Introduction

Algorithmic Price Personalization: From Laesio Enormis *to* Laesio Algorithmica?

Fabrizio Esposito and Mateusz Grochowski

I.1 THE CONCEPT OF THE HANDBOOK

Of the many concerns triggered by the rapid growth of digital commerce and the expansion of the data-based economy, price personalization occupies a prominent yet peculiar position. For many firms, the availability of big data and refined algorithmic tools has opened unprecedented avenues to learn about consumers' financial and personal standing, market preferences, and transactional behaviour patterns. Building on these insights, firms have (at least to some degree) obtained an ability to make behavioural predictions about the future conduct of their clients, including their interest in a particular assortment of products, responsiveness to certain forms of advertising, and – not least importantly – their willingness to pay a certain price. Hence, it became possible to price consumers along the lines of this willingness, offering higher prices to those who were evaluated by an algorithm as being ready to pay them. This practice, commonly referred to as price personalization or price discrimination,[1] is becoming an increasingly widespread business model in the online economy. Although most firms desist from disclosing any algorithm-based price differentiation to the outside word, a growing array of empirical studies, media revelations, and litigation leaves no doubt that various modes of algorithmic pricing are commonplace in numerous market sectors. The mounting awareness of these practices has prompted numerous economists and lawyers to voice concerns about possible detriments to the market and social structures that these practices may likely bring about.

The *Cambridge Handbook on Algorithmic Price Personalization and the Law* contains contributions from a multidisciplinary group of scholars with substantial expertise in legal, economic, data science, and marketing research on consumer prices. The authors, from various European and non-European jurisdictions, have

[1] See also Section I.2.

different perspectives on personalized prices. The plurality of voices collected in the Handbook stimulates readers to form their own opinions and join the collective reflection on what, if anything, the law should do about algorithmic price personalization. The structure of the Handbook rests on three interdependent parts, each containing chapters by experts from law and other social sciences.

Part I sets the stage by presenting background knowledge about the historical, normative, technological, and economic context that is needed to reflect critically on price personalization. Tagiuri reminds us that personalized prices are not a new phenomenon and perhaps have been more common historically than standard prices.[2] Offering a data scientist's perspective, Han then introduces clear criteria by which to define price personalization, explains how it works, and points out that we can expect it to spread offline as well. Next, Brinca, Costa, and Martinez discuss the theoretical and empirical insights into price personalization that are critical to putting this pricing technique into perspective.[3] Davola, Esposito, and Grochowski delve more deeply into the interconnection between personalization of prices and other contract terms, using insurance and financial service agreements as illustrations.[4] Against the need to choose in favour of or against price personalization, Bagchi[5] reviews the main normative perspectives on price personalization.

Part II looks at the European Union (EU) regulatory framework, which deserves to be analysed in great detail given the bloc's pro-active stance, relative to other jurisdictions, on regulating various aspects of the digital marketplace. Maggiolino and Caforio identify the limits of EU competition law and the EU's Digital Markets Act in the governance of price personalization.[6] Jabłonowska, Lagioia, and Sartor provide an overview of EU consumer data law to identify a set of existing constraints on price personalization strategies.[7] Finally, Artigot Golobardes and Gómez Pomar, taking a law and economics approach, cast doubt on the ability of the Unfair Contract Terms Directive (UCTD) to limit algorithmic price personalization.[8]

Part III complements Part II with a legal comparative perspective. Meyerhof Salama and Batista da Silva build on a recent decision that found that price personalization infringed general Brazilian consumer law and privacy law to reconstruct the interaction between consumer, privacy, and competition law.[9]

