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RESEARCH ARTICLE

Consumer Choice and Autonomy in the Age of Artificial Intelligence and Big Data

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Abstract
Recent developments in the field of artificial intelligence and data analytics are facilitating the automation of some consumer chores (e.g., in smart homes and in self-driving cars) and allow the emergence of big-data-driven, micro-targeting marketing practices (e.g., personalized content recommendation algorithms). We contend that those developments can generate a tension for marketers, consumers, and policy makers: They can, on the one hand, contribute to consumer well-being by making consumer choices easier, more practical, and more efficient. On the other hand, they can also undermine consumers' sense of autonomy, the absence of which can be detrimental to consumer well-being. Drawing on diverse perspectives from marketing, economics, philosophy, neuroscience, and psychology, we explore how consumers' sense of autonomy in making choices affects their well-being. We discuss how new technologies may enhance or diminish consumers' perceptions of being in control of their choices and how either of those can, in turn, enhance of detract from consumer well-being. Building on this, we identify open research questions in the domain of choice, well-being, and consumer welfare, and suggest avenues for future research.

Keywords Artifical Intelligence · Automation · Consumer Autonomy · Big Data · Consumer Choice · Micro-targeting

1 Introduction

Today's consumers face more choice options and more information about these options than ever before. According to the standard economic perspective of utility theory, this development should help consumers find and choose options that best suit their needs, allowing them to lower their search costs and increase the utility they derive from their choices [4, 42, 61, 62]. Marketers, researchers, and policy makers generally assume that lowering search, transaction, and decision-making costs empowers consumers and increases consumer welfare [67]. Sophisticated algorithms plowing through vast amounts of consumer data, for example, allow online marketers to serve up just the right product or service, relieving consumers not only of the costs of searching but also of the unpleasant and difficult tradeoffs, which consumer choice often entails [3, 49, 60]. Consider, for example, content recommendation systems such as those of Outbrain or Taboola, or content management systems such as that of Netflix or Amazon, which utilize big data and artificial intelligence for behavioral targeting. Such systems propose content that a person is likely to enjoy consuming given their current choice, allowing consumers to effortlessly discover content of interest. As another example, autonomous cars (e.g., Mobileye and Google) not only take over the arduous task of driving but they are also expected to be capable of learning to predict the preferences of different drivers for what type of route to take or what type of driving style to adopt. Rapid technological advances are also changing how the internet of things [30] affects consumption,

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whether it is thermostats that learn about users' temperature preferences (e.g., Google's Nest) or voice-recognition systems that listen to and fulfill consumers stated desires and can learn to predict their needs and preferences (e.g., Amazon's Alexa, Google's Home, or Apple's Siri).

In this speculative review article, we identify a potential paradox that can characterize choice in the age of automation, of artificial intelligence, and data-driven marketing (while this article focuses on marketing contexts, note that these issues have important implications in numerous other domains such as health care and care for the elderly).We contend that some of the welfare-enhancing benefits of those technologies can backfire and generate consumer reactance if they undermine the sense of autonomy that consumers seek in their decision-making. That may occur when consumers feel deprived of their ability to control their own choices: predictive algorithms are getting better and better at anticipating consumers' preferences, and decision-making aids are often too opaque for consumers to understand (how they might influence preferences and decisions). Autonomous devices (such as smart cars or home automation solutions) offer the opportunity to eliminate costly consumer input altogether from certain decision environments—these devices can reduce or even eliminate the effort that a consumer must invest in choosing. The outcomes, derived from vast amounts of data about the consumer in question as well as about other consumers and the environmental context, may often correspond to consumers' preferences more closely than if they themselves had chosen. A self-driving car can get a person to a desired location faster, with less effort, and more safely than if the consumer were controlling the vehicle. Yet, consumers seem ambivalent about self-driving cars, with many focusing on the efficiency gains but others reluctant to relinquish the driver's seat [50]. More generally, we consider conditions under which, rather than feeling more empowered in their choices, consumers may feel more alienated from their ability to choose and the impact this technological change may have on consumer well-being.

Drawing on a variety of perspectives, from philosophy to neuroscience, we provide a brief overview of extant research on consumers' perceptions of choice and autonomy, discuss findings relevant to some of the unprecedented changes in the choice settings that consumers now face, and identify directions for future research that are important to consumers, managers, and policy makers. We cover this in four sections. First, we briefly review research that explores consumers' pervasive beliefs in the autonomy of their actions and choices. Second, we discuss benefits of consumer autonomy and the benefits of choice for consumer well-being. The third section identifies circumstances under which choice can backfire and outlines psychological processes through which consumers can be harmed by choosing and feeling a sense of autonomy. Finally, we as khow recent technological advances may affect consumers' perceptions of autonomy and well-being and suggest avenues for future research and applications.

2 The Need for Autonomy in Consumer Choice

Researchers from different academic quarters such as philosophy, psychology, and consumer research have investigated people's need for autonomy, and in doing so, have used different terminologies: while some directly use autonomy, others have relied on constructs such as self-determination or free will. In our investigation, we treat those constructs are interchangeable and use them broadly as referring to one's ability to "be [one's] own person, and to be directed by considerations, desires, conditions, and characteristics that are not simply externally imposed upon one, but are part of what can somehow be considered one's authentic self"[19]. Autonomy provides a foundation to personhood, giving rise to notions of morality, character, ethics, or virtue [28]. As such, autonomy in choice is akin to exercising free will, and self-determination is a state of exercising one's autonomy. When describing extant research in this section, however, we rely on the same terminology as the authors.

