nation: Law in an era of ubiquitous personal information», *Northwestern University Law Review,* vol. 102, num. 4, pp. 1667 ss.

STUCKE, Maurice E/EZRACHI, Ariel, «Antitrust, algorithmic pricing and tacit collusion», in BARFIELD Woodrow/PAGALLO, Ugo (eds.), *Research Handbook on the Law of Artificial Intelligence*, Edward Elgar Publishing, 2018, pp. 624 ss.

STUYCK, Jules, «Case C-484/08 Caja de Ahorros y Monte de Piedad de Madrid v Asociación de Usuarios de Servicios Bancarios (Ausbanc)», *Case Note*, 2010, pp. 449 ss.

TAN, Yinliang *et al.,* «Mitigating inventory overstocking: Optimal order-up-to level to achieve a target fill rate over a finite horizon», *Production and Operations Management,* vol. 26, num. 11, pp. 1971 ss.

TAYLOR, Curtis R, «Consumer privacy and the market for customer information», *RAND Journal of Economics*, vol. 35, num. 4, 2004, pp. 631 ss.

TENE, Omer/POLONETSKY, Jules, «Big data for all: Privacy and user control in the age of analytics», *Northwestern Journal of Technology and Intellectual Property,* vol. 11, num. 5, 2013, pp. 239 ss.

TGI DE GRENOBLE, Ordonnance de référé du 4 juillet 2018.

TIROLE, Jean, *The theory of industrial organization*, MIT Press, 1988.

TOWNLEY, Christopher *et al.,* «Big data and personalized price discrimination in EU competition law», *Yearbook of European Law,* vol. 36, num. 1, 2017, pp. 683 ss.

Treaty on the Functioning of the European Union.

TRZASKOWSKI, Jan, «Behavioural economics, neuroscience, and the unfair commercial practises directive», *Journal of Consumer Policy,* vol. 34, num. 3, 2011, pp. 377 ss.

TUROW, Joseph, *The aisles have eyes*, Yale University Press, 2017.

TUROW, Joseph, *Niche envy: Marketing discrimination in the digital age*, MIT Press, 2008.

TUROW, Joseph *et al.,* «Open to Exploitation: America's Shoppers Online and Offline», *A Report from the Annenberg Public Policy Center of the University of Pennsylvania,* 2005.

UR, Blase *et al.*, «Smart, useful, scary, creepy: Perceptions of online behavioral advertising», *Proceedings of the eighth symposium on usable privacy and security*, 2012, pp. 1 ss.

VALENTINO-DEVRIES, Jennifer *et al.,* «Websites Vary Prices, Deals Based on Users' Information», *The Wall Street Journal*, 2012, retrieved from https://www.wsj.com/articles/SB1000142412 7887323777204578189391813881534.

VAN DEN BERGH, Roger J, *Comparative competition law and economics*, Edward Elgar Publishing, 2017.

VARIAN, Hal R, *Intermediate microeconomics: A modern approach,* 8th edn, WW Norton & Company, 2010.

VARIAN, Hal R, «Price discrimination and social welfare», *The American Economic Review,* vol. 75, num. 4, 1985, pp. 870 ss.

VARIAN, Hal R, «A model of sales», *The American Economic Review*, vol. 70, num. 4, 1980, pp. 651 ss.

WAGNER, Gerhard/EIDENMÜLLER, Horst, «Down by algorithms: Siphoning rents, exploiting biases, and shaping preferences: Regulating the dark side of personalized transactions», *University of Chicago Law Review,* vol. 86, num. 2, 2019, pp. 581 ss.

WEBER, Franziska, «The Law and Economics of Self-regulation in Advertising», *Journal of European Consumer and Market Law*, vol. 3, num. 1, 2014, pp. 5 ss.

WEISMAN, Dennis L/KULICK, Robert B, «Price discrimination, two-sided markets, and net neutrality regulation», *Tulane Journal of Technology and Intellectual Property,* vol. 13, num. 1, 2010, pp. 81 ss.

WEISS, Robert/MEHROTRA, Ajay K, «Online dynamic pricing: Efficiency, equity and the future of e-commerce», *Virginia Journal of Law & Technology,* vol. 6, num. 2, 2001, pp. 1 ss.

WEISSTEIN, Fei *et al.,* «Effects of price framing on consumers' perceptions of online dynamic pricing practices», *Journal of the Academy of Marketing Science*, vol. 41, num. 5, 2013, pp. 501 ss.

WILLIS, Lauren E, «When Nudges Fail: Slippery Defaults», *University of Chicago Law Review,* vol. 80, num. 3, 2013, pp. 1155 ss.

XENIDIS, Raphaële/SENDEN, Linda, «EU non-discrimination law in the era of artificial intelligence: Mapping the challenges of algorithmic discrimination», in BERNITZ, Ulf *et al.* (eds.), *General Principles of EU law and the EU Digital Order,* Kluwer Law International, 2020, pp. 151 ss.

XIA, Lan *et al.,* «The price is unfair! A conceptual framework of price fairness perceptions», *Journal of Marketing,* vol. 68, num. 4, 2004, pp. 1 ss.

XU, Zibin/DUKES, Anthony, «Product line design under preference uncertainty using aggregate consumer data», *Marketing Science,* vol. 38, num. 4, 2019, pp. 669 ss.

ZIMMERMANN, Reinhard, *The law of obligations: Roman foundations of the civilian tradition*, Clarendon Press, 1996.

ZUBOFF, Shoshana, «Surveillance capitalism and the challenge of collective action», *New labor forum,* vol. 28, num. 1, 2019, pp. 10 ss.

ZUIDERVEEN BORGESIUS, Frederik/POORT, Joost, «Online price discrimination and EU data privacy law», *Journal of Consumer Policy,* vol. 40, num. 3, 2017, pp. 347 ss.