[2] Giacomo Tagiuri, 'The Rise and Uneasy Decline of the Impersonal Price'.
[3] Pedro Brinca, João Ricardo Costa Filho, and Luis F. Martinez, 'The Economics of Price Personalization: Theory and Evidence'.
[4] Antonio Davola, Fabrizio Esposito, and Mateusz Grochowski, 'Price Personalization vs. Contract Terms Personalization: Mapping the Complexity'.
[5] Aditi Bagchi, 'What Is the Problem with Price Personalization?.
[6] Valeria Caforio and Mariateresa Maggiolino, 'EU Competition Law and Personalized Pricing'.
[7] Agnieszka Jabłonowska, Francesca Lagioia, and Giovanni Sartor, 'Beyond the Price Tag: Personalized Pricing and the Pre-contractual Rights of Consumers and Data Subjects under EU Law'.
[8] Mireia Artigot Golobardes and Fernando Gómez Pomar, 'Personalized Prices and Contractual Controls in EU Consumer Law'.
[9] Bruno Meyerhof Salama and Leda Batista da Silva, 'Personalized Pricing in Brazil'.

Chapdelaine presents the legal landscape of algorithmic personalized pricing in Canada by focusing predominantly on personal data protection as well as on contracts and consumer and anti-discrimination law.[10] Ge explains that in China, 'big data backstabbing' is regulated by a dense web of legal sources and enforced by various authorities that significantly limit retailers' power to personalize prices.[11] Porat finds that relevant principles for the governance of price personalization can be extracted from US law, in particular from the individual's ability to withdraw their data from the pool used for personalized price setting.[12] All the relevant legal instruments are decentralized (as they operate only in selected state law), and none of them addresses personalized prices up-front. Finally, Ashok and Abhay Jain provide a comprehensive picture of the legal framework that applies (or may possibly apply) to personalized pricing on various levels of the Indian legal order.[13]

Each part of the Handbook creates a thorough overview of the various issues associated with algorithmic pricing in law and other social sciences. Overall, the Handbook shows that while the technology is steadily evolving, legal academics have struggled to identify general normative premises on which to build a coherent and effective regulatory response based on existing legal materials or even to formulate promising legal reforms.

At the same time, the traditional set of legal principles and rules that have long governed contracts and the emerging principles governing algorithms appear suited to provide normative and institutional guidance for reflecting on how to regulate price personalization. In fact, as we elaborate in Section I.3, the interplay of transparency and substantive considerations about prices and algorithms forms the main ingredient of all the regulatory solutions explored in this volume. From a broader perspective, as we explain in Section I.2, what price personalization really does is inject an unprecedented level of granularity into long-standing market practices. But at the same time, virtually all contributors to this volume acknowledge that price personalization could lead to unfair outcomes. What follows is a plea for a regulatory response that is a capable match for the economic and legal particularities of algorithmic pricing. We believe that the search for such a response should follow the rule of thumb that more granular market practices are to be complemented by more granular legal principles and institutions.[14]

[10] Pascale Chapdelaine, 'The (Il)legality of Algorithmic Personalized Pricing: A Canadian Perspective'.
[11] Jiangqui Ge, 'Algorithmic Price Personalization in China'.
[12] Haggai Porat, 'Algorithmic Personalized Pricing in the United States: A Legal Void'.
[13] Pratiksha Ashok and Sunitha Abhay Jain, 'Price Personalization: An Indian Perspective'.
[14] Christoph Busch and Alberto De Franceschi, Granular Legal Norms: Big Data and the Personalization of Private Law, in Vanessa Mak, Eric Tjong, Tjin Tai, and Anna Berlee (eds.), *Research Handbook in Data Science and Law* (Edward Elgar, 2018); Marietta Auer, Granular Norms and the Concept of Law: A Critique, Christoph Busch and Alberto De Franceschi (eds.), *Algorithmic Regulation and Personalized Law: A Handbook* (CH Beck; Hart; Nomos, 2021). These uses of the expression 'granularity' and its cognates are not to be confused with their uses in legal informatics; see Vytautas Cyras and Friedrich Lachmayer, Dual Textuality of Law, in Vytautas Cyras and Friedrich Lachmayer (eds.),

For these reasons, we think that the yardstick for algorithmic pricing, or – to put it differently, the borderline between admissible and inadmissible price personalization – should be constructed idiosyncratically. Just as the classical discourse on price fairness has frequently referred to *laesio enormis*,[15] is it now time to think of *laesio algorithmica*? If so, what would be its core premises and benchmarks? This volume attempts to answer at least some of these questions.