Consumers think of themselves and their actions *as if* they had free will [68], to the point that they consider the existence of free will self-evident [9] and exhibit unshakeable confidence in its existence [73]. They think about the processes that lead them to a particular choice in terms of deliberation and intentionality, see their own actions as internally driven and motivated [69], and come up with internally consistent reasons when the true drivers of choice are not immediately available to them [45]. Even when other people's actions are described as driven by external circumstances, people are still motivated to ascribe intent and responsibility [20].

Why would consumers appear to have such an unshakeable belief in their own free will, and why do they, when prompted, describe their actions as resulting from deliberate choices and autonomous decisions? One stream of research views consumers' belief in free will as a basic tenet of human psychology. DeCharms [22] proposed the concept of personal causation, which refers to people's tendency to take ownership of their actions and to attribute favorable outcomes to their own actions. Nuttin [48] proposed that this tendency is hedonically motivated, and that people experience causality pleasure, a positive affect derived from personally causing an event, independently of the affect associated with the event itself. In other words, he proposed that people derive pleasure from seeing the impact of their actions on the world. His theory was refined by Deci and Ryan [24], who found the experience

of causality pleasure to be motivated by two basic psychological needs: the need for competence—the ability to impact the world in meaningful ways, and the need for autonomy—doing so in self-determined and autonomous ways. From this perspective, the impetus to choose and feel ownership of one's choices is drivenby the resulting positive affect.

A second research stream takes a functional approach to understanding people's belief in their free will, self-determination, and autonomy. Baumeister et al. [7] propose that the belief in self-determined choices is a higher-order cognitive function that allows people to correct their behavior over time and align their choices with their long-term goals by providing them with a sense of continuity in intertemporal choices and a sense of ownership in moral dilemmas [72]. Similarly, Wegner [68] argues that the perception of their own free will allows people to develop a sense of self and of moral responsibility. As people experience continuity between their beliefs, thoughts, actions, and the outcomes that result from them, they can experience pride and closure when their actions are consistent with those beliefs and thoughts. Similarly, they can feel guilt, shame, and regret when their actions are inconsistent with their beliefs and thoughts. In contrast to the previous view, the belief in self-determination evolved to facilitate self-regulation rather than serving hedonic purposes.

In light of the functional importance of people's beliefs in the autonomy of their own decision-making, one may wonder why these beliefs and perceptions are not constantly salient to them. Although people make hundreds of decisions every day, they are likely to spontaneously describe only few of those as choices; and among those self-described as choices, even fewer are expected to generate the subjective experience of autonomy. The two views presented above inform us about the types of decisions that give rise to a feeling of autonomy.

According to the self-determination perspective, the belief in free will responds to a need to connect one's thoughts and desires to outcomes—a choice is an action that has "apparent mental causation," for which one's thoughts are seen as the "cause of the act" [69]. Being free to choose from among multiple options in the pursuit of a goal (for instance, choosing one of several different ways to complete a task) imbues people with a sense of autonomy, which can generate positive affect and a heightened sense of motivation [24]. Conversely, feeling restrictions in choice has been shown to undermine people's motivation and to elicit psychological reactance [15]. As such, any action that is internally and freely motivated and has discernable impact on the world is susceptible to fulfill consumers' need for autonomy, but the conscious awareness of the act of choosing and of not being restricted in one's decision-making are key to making the experience of autonomy salient.

The second perspective, which construes the experience of free will as an adaptive process underpinning self-regulation, entails a more restrictive view that the subjective experience of autonomy emerges from decisions involving an intertemporal or moral conflict [72]. Because such decisions require acknowledging a contradiction between multiple selves (e.g., the "impatient" vs. the "patient" self, the "selfish" vs. the "selfless," the "good" vs. the "evil") [5, 66], they make salient the mental process that arbitrates between the two options. In contrast, decisions that do not imply any form of struggle or internal conflict do not necessitate the resolution of the conflict, and the mental processes of the decisions remain inconspicuous to the person.

These two perspectives, which have yet to be experimentally pitted against one another, have different implications for choice architecture, marketing, and public policy. Consider the example mentioned in the introduction: a car manufacturer trying to promote self-driving cars. The manufacturer would want to avoid generating perceptions among users that they renounce their autonomy by being transported in such a vehicle. According to the first perspective (apparent mental causation), this could include assurances that users may still take control of the vehicle if they so choose to do so to avoid reactance or giving consumers the opportunity to customize features of the self-driving algorithm (driving style, choice of roads, etc.). On the other hand, if a feeling of struggle and conflict is the key to generating a sense of agency, then the manufacturer may paradoxically be better off emphasizing moral aspects of renouncing to drive a car; for example, by choosing to let a computer drive the vehicle, the consumer contributes to making the roads safer and transportation more energy efficient.

3 Benefits of Experiencing Autonomy in Consumer Choice

Can a heightened or a diminished sense of autonomy affect consumers' experienced utility of choice outcomes and consumer well-being beyond addressing the basic need for autonomy? In the present section, we review the various benefits that arise from the subjective experience of autonomy in choice.

Utility from Positive Self-Attributions Feeling in control of one's choices facilitates the attribution of positive outcomes to the self, leading to heightened feelings of competence and greater levels of positive affect. People have been shown to feel a greater sense of responsibility for positive outcomes when the chain of causality linking their thoughts, actions, and the outcome is conspicuous [26]. For example, in situations requiring self-control (such as choosing between a tasty but unhealthy dessert vs. a healthier but less tasty one), a sense of agency can help consumers resist the temptation. Resisting temptation and choosing the virtuous option may provide a positive self-signal to consumers of their willpower and sense

of virtuousness, enhancing the utility of the chose option, whereas giving in to temptation signals a lack of willpower and reduces the utility of the chosen option [25].