1.2 PERSONALIZED — DYNAMIC — ALGORITHMIC PRICING

As Tagiuri evidences in his broad historical panorama of impersonal versus personalized price schemes, pricing customers differently for the same goods or services is not a new commercial practice,[16] but the way it is changing in the online economy raises several new legal and ethical issues. Not only has the development of massive data harvesting techniques combined with robust computation skills employed in processing the data made the price calculations much more sophisticated than ever before, but it has also opened an entirely new chapter in our understanding of the relationship between the individual on the market and the value of a good or service. But legal scholarship has referred to the notion of algorithmic pricing in many, and not always fully coherent, ways. The conceptual structure of price personalization involves and rests on three essential building blocks.

First, the relationship between price personalization and price discrimination has been a source of much doubt among legal scholars. The more economically oriented accounts tilt towards discrimination and generally equate[17] price discrimination with offering differentiated prices to different groups of market actors. In this setting, 'discrimination' is understood, mostly in descriptive terms, as a synonym for divergent pricing schemes.[18] But this account does not convey any clear moral judgment as the notion of discrimination in a legal or ethical analysis would, a caveat

Essays on the Visualisation of Legal Informatics (Springer International Publishing, 2023) https://doi.org/10.1007/978-3-031-27957-7_16 accessed 29 October 2023.

[15] Thomas Finkenauer, Laesio Enormis, Jürgen Basedow, Klaus J. Hopt, Reinhard Zimmermann, and Andreas Stier (eds.), *Max Planck Encyclopedia of European Private Law* (Oxford University Press, 2012); Reinhard Zimmermann, *The Law of Obligations: Roman Foundations of the Civilian Tradition* (1990; paperback edn 1996), 259 ff; Frederik Willem Grosheide, Iustum Pretium Redivivum?, Frederik Willem Grosheide and Ewoud Hondius (eds.), *International Contract Law*, 2003 (2004), p. 69ff; James Gordley, *Foundations of Private Law: Property, Tort, Contract, Unjust Enrichment* (2007), pp. 364ff.

[16] Tagiuri in this volume.

[17] Sometimes however, discrimination based on idiosyncrasies of individuals' conduct ('behavioural discrimination') is perceived as generally advantageous for enhancing market fairness; see Ariel Ezrachi and Maurice E. Stucke, *Virtual Competition: The Promise and Perils of the Algorithm-Driven Economy* (Harvard University Press, 2016), pp. 117–130.

[18] On this confusion also, long before the era of algorithmic pricing, Kenneth W. Dam, The Economics and Law of Price Discrimination: Herein of Three Regulatory Schemes, *University of Chicago Law Review*, 28, 1963, p. 1.

that must be acknowledged in any cross-reference between economics and the other disciplines that have approached the issue of differentiated pricing. In other words, not every discriminatory price in the economic sense will be legally or ethically intolerable discrimination.

Second, it is necessary to distinguish among various premises of price differentiation. This is the least confusing part of the conceptual framework of personalized pricing. Its foundations were laid in the 1930s already by Arthur C. Pigou[19] and until the present had remained mostly uncontested. With the advent of algorithmic pricing, his long-established typology underwent a renaissance, and numerous scholarly accounts and policy papers (many referred to in this volume) have invoked it recently. In the Pigouvian view, price personalization can be divided into three layers.

The first layer assigns every customer a tailor-made price that reflects the highest amount that this particular individual is willing to pay. This is the 'reservation price', which denotes a clearly futuristic state of affairs in which suppliers are capable of precisely identifying each client's willingness to pay. Hence, this type of differentiated pricing – often referred to as the 'perfect price discrimination'[20] – operates mostly as a yardstick for the pricing techniques that are actually applied in practice, allowing a better understanding of the extent to which a particular pricing scheme corresponds to the preferences of a generic customer or can accommodate to a more idiosyncratic degree an individual's willingness to pay. As will be explained later in this section, algorithmic price calculation firmly promises to bring consumer prices into close proximity with a perfectly personalized price. Algorithms can make a specific behavioural prediction about an individual, estimating their willingness to pay a particular price in the given circumstances (imagine, for example, a man who has just become a grandparent for the first time and is looking for baby clothes). But for epistemic reasons having to do with data availability and analytical power, perfect personalization is not currently feasible and will in all probability remain the Holy Grail of the consumer economy for the foreseeable future.

The second layer of Pigouvian price discrimination represents a pricing scheme whereby customers are grouped by distinctive features such as age, income or geographical location that in the supplier's view will affect their willingness to pay. This scheme sets the reservation price separately for each such cluster as an approximate willingness to pay evaluated in reference to one or more distinctive properties. This way of pricing is relatively far removed from the 'perfect personalization' ideal but at the same time is actually closer to the epistemic reality of the consumer market. Naturally, it is easier to identify the key premises that determine the client's attitude towards price for an average group member than for an idiosyncratic individual.

[19] Arthur C. Pigou, *The Economics of Welfare* (1932).
[20] See, for example, Dirk Bergemann, Benjamin Brooks, and Stephen Morris, The Limits of Price Discrimination, *The American Economic Review*, 105, 2015, p. 921.

This model of pricing underpins all the existing schemes of algorithmic pricing, which build on automated pooling of consumers into clusters. These clusters are then priced differently based upon distinguishable characteristics. Over time, such pooling techniques will supposedly tend towards apportioning clients into increasingly smaller clusters – hence striving for the 'perfect personalization' ideal.

While price personalization fashioned after the first and second Pigouvian layers may not always reflect established market practice, it may also be conducive to other forms of personalizing the contract. Most indicative of how personalization can affect terms other than price are various instances in which price depends on a personalized risk assessment in the insurance and financial services industries. However, as Chapter 3 argues, such dependencies do not apply universally to all consumer transactions. Instead, they typically presuppose two neoclassical model conditions: first, prices must be set at marginal costs; second, consumption must have no externalities. If at least one of these conditions does not hold (and they often do not), term personalization can occur without price personalization.

The third layer of personalized pricing refers to the natural process of charging different prices for the same asset in response to objective market criteria such as fluctuations in the price of raw materials and shipment costs to different locations. This mode of price differentiation can hardly be described as belonging in the milieu of 'personalization' as such. It relates instead to the general cost/price dynamic and hardly involves those personal idiosyncrasies that affect the value of the performance for the client (the willingness to pay).

Here, one must distinguish between personalized pricing and dynamic pricing. 'Dynamic' refers to price differences that track vacillations in supply and demand or in the costs associated with procuring a good or with conducting the transaction itself. Widespread (and widely accepted) practices along these lines for decades have been to price train tickets differently for peak versus off-peak travel, to charge different fuel prices at gas stations depending on the day of the week, or to airlines changing their fares to reflect higher or lower demand. Although dynamic pricing is at times placed in the same rubric as price personalization, the two phenomena are structurally different. Whereas dynamic pricing is primarily concerned with responding to changing market dynamics, personalization schemes aim more or less directly at the client's individual features. To the extent that the client's reservation price may rise or fall along with the overall market, the two mechanisms may converge in practice. But this will not be the rule. And even if such convergence actually occurs, the premises for the price calculation will differ, at least in part. Qiwei Han's chapter illuminates the mechanics of price setting and the role played by data (personal as well as aggregated big data) in this process.[21] In particular, Han's chapter discusses how algorithms are capable of identifying patterns across the data

[21] Qiwei Han, 'Personalized Pricing in the Age of Big Data: A Technical Perspective'.

pool and of associating them with individual consumer characteristics. Han also discusses the dimensions of privacy and threats to privacy from this practice. At the same time, his chapter argues that data pools themselves offer an opportunity to mitigate privacy shortcomings. Even anonymized data can still be a viable resource for identifying market preferences and arriving at reservation prices for clusters of consumers.