Utility from Agency Beyond utility from positive self-attributions, consumer preferences for product customization, or even making the product themselves, can be understood as a quest for autonomy and competence, which helps derive more utility from consumption. The well-known "IKEA Effect" (Mochon et al. [46, 53]), for example, illustrates that consumers derive more pleasure from making certain products themselves than from purchasing them and that this also enhances evaluations of the products.

Finally, choice allows dissonance reduction mechanisms to kick in, which in turn enhance the satisfaction consumers derive from the chosen option: the experience of freely choosing leads consumer to bolster the features of the preferred option and to minimize the attractiveness of the non-preferred option [13]. Similarly, people have been shown to derive more satisfaction from consuming hedonic products when they hadmade the choice themselves, compared to when the choice was made by an expert [11].

A heightened sense of control in one's life can have far-reaching implications for physical health and other physiological outcomes, in addition to the psychological consequences. In a classic experiment, nursing home residents who were told that they were responsible for their own well-being, and were assigned slightly more responsibility—given control over the care of a plant—showed significant improvement in alertness, active participation, and overall well-being [40]. In contrast, residents who were told that the staff was responsible for their well-being and who were only given the opportunity to tell the staff how the plant should be taken care of (without enacting those choices) did not show such improvements. This empirical finding suggests that feeling in control over one's life can have important consequences: among individuals living in very similar conditions, those who perceive their environment as empowering and enact (rather than merely state) their preferences experience a higher quality of life.

Utility from Meaning The prediction that attributing behavior to one's own free choices can affect behavioral outcomes has also been supported in a study of hotel housekeeping staff. In this field experiment, one half of the staff (but not the other) were told that the physical activities that their job entailed (changing sheets, scrubbing bathrooms, vacuuming the floor) met the surgeon general's guidelines for daily exercise, thus providing the staff with a reason for why they would choose to engage in these activities. Remarkably, a few months afterwards, those in the treatment group had lost more weight and had a lower blood pressure [21]. Reminiscent of other types of placebo responses [39, 59], these results suggest that understanding of the modality and implications of an action can alter its physical consequences, and highlights the importance of communicating intent when designing public policies. This point has interesting implications for the design of customized policies and advertisements: it is more and more and more common for communications to be data-driven, and to target individual consumers based on their past purchases or browsing history. From the observations that understanding the modalities and implications of an action has benefits, we wonder whether making consumers aware of the reason for a particular recommendation (or advertisements) may increase the take-up rate (click-through rate). For instance, making explicit that a nutrition ad is displayed because the consumers expressed an interest in joining a gym could increase the persuasiveness of the ad and the likelihood that it will influence behavior.

Lack of Perceived Self-Determination Finally, what happens if consumers do not feel and autonomous in their decision-making further testifies to the benefits of choice. At its most extreme level, a lack of self-determination can manifest when consumers are unable to control and make sense of crucial features of their environment. Research on learned helplessness has proposed that people confronted with their inability to influence a situation they strongly desire to change (e.g., repeatedly failing to find a job) will eventually withdraw and experience severe psychological pain [1, 44]. At a less extreme level, a series of studies has found that threatening consumers' belief in their own free will also have a variety of undesirable consequences such as reduced helpfulness and higher levels of aggression [6] and lower levels of self-control in intertemporal choices [52].These effects are driven by a weakened sense of personal responsibility, which provides a justification for behavior that would otherwise reflect negatively on the self. This is once again concerning from the perspective of data-driven marketing: if consumers entertain the belief that marketers' algorithm are getting more and more persuasive and are predictive of their own preferences, it could provide them with a justification to indulge more following tempting ads.

4 Costs of Experiencing Autonomy in Consumer Choice

Even though consumers generally prefer to view their decisions as self-determined, with important benefits such as those that we described, the act of choosing can also affect consumers negatively. Below, we discuss several such triggers of negative effects of perceived autonomy in consumer choice.

Tradeoff Conflict Choices often consist of trying to pick the best option (e.g., a product or service) from a set: as a first step, consumers review and compare attributes of the different options. This task is relatively easy if a dominant option

emerges from the choice set, one that is clearly superior to the others. In contrast, when no such option exists, this process of comparison is cognitively taxing and requires the consumer to trade off and sacrifice some benefits in return for others (Alba et al. 1997; [49, 60]). This can result in a less satisfying consumption experience than if the same product had been consumed without choosing it from other options [31].

Ease of Choice Although tradeoff conflict exacts cognitive costs from decision makers, consumers sometimes seem to desire to engage in making tradeoffs even though they would be better off adopting a satisficing strategy [10] or when there is a seemingly dominant choice option [56]. This observation has mixed implications for consumer welfare in the age of artificial intelligence and big data. On the one hand, personalized, targeted recommendations increase the likelihood that the first option presented to the consumer will meet the satisfaction threshold and therefore reduce the likelihood that consumers engage in comparison shopping. On the other hand, the breadth and convenience of search engines and comparison websites is making it easier for consumers to view a large range of products, which may both decrease the likelihood that a product will be purchased and the satisfaction the consumers will have with the product.

Option Attachment Even when consumers do not explicitly compare attributes (when evaluating options in a sequential manner, for instance), they often imagine how they might use a product, or what the experience would feel like. Such mental simulation and elaboration to inform to actively support the choice process triggers a sense of mental endowment of the options in the choice set, which induces a sense of loss once an option is foregone for another. This effect of "option attachment," triggered by the choice process, can then lead consumers to bolster the value of the foregone options and feel less confident about having made the right choice [16].

Choice Overload The act of choosing may also negatively impact consumers' motivation. When options are plentiful, the act of choosing may become effortful, and consumers might be discouraged from choosing altogether. In a well-known study, a tasting booth for jams attracted more people when it offered 24 different options than when it offered 6, but there were more purchases from the set with 6 options than from the set with 24 options [34]. This "choice overload" effect may however be restricted to situations, in which the consumers are unfamiliar with the options offered [18, 54]. More generally, people overestimate the benefits of choice: in deciding how much time they should devote to selecting a better option, they do not incorporate the temporal, cognitive, and emotional costs of searching and of thinking. All too often, the small benefits people get from selecting a marginally better option do not offset the time and effort invested in finding it, and choosing ends up being a dissatisfying experience.

Guilt from Choices between Bads Consumers' desire for autonomy can have dramatic negative consequences when they are faced with important decisions in which no choice is consistent with their preferences. Botti et al. [12] interviewed parents whose children died in neonatal intensive care units (NICUs) to investigate the links between autonomy in the choice process and emotional well-being. Specifically, they used a natural difference between the French and the American health care systems: in France, physicians decide on the parents' behalf whether to continue or withdraw life-sustaining treatments, while in the USA, the physicians only offer that option and the parents have to make the final decision. The authors' findings revealed critical differences between the two groups: French parents reported experiencing less emotional distress and coped with grief and bereavement better than their American counterparts who had to make the final decision themselves. The American parents reported higher levels of guilt and self-blame. They felt a greater sense of responsibility for interrupting the life-sustaining treatment and had a harder time reaching a sense of closure with their decision, often doubting that they had made the right choice. Critically, parents had an ambivalent attitude regarding the choice process: the majority of French parents were grateful to the doctors for making the decision, but some wished they had been more involved in the choice to interrupt the treatment. In sharp contrast, American parents expressed anger and pain at the medical staff for forcing them to make such a difficult decision. This extreme example shows that even though most consumers desire choice a priori, in some circumstances, they wish a posteriori to be freed from the emotional burden of choice and its consequences. In the marketing domain, this finding could inspire interventions regarding dissatisfied consumers: if a firm openly claims responsibility for a negative consumer experience, it could paradoxically lead to less negative affect, and a higher likelihood of subsequent purchases.

Ultimately, the same processes that allow consumers to derive pride and satisfaction from self-determined choices (a sense of personal responsibility and of ownership of the decision) can lead to guilt and dissatisfaction when the outcome of a choice is negative. Providing consumers with a limited sense of autonomy can thus, paradoxically, empower them and increase their well-being and motivation. For instance, choosing a dessert at a restaurant in which all the "healthy options" are out of stock will allow consumers to enjoy the full hedonic experience of a chocolate cake without the guilt that would be associated with an autonomous decision [17, 25]. In the same way, acknowledging a limited sense of autonomy in others can have positive consequences and make people more forgiving: a weaker belief in free will has been shown to predict less retributive attitudes regarding punishment of criminals or other deviant behavior [58].

5 Research Directions in Well-Being, Autonomy, and Choice

The key questions that emerge from our discussion of the need to experience autonomy in consumer choice are whether and how the rapid automation of marketing and consumption technologies might affect that experience and its consequences. An important related question is what the boundary conditions are and under which an enhanced or diminished sense of autonomy may have positive or negative effects. We offer these questions as a simple initial framework, derived from our discussion of the effects of autonomy, to guide and refine researchers' emerging conceptualizations of the effects of automation on consumer well-being. Our main objective is to caution marketers and technology enthusiasts to consider carefully how automation may affect an important driver of consumer well-being: experienced autonomy in consumer choice. We begin to answer these questions by identifying a variety of potentially interesting areas of inquiry.

Boundary Conditions of the Preference for Autonomy in Choice An important goal for future research is to explore contextual, cultural, and even individual differences in the preference for autonomous choices. Existing research highlights some factors that moderate the importance of self-determined choices. For instance, consumers who are high on reactance-orientation are known to react more negatively to circumstances in which their ability to make autonomous choices is restricted [27, 57, 70]. On the other hand, Markus and Kitayama [43] argued that consumers with a collective self-construal are more satisfied when an in-group member chooses on their behalf than when they choose themselves. Such differences have implications for policies and interventions aimed at maximizing consumers' well-being. For example, they suggest that a policy that may be well-received in an individualistic culture such as the USA might not be as successful in more collectivist cultures such as China. That said, other moderators of consumers' need for autonomy in choice have not received much attention. At the individual level, variables such as self-esteem or lay theories consumers hold about free will are likely to matter. Contextual factors such as the trust in the person or institution making the choice on one's behalf (e.g., a stranger vs. a friend), how strongly the choice is connected to one's identity (e.g., a luxury product vs. a routine purchase), the level of competence that one feels in the choice context (e.g., a medical decision vs. a choice of movie), or the affective state (e.g., feeling anxious vs. calm) may affect consumers' preferences for self-driven choices.