Keeping in mind the multitude of terms used in the discourse over algorithmic pricing, one clarification is needed. Though this Handbook focuses on 'algorithmic price personalization', it should however be noted that some contributors prefer to refer more generally to 'price personalization' or to 'algorithmic pricing' as the analytical categories. Unless the context indicates otherwise, these notions are used interchangeably to denote first- and the second-degree price discrimination in the Pigouvian construct. Finally, unless something else follows from the context, price personalization also encompasses personalized discounts arrived at where the initial price is calculated impersonally but an algorithm allocates discounts to particular clients.[22]

I.3 FAIRNESS AND TRANSPARENCY

I.3.1 *Emphasis on Algorithmic Decisions or on the Price?*

The literature on algorithmic price personalization, including the contributions to this volume, maps along an axis of whether the authors emphasize that an algorithm is taking decisions or that the decisions taken are about price. This axis is particularly conspicuous in discourse about the fairness and transparency of algorithmic price personalization.

In a first approximation, scholars focusing on algorithmic fairness are investigating price personalization in reference to an already pretty robust body of literature on the general fairness of algorithmic decisions. The price-focused literature in turn looks at algorithmic price personalization from the perspective of contracts and competition, and of market law more generally, to identify instances of fair as well as unfair algorithmic price personalization. Consequently, scholars emphasizing the transparency of algorithmic decision-making rely primarily on the vast literature on transparency and explainability (the algorithmic 'black box' problem) and on the 'human in the loop' idea of algorithmic bias and related problems.

The accounts tilting towards the price dimension refer more frequently to the economic parameters of personalized pricing, including its welfare and distributional outcomes as well as its effects on competition and antitrust law. In addition, the price-centred accounts often invoke transparency, which in this context refers not to algorithmic transparency as such, but to informing consumers about price

[22] See also Joseph Turrow, *The Aisles Have Eyes: How Retailers Track Your Shopping, Strip Your Privacy, and Define Your Power* (Yale University Press, 2017).

and its basic parameters. Less commonly, this thread of literature also invokes the link between personalized pricing and classical price fairness doctrine as well as the general toolbox for reviewing price clauses (which includes such instruments as the EU Unfair Contract Terms Directive [UCTD]).

A deeply intertwined set of concerns, situated somewhere between price and fairness, is privacy.[23] By its nature, algorithmic pricing builds on harvesting and processing personal data from the consumer market. Hence, algorithmic pricing clearly falls within the ambit of privacy regulations such as the General Data Protection Regulation (GDPR)[24] and the California Consumer Privacy Act (CCPA).[25] Consequently, algorithmic pricing is also incidentally subject to rules on automated profiling in the EU law, especially to Article 22 of the GDPR[26] (notwithstanding that the real significance of this rule for price personalization is limited and cumbersome). From the algorithmic pricing perspective, privacy can be seen in a twofold way. First, if it is considered to constitute a stand-alone value in personalized pricing, privacy may be situated near the algorithmic-price-fairness end of the spectrum.[27] Second, privacy can also be understood instrumentally, as a component of the transparency requirement. Seen through this prism, privacy is more of a procedural than a substantive standard, meant to protect other interests (e.g., not being exploited or discriminated) by prohibiting the use of consumer information in ways that will harm them.

In the background of these institutional and normative standpoints lies a broad cluster of empirical studies into consumer attitudes towards dynamic and personalized pricing schemes. All these studies point to a clear bottom line: consumers are generally strongly averse towards algorithmic pricing[28] (and generally towards all instances of price differentiation in online and offline contexts[29]). Arguably, this

[23] Frederik Zuiderveen Borgesius, Natali Helberger, and Agustin Reyna, The Perfect Match? A Closer Look at the Relationship between EU Consumer Law and Data Protection Law, *Common Market Law Review*, 54, 2017, p. 1427.