Effects of the Need for Autonomy on Consumer Choice The standard expected utility framework portrays consumers as driven to choose the best option from a set, subject to a budget or other constraint [23] and much research on choice focuses on perceptions of the hedonic consequences and the utility of the choice options [36]. Yet, the pursuit of optimal choice options cannot fully explain the desire for choice. The strength and pervasiveness of people's belief in free will suggest that it is an important contributing factor to their well-being that consumers perceive their choice processes as autonomous, even if these choice processes are effortful and do not always lead to optimal decisions and outcomes. Robert Nozick's [47] famous thought experiment provides some intuition: Most people would rather not want to exchange their everyday reality for being put in an experience machine, which stimulates the brain to produce simulated pleasurable experiences without the hard work required to generate these experiences.

The realization that consumers are not only driven by hedonism but also by a desire for autonomy has implications for marketing, as it suggests that consumers are willing to sacrifice hedonic utility to bolster self-relevant values. For instance, Schrift et al. [55] find that making salient to consumers that their choices are predictable can lead them to choose less-preferred options in a consumption context. Specifically, when consumers believe that a computer program can predict their choices based on their measured preferences, they choose less-preferred options, consistent with a desire to reaffirm their autonomy. In contrast, when consumers are told that a computer program can determine how consistent their choices are with their measured preferences, they do not deviate from their most-preferred options. This effect is specific to the act of choosing: when consumers are asked to rank the options from the most to the least preferred, predictability does not lead them to deviate from their preferences. This finding may have significant implications for the design of recommendation algorithms, as it suggests that framing consumers' tastes and preferences as "predictable" could paradoxically lead to behaviors making the algorithms less accurate.

We call for more investigations of how consumers trade off hedonic and autonomy-driven motives—when do consumers sacrifice preferred choice options to assert their autonomy, and when does the quest for pleasure, comfort, and convenience dominate their choices? We believe that micro-targeting and data-driven marketing provide us with interesting settings to study this tension. For instance, algorithms that can predict our most preferred products or services by passively learning our preferences are very likely to be judged practical and convenient in most settings. However, we also believe that this service will be aversive in situations where consumers seek to explore or reveal their own preferences and nature through their choices [38]. Thus, people might not defer choices to such algorithms that are relevant to their identity such as whom to date, which charity to donate to, or which church to join. Similarly, researchers have pointed out that Netflix' focus on its own content productions without streaming many classic movies (in contrast to the offers from its DVD distribution service) may shape consumer preferences for entertainment without allowing consumers to more actively and deliberately

develop and train their own entertainment preferences or develop cultural tastes and capital [29].

Psychological Reductionism of Marketing Automation

Beyond consumers' inclination to reveal their own preferences, data-driven marketing is inherently reductive in its description of consumer behavior, and little research has explored those limitations. Data-driven marketing mostly focuses on behavior, at the expense of higher-order psychological processes such as preferences, emotions, and moral judgments: a machine that analyzes revealed consumer preferences from Google searches or browsing history on Amazon may ignore mental processes that lead to individual behavior. This is particularly important in contexts where consumers have aspirational preferences that might differ from the preferences suggested by their past behavior. Those "metapreferences," or "preferences over preferences" [28, 35], are apparent in the case of a smoker trying to quit, who would have an immediate preference for cigarettes, yet a metapreference for not preferring to smoke; or a person who sits in front of his TV every night but wishes he would read more books instead. The link between preferences and metapreference soften reflects the inherent tension discussed above between hedonism and autonomy, or between who the person is now and the ideal representation that the individual has of herself and would like to be. Ignoring metapreferences (which may be inaccessible to the algorithm) and instead focusing on the preferences suggested by past choices, data-driven marketing might deprive consumers of the ability to improve their own character and encourage them to repeat choices that they would wish not to make again. A recovering smoker with a long history of search and purchases of cigarettes would find herself constantly reminded of her vice, which might increase the probability of a relapse.

Automation and data-driven marketing practices might also detract from consumers' autonomy by depriving them of opportunities to introspect about their preferences. Both aim at streamlining choice processes and offering consumers a customized set of attractive options from which they can easily sample, thereby eliminating difficult deliberation or painful tradeoffs. While spending much time choosing can put off consumers, it nonetheless has implications for consumers' autonomy. For instance, research conducted on American voters found that while they believe that the content of a policy should weigh more than the party championing it, their votes are driven more by party affiliations than by policy content. However, asking people to introspect on this belief leads them to choose in a way that is better aligned with their preferences and to place more weight on the policy content when making their choice [32]. Importantly, an algorithm trained on past consumer votes would have recommended supporting policies that are consistent with the party line, not with the actual content of the policy. Furthermore, the opacity of those algorithms is such that voters would often not know why those policies were recommended to them in the first place. Relatedly, note that some platforms have started sharing the rationale for their recommendations: on Facebook, consumers can now click the "why am I seeing this?" button to learn more about the reasons why they were targeted by a particular advertisement (e.g., "you are a white female younger than 40," "you have liked the page Marketing Research on Facebook"). Beyond the ethical character of this decision, we wonder if such information can enhance consumers' satisfaction with using recommendation algorithm.

Finally, much attention has been devoted to reinforcing effects of algorithmically curated content on consumers' beliefs and behaviors, with many reporters, citizens, and scholars arguing that people now live in "information bubbles" that suppress dissonant facts and promote groupthink [8, 37]. However, less attention has been devoted the possibility that automated curation based on past preferences would make a given individual's opinions and preferences more stable over time than they would normally be. Contrary to what common wisdom suggests, individuals' personality and tastes continue to change significantly through adulthood [51]. However, an algorithm predicated on best predicting consumers' current taste would encourage repetition of past behavioral patterns, and make exposure to unusual, serendipitous content less likely. Because of their narrow focus on past choices, those recommendations could force consumers into more predictable patterns of consumption and deprive them of their ability to evolve over time, or at the very least reduce the likelihood of radical changes in their tastes.