[24] 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 (OJ L 119, 4.5.2016, pp. 1–88).

[25] CCPA of 28 June 2018, California Civil Code §§ 1798.100; on the relevance of this legislation for personalized pricing, see also Porat's contribution in this volume.

[26] Mateusz Grochowski et al., Algorithmic Price Discrimination and Consumer Protection: A Digital Arms Race?, *Technology and Regulation*, 4, 2022, p. 43; Fabrizio Esposito, Making Personalised Prices Pro-Competitive and Pro-Consumers, *CAHIERS DU CeDIE WORKING PAPERS 2020/02*.

[27] On the link between algorithmic price fairness and privacy, see Section I.3.2.

[28] See also Lina M. Khan, Amazon's Antitrust Paradox, *Yale Law Journal*, 126, 2017, p. 763; Oren Bar-Gill, Algorithmic Price Discrimination When Demand Is a Function of Both Preferences and (Mis) perceptions, *The University of Chicago Law Review*, 86, 2019, p. 242.

[29] Kelly Haws and William O. Bearden, Dynamic Pricing and Consumer Fairness Perceptions, *Journal of Consumer Research*, 33, 2006, p. 309; Timothy J. Richards, Jura Liaukonyte, and Nadia Streletskaya, Personalized Pricing and Price Fairness, *International Journal of Industrial Organization*, 44, 2016, p. 150; P. K. Kannan and Praveen K. Kopalle, Dynamic Pricing on the Internet: Importance and Implications for Consumer Behavior, *International Journal of Electronic Commerce*, 5, 2012, p. 73; Haws and Bearden, Dynamic Pricing, pp. 308–310; Sophie C. Boerman, Sanne Kruikemeier,

aversion is rooted in consumers' intuition that price differentiation carried out by a machine is substantially different from similar operations in the brick-and-mortar setting.[30] In other words, popular perception holds algorithmic pricing to be ethically questionable, not only because it allocates different prices to different clients[31] but also because the differentiation in question is based on personal details analysed by a de-humanized agent.

The relevance of the empirical studies in question is two-fold. First, the pedestrian view of price fairness can serve as a guideline in setting regulatory frameworks for personalized pricing. Although collective moral judgments are not definitive for the design of legal rules, they do however provide relevant signposts for understanding where the boundaries of price personalization should be placed.[32] Second, consumer backlash may dissuade firms from using algorithms at all (or at least, from using them opportunistically, as a way of rent-seeking). This pertains especially to what is known as 'dual entitlement theory', which provides an explanatory formula for social attitudes towards price changes identified through empirical studies. Dual entitlement theory holds that firms are generally averse to increasing prices solely due to fluctuations in demand or for certain other reasons that consumers generally do not deem acceptable. In turn, the dual entitlement view holds that firms are more inclined to increase prices to reflect increased costs of producing or obtaining a good (or at least, they are inclined to present price increases this way), as this is the only type of price increase that the majority of consumers tends to approve of. From a normative perspective, while dual entitlement theory taken by itself is merely one guide, its fitness with a broader fairness account needs to be stressed and is discussed in Section I.3.2.

I.3.2 *Fairness*

The bourgeoning use of personalized (that is, of individual or at least of granularized) prices, based on profiling of individual market preferences, triggers academic and policy discussion along several lines. One of the most foundational (and

and Nadine Bol, When Is Personalized Advertising Crossing Personal Boundaries? How Type of Information, Data Sharing, and Personalized Pricing Influence Consumer Perceptions of Personalized Advertising, *Computers in Human Behavior Reports*, 4, 2021 pp. 8–10; The European Consumer Organization (BEUC), *Connected, But Unfairly Treated. Consumer Survey Results on the Fairness of the Online Environment* (Brussels 2023), p. 10.

[30] Martin Fassnacht and Sebastian Unterhuber, Consumer Response to Online/Offline Price Differentiation, *Journal of Retailing and Consumer Services*, 28, 2016, p. 146; Gerrit Hufnagel, Seeking the Perfect Price: Consumer Responses to Personalized Price Discrimination in e-Commerce, *Journal of Business Research*, 143, 2022, pp. 355–357.