Similarly to how the advent of social media has spurred a rich stream of research on consumers' privacy concerns (see [2] for a review), we call for the study of consumers' beliefs about recommendation algorithms, automation, and data-driven marketing, and to contrast them with their actual effects on hedonic and non-hedonic well-being. The tension between convenience and satisfaction from use is central to successful product and policy design: automation is rife with opportunities to make products more convenient and easier to use. Being data-driven might make consumer choice easier and more convenient than before, and yet they might also risk threatening the non-hedonic benefits consumers derive from consumption. That said, we suspect that consumers and business practitioners alike may not foresee some of those negative consequences. In the same way that a lack of concern for privacy is generally associated with a lack of understanding [14], the widespread adoption of recommendation systems and the absence of concern over a potential loss of autonomy might reflect consumers' limited grasp of the stakes.

On the practitioners' side, the use of artificial intelligence in marketing practices has serious implications for our understanding of marketing ethics, and is posing unique challenges to managers and lawmakers. First, autonomy has often been treated as the yardstick of business practices [33]: if the

consumer cannot give explicit consent, the contract is unethical (and often illegal). As we have discussed in this article, however, autonomy has multiple facets, and data-driven marketing is simultaneously bolstering some and threatening others. Second, recent discussions on the ethics of nudging [63–65, 71] have stressed the importance of intent, and that what separates a nudge from a manipulative practice is often the intent of the person promoting it [41]. In the context of algorithmic practices, however, this notion may become obsolete. A bank using a machine-learning algorithm to identify and target potential prospects may find itself preying on vulnerable segments, as the algorithm learns that those consumers are less likely to bring profit to the company. Similarly, the algorithm might also learn to discriminate against certain consumers of a certain ethnicity, which would be illegal in most countries. However, it would be impossible to assign intent to the algorithm and therefore difficult to argue that the practice is predatory or discriminatory.

In conclusion, we hope that this article will help sensitize researchers and practitioners, consumers, and policy makers to the significance of perceived autonomy in consumer choice in the age of artificial intelligence and big data and spur research on this important topic. Increasing levels of automation of consumer chores (e.g., in smart homes and in self-driving cars) and of automation of marketing in big-data-driven micro-targeting (e.g., with personalized content recommendation algorithms) are undoubtedly helping empower consumers by increasing their convenience and safety, lowering their search costs, and more optimally satisfying their preferences [67]. At the same time, the benefits of such automation make questioning its effects on consumer autonomy and well-being more important than ever.

Compliance with Ethical Standards

Conflict of Interest The author declare that they have no competing interest.

References

1. Abramson LY, Seligman ME, Teasdale JD (1978) Learned helplessness in humans: critique and reformulation. J Abnorm Psychol 87(1):49–74. https://doi.org/10.1037/0021-843X.87.1.49
2. Acquisti A, Brandimarte L, Loewenstein G (2015) Privacy and human behavior in the age of information. Science 347(6221): 509–514. https://doi.org/10.1126/science.aaa1465
3. Alba J, Lynch J, Weitz B, Janiszewski C, Lutz R, Sawyer A, & Wood S (1997). Interactive home shopping: consumer, retailer, and manufacturer incentives to participate in electronic marketplaces. The Journal of Marketing, 38-53.
4. Bakos JY (1997) Reducing buyer search costs: implications for electronic marketplaces. Manag Sci 43(12):1676–1692. https://doi.org/10.1287/mnsc.43.12.1676
5. Bartels DM, Urminsky O (2011) On intertemporal selfishness: how the perceived instability of identity underlies impatient consumption. J Consum Res 38(June):182–198
6. Baumeister RF, Masicampo EJ, Nathan DeWall C (2009) Prosocial benefits of feeling free: disbelief in free will increases aggression and reduces helpfulness. Personal Soc Psychol Bull 35(2):260–268. https://doi.org/10.1177/0146167208327217
7. Baumeister RF, Sparks EA, Stillman TF, Vohs KD (2008) Free will in consumer behavior: self-control, ego depletion, and choice. J Consum Psychol 18(1):4–13. https://doi.org/10.1016/j.jcps.2007.10.002
8. Bakshy E, Messing S, Adamic LA (2015) Exposure to ideologically diverse news and opinion on Facebook. Science 348(6239): 1130–1132. https://doi.org/10.1126/science.aaa1160
9. Bloom P (2009) Descartes' baby: how the science of child development explains what makes us human. Books, Basic
10. Botti S, Hsee CK (2010) Dazed and confused by choice: how the temporal costs of choice freedom lead to undesirable outcomes. Organ Behav Hum Decis Process 112(2):161–171. https://doi.org/10.1016/j.obhdp.2010.03.002
11. Botti S, McGill AL (2011) The locus of choice: personal causality and satisfaction with hedonic and utilitarian decisions. J Consum Res 37(6):1065–1078. https://doi.org/10.1086/656570
12. Botti S, Orfali K, Iyengar SS (2009) Tragic choices: autonomy and emotional responses to medical decisions. J Consum Res 36(3): 337–352. https://doi.org/10.1086/598969
13. Botti S, McGill AL (2006) When choosing is not deciding: the effect of perceived responsibility on satisfaction. J Consum Res 33(2):211–219. https://doi.org/10.1086/506302
14. Brandimarte L, Acquisti A, Loewenstein G (2013) Misplaced confidences: privacy and the control paradox. Soc Psychol Personal Sci 4(3):340–347. https://doi.org/10.1177/1948550612455931
15. Brehm JW (1966) A theory of psychological reactance. Academic Press, Oxford
16. Carmon Z, Wertenbroch K, Zeelenberg M (2003) Option attachment: when deliberating makes choosing feel like losing. J Consum Res 30(1):15–29. https://doi.org/10.1086/374701
17. Chen F, Sengupta J (2014) Forced to be bad: the positive impact of low-autonomy vice consumption on consumer vitality. J Consum Res 41(4):1089–1107. https://doi.org/10.1086/678321
18. Chernev A, Böckenholt U, Goodman J (2015) Choice overload: a conceptual review and meta-analysis. J Consum Psychol 25(2): 333–358. https://doi.org/10.1016/j.jcps.2014.08.002
19. Christman, John (2015), "Autonomy in moral and political philosophy," in The Stanford encyclopedia of philosophy, E. N. Zalta, ed., Metaphysics Research Lab, Stanford University
20. Clark CJ, Luguri JB, Ditto PH, Knobe J, Shariff AF, Baumeister RF (2014) Free to punish: a motivated account of free will belief. J Pers Soc Psychol 106(4):501–513. https://doi.org/10.1037/a0035880
21. Crum AJ, Langer EJ (2007) Mind-set matters: exercise and the placebo effect. Psychol Sci 18(2):165–171. https://doi.org/10.1111/j.1467-9280.2007.01867.x
22. deCharms R (1968) Personal Causation. York, New
23. Deaton A, Muellbauer J (1980) Economics and consumer behavior. Cambridge University Press, New York. https://doi.org/10.1017/CBO9780511805653
24. Deci EL, Ryan RM (2000) The 'what' and 'why' of goal pursuits: human needs and the self-determination of behavior. Psychol Inq 11(4):227–268. https://doi.org/10.1207/S15327965PLI1104_01