[31] Bar-Gill, Algorithmic Price Discrimination, p. 227.

[32] In a similar way, the relevance of empirical evidence on social perception of fairness; see Daniel Kahneman et al., Fairness as a Constraint on Profit Seeking: Entitlements in the Market, *The American Economic Review*, 76, 1986, p. 729. See also, in this volume, Brinca, Costa Filho and Martinez in this volume.

chronologically, the most seminal[33]) of them ponders the (un)fairness of price calculation schemes.[34] The widespread use of various argumentative formulas, also in this regard, ultimately seems inconclusive, or at least not fully consistent in its ends.[35] In many instances, fairness operates as the epitome of an unspecified set of values that embody the moral features of a 'proper' algorithmic price calculation. At the same time, fairness-based assertions occupy a particularly prominent position in the algorithmic pricing debate. The emergence and rapid proliferation of automated price calculation have brought the long-stagnant and 'distinctly unfashionable'[36] debate over price fairness to the fore again. It has revived foundational questions of the ethics of setting prices and is attempting to incorporate into them a partly altered domain of market phenomena and ethical judgements.

In the general debate on algorithms, the notion of fairness hence functions as something of a nebulous concept of certain values or moral principles that can serve as a yardstick for gauging whether the use of a particular algorithm is, broadly considered, ethical.[37] In a nutshell, fairness-based arguments are underpinned by one of the two patterns mentioned earlier.[38] They gravitate either towards the question of price per se or towards the fairness of the algorithmic procedure. Under the latter view, the concept of algorithmic fairness encompasses a diverse set of issues.[39] Some of these issues involve imperfections in the algorithmic decision and the biases affecting it.[40] Other issues may be more foundational, as they regard the right to be left alone, understood in this context as the wish to keep one's 'private' life and persona separate from one's 'market' persona.[41] Here, again, it is possible

[33] The discussion about the permissibility of algorithmic pricing originated as early as 2000, when it became apparent that Amazon was differentiating prices for DVDs (Craig Bicknell, Online Prices Not Created Equal, *Wired*, 7 September 2000). The general unrest of that time, encapsulated in Paul Krugman's op-ed: Reckonings; What Price Fairness?, *New York Times*, 4 October 2000, spurred ample debate over price personalization, which before then had been quite limited – for a historical outline of this discussion, see, for example, Frederick Zuiderveen Borgesius and Joost Poort, Online Price Discrimination and EU Data Privacy Law, *Journal of Consumer Policy*, 40, 2017, pp. 348–350.

[34] On the concept of fairness in the algorithmic context, see Mateusz Grochowski, Algorithmic Price Fairness (2024).

[35] See especially an ample analysis by Akiva A. 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*, 19, 2014, pp. 68ff.

[36] Robert C. Hockett and Roy Kreitner, Just Prices, *Cornell Journal of Law and Public Policy*, 27, 2018, pp. 771–796.

[37] See also Aditi Bagchi, 'What Is the Problem with Price Personalization?'.

[38] See Section I.3.1.

[39] Tal Zarsky, The Trouble with Algorithmic Decisions: An Analytic Road Map to Examine Efficiency and Fairness in Automated and Opaque Decision Making, *Science, Technology, and Human Values*, 41, 2016, pp. 118–132; Aditi Bagchi, 'What Is the Problem with Price Personalization?'.

[40] Further on the biases embedded in the algorithmic design, see, for example, Anupam Chander, The Racist Algorithm?, *Michigan Law Review*, 115, 2017, pp. 1023–1045; Kate Crawford, The Hidden Biases of Big Data, *Harvard Business Review*, 1 April 2013; Tar Zarsky, 'The Trouble'.

[41] On the 'digital persona' and its implications for personalized pricing, cf. Mateusz Grochowski, 'Algorithmic Price Fairness'.