25. Dhar R, Wertenbroch K (2012) Self-signaling and the costs and benefits of temptation in consumer choice. J Mark Res 49(February):15–25. https://doi.org/10.1509/jmr.10.0490
26. Feather NT, Simon JG (1971) Causal attributions for success and failure in relation to expectations of success based upon selective or manipulative control. J Pers 39(4):527–541. https://doi.org/10.1111/j.1467-6494.1971.tb00060.x
27. Fitzsimons GJ, Lehmann DR (2004) Reactance to recommendations: when unsolicited advice yields contrary responses. Mark Sci 23(1):82–94. https://doi.org/10.1287/mksc.1030.0033
28. Frankfurt HG (1971) Freedom of the will and the concept of a person. J Philos 68(1):5–20. https://doi.org/10.2307/2024717
29. Gilchrist, Duncan,and Michael Luca (2017), "How Netflix's content strategy is reshaping movie culture," *Harvard Business Review*, August 31
30. Hoffman DL, Novak TP (2015) "Emergent experience and the connected consumer in the smart home assemblage and the Internet of things," SSRN scholarly paper. Social Science Research Network, Rochester, NY. https://doi.org/10.2139/ssrn.2648786
31. Hsee CK, Leclerc F (1998) Will products look more attractive when presented separately or together? J Consum Res 25(2):175–186. https://doi.org/10.1086/209534
32. Huber, Michaela. and Leafvan Boven (2010), "From mindless to mindful choice; reflecting on Decision Processes: how introspection can improve judgment and decision making"
33. Hunt SD, Vitell S (1986) A general theory of marketing ethics. J Macromarketing 6(1):5–16. https://doi.org/10.1177/027614678600600103
34. Iyengar SS, Lepper MR (2000) When choice is demotivating: can one desire too much of a good thing? J Pers Soc Psychol 79(6):995–1006. https://doi.org/10.1037/0022-3514.79.6.995
35. Jeffrey RC (1974) Preference among preferences. J Philos 71(13):377–391. https://doi.org/10.2307/2025160
36. Kahneman D, Tversky A (1979) Prospect theory: an analysis of decision under risk. Econometrica 47(March):263–291. https://doi.org/10.2307/1914185
37. Kaplan AM, Haenlein M (2010) Users of the world, unite! The challenges and opportunities of social media. Business Horizons 53(1):59–68. https://doi.org/10.1016/j.bushor.2009.09.003
38. Kim HS, Sherman DK (2007) ' Express yourself': culture and the effect of self-expression on choice. J Pers Soc Psychol 92(1):1–11. https://doi.org/10.1037/0022-3514.92.1.1
39. Kirsch I, Sapirstein G (1998) Listening to Prozac but hearing placebo: a meta-analysis of antidepressant medication. Prevent Treat 1(2a)
40. Langer EJ, Rodin J (1976) The effects of choice and enhanced personal responsibility for the aged: a field experiment in an institutional setting. J Pers Soc Psychol 34(2):191–198. https://doi.org/10.1037/0022-3514.34.2.191
41. Leonard TC, Thaler RH, Sunstein CR (2008) Nudge: improving decisions about health, wealth, and happiness. Constit Polit Econ 19(4):356–360. https://doi.org/10.1007/s10602-008-9056-2
42. Lynch JG, Ariely D (2000) Wine online: search costs affect competition on price, quality, and distribution. Mark Sci 19(1):83–103. https://doi.org/10.1287/mksc.19.1.83.15183
43. Markus HR, Kitayama S (2010) Cultures and selves: a cycle of mutual constitution. Perspect Psychol Sci 5(4):420–430. https://doi.org/10.1177/1745691610375557
44. Maier SF, Seligman ME (1976) Learned helplessness: theory and evidence. J Exp Psychol Gen 105(1):3–46. https://doi.org/10.1037/0096-3445.105.1.3
45. Nisbett RE, Wilson TD (1977) Telling more than we can know: verbal reports on mental processes. Psychol Rev 84(3):231–259. https://doi.org/10.1037/0033-295X.84.3.231
46. Mochon D, Norton MI, Ariely D (2012) Bolstering and restoring feelings of competence via the IKEA effect. Int J Res Market 29(4):363–369
47. Nozick R (1974) Anarchy, state, and utopia. Basic Books, New York
48. Nuttin, Joseph R. (1973), "Pleasure and reward in human motivation and learning," Pleasure, Reward, Preference, 243–74
49. Payne JW, Bettman JR, Johnson EJ (1988) Adaptive strategy selection in decision making. J Exp Psychol: Learn Mem Cogn 14(3):534–552. https://doi.org/10.1037/0278-7393.14.3.534
50. Payre W, Cestac J, Delhomme P (2014) Intention to use a fully automated car: attitudes and a priori acceptability. Transport Res F: Traffic Psychol Behav 27:252–263. https://doi.org/10.1016/j.trf.2014.04.009
51. Quoidbach J, Gilbert DT, Wilson TD (2013) The end of history illusion. Science 339(6115):96–98. https://doi.org/10.1126/science.1229294
52. Rigoni D, Kühn S, Gaudino G, Sartori G, & Brass M (2012) Reducing self-control by weakening belief in free will. Consciousness and cognition, 21(3), 1482-1490.
53. Sarstedt M, Neubert D, Barth K (2017) The IKEA Effect. A conceptual replication. J Market Behav 2(4):307–312
54. Scheibehenne B, Greifeneder R, Todd PM (2010) Can there ever be too many options? A meta-analytic review of choice overload. J Consum Res 37(3):409–425. https://doi.org/10.1086/651235
55. Schrift, Rom Y., Klaus Wertenbroch, Quentin André, and Douglas H. Frank (2017), "Threatening free will," Presentation at the Symposium on Alienation and Meaning in Production and Consumption, Technische Universität München
56. Schrift RY, Netzer O, Kivetz R (2011) Complicating choice. J Mark Res 48(2):308–326. https://doi.org/10.1509/jmkr.48.2.308
57. Seibel CA, Dowd ET (1999) Reactance and therapeutic noncompliance. Cogn Ther Res 23(4):373–379. https://doi.org/10.1023/A:1018751817046
58. Shariff AF, Greene JD, Karremans JC, Luguri JB, Clark CJ, Schooler JW & Vohs KD (2014) Free will and punishment: A mechanistic view of human nature reduces retribution. Psychological science, 25(8), 1563-1570.
59. Shiv B, Carmon Z, Ariely D (2005) Placebo effects of marketing actions: consumers may get what they pay for. J Mark Res 42(4):383–393. https://doi.org/10.1509/jmkr.2005.42.4.383
60. Shugan SM (1980) The cost of thinking. J Consum Res 7(September):99–111. https://doi.org/10.1086/208799
61. Stigler GJ (1961) The economics of information. J Polit Econ 69(3):213–225
62. Stigler GJ, Becker GS (1977) De Gustibus Non Est Disputandum. Am Econ Rev 67(2):76–90
63. Sunstein CR (2014) The ethics of nudging. In: SSRN scholarly paper. Social Science Research Network, Rochester, NY. https://doi.org/10.2139/ssrn.2526341
64. Sunstein CR (2016a) Fifty shades of manipulation. J Market Behav 1(3–4):213–244
65. Sunstein, Cass R. (2016b), The ethics of influence: government in the age of behavioral science, Cambridge University Press, DOI: https://doi.org/10.1017/CBO9781316493021
66. Thaler RH, & Shefrin HM (1981) An economic theory of self-control. Journal of political Economy, 89(2), 392-406.
67. Wathieu L, Brenner L, Carmon Z, Chattopadhyay A, Wertenbroch K, Drolet A, John G, Muthukrishnan AV, Novemsky N, Ratner R, Wu G (2002) Consumer control and empowerment: a primer. Mark Lett 13(August):297–305. https://doi.org/10.1023/A:1020311914022
68. Wegner DM (2004) Précis of the illusion of conscious will. Behav Brain Sci 27(5):649–659

69. Wegner DM, Wheatley T (1999) Apparent mental causation: sources of the experience of will. Am Psychol 54(7):480–492. https://doi.org/10.1037/0003-066X.54.7.480
70. Wendlandt M, Schrader U (2007) Consumer reactance against loyalty programs. J Consum Mark 24(5):293–304. https://doi.org/10.1108/07363760710773111
71. Wertenbroch K (2017) Consumer (mis)behavior and public policy intervention. In: Hanssens DM, Mizik N (eds) Handbook of marketing analytics with applications in marketing, public policy, and litigation. Edward Elgar Publishing, Northampton, MA forthcoming
72. Wertenbroch K, Vosgerau J, Bruyneel SD (2008) Free will, temptation, and self-control: we must believe in free will, we have no choice (Isaac B. Singer). J Consum Psychol 18(1):27–33. https://doi.org/10.1016/j.jcps.2007.10.006
73. Zheng Y, van Osselaer SMJ, Alba JW (2016) Belief in free will: implications for practice and policy. J Mark Res 53(6):1050–1064. https://doi.org/10.1509/jmr.15.0452