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Decision Traps: How Cognitive Biases Shape Irrational Consumer Choices

Abstract

This study explores the impact of cognitive biases on the decision-making process of consumers using behavioural economics and cognitive psychology frameworks. Based on dual-process theory, we focus on three main domains of decision bias: value evaluation biases (anchoring, framing effects, loss aversion), option evaluation biases (status quo bias, availability heuristic), and temporal judgment biases (hyperbolic discounting, projection bias). The meta-analysis of 83 studies on retail pricing reveals pervasive anchoring effects across product types (Cohen's d = 0.62-0.89) while field studies show framing of the same options differently leading to preference reversals in 38-54% of subjects. Asymmetric price demand response illustrates loss aversion, where demand declines 2.4 times more for price increases than increases for equivalent price drops. Certain biases are accentuated in online environments as more debiasing opportunities arise while environments amplify others, shown with selection rates for default settings seeing increases of 65-428% across e-commerce sites. Comparisons across 42 nations show significant divergence in the expression of bias where collectivist cultures displayed 1.4 times greater loss aversion than individualist cultures. With this evidence, traditional models of utility maximisation need refinement with the addition of heuristics and biases for marketplace analysis models if they are to effectively predict behaviour.

Keywords:cognitive bias; consumer decision-making; loss aversion; choice architecture; behavioral economics

1 Introduction

The human mind is both reasoning and irrational. Understanding these irrational behaviours dubbed as 'intentional analysis' by vt Mazijk involves a systematic method of analysing the thought processes behind observable actions [1]. Exploring consumer patterns through this lens helps understand the illogical behaviour that is rooted in classical economics theories that rely on rational thinking for expectation models. Consumers irrationally opt for cognitive biases which makes this subject matter interesting as it combines aspects of psychology that focus on controlled experimental settings with the outside world and everyday actions. This balance unifies the dichotomous framework of behavioural science by Jacobson [2].

The broad effects of psychological principles on human decision-making processes, at both an individual and societal level, have recently come to the attention of communication and behavioural science professionals. Understanding the psychology behind the so-called “irrational” choices people make is useful in designing more effective policies and programmes, as Maibach et al. point out in their systematic review of behaviour change communication [3]. The same insight applies to

Anja Vestergaard-Kirschbaum*
Email: a.vestergaard@ecbi.li
Affiliation: European School of Behavioral Economics, Fürst-Franz-Josef-Strasse 28, 9490 Vaduz, Liechtenstein

purchasing behaviours because a variety of cognitive biases distort buying patterns, perceptions of value, and evaluations of products. The digital transformation of consumer environments only adds to these problems by providing new environments for the expression of biases and new aids for analysis, as noted by Kopelovich et al. in their studies on technology-mediated behavioural interventions [4].

The balance between thinking and the unconscious brain is one of the highlights when explaining irrational consumer behaviours, the thought processes and motivations that lead to such behaviours. Kam's work on the unconscious alongside the conscious mind serves to explain how automatic and intuitive approaches, also known as System 1 thinking, often supplant more reasoned frameworks, System 2 thinking, in consumer situations [5]. This two-track strategy explains contradictions, an example being why consumers make choices that go against their declared preferences or economic self-interest. Decisions made by consumers are in addition shaped by self-regulatory processes, with newer studies from Sawada and Fujiwara showing how digestion might interact with cognitive function and how it could affect decision-making processes in ways that remain largely untapped [6].

From an evolutionary standpoint, Bragazzi et al.'s work claim that a large portion of cognitive biases were heuristics that evolved from primitive environments to allow quicker decisions, where they could be useful for survival [7]. These same cognitive shortcuts, when applied, result in flawed decisions in today's resource-rich but intricate and heavily marketed environments. Neurobiological studies, including Shobako et al.'s work on cognitive function, provide evidence that certain pathways in the brain are designed to handle decision-making that fall prey to predisposed systematic irregularities [8]. Uysal's account of these enduring, non-random biases among diverse populations of consumers provides support to his findings on the functional neuroanatomy of biases explained, while suggesting an underlying framework for their non-random distribution [9].

The most recent integrative strategies acknowledge that biases in consumer behaviour are influenced by an interplay of psychological, neurological, and environmental factors. Al-Beltagi et al.'s work on individual differences illustrates the role of cognitive processing in bias susceptibility [10]. This more comprehensive view still draws on Tolman's work on behaviour and motivation, which defied stimulus-response models of human decision-making [11]. The specific aims of this paper are to analyse the cognitive biases that affect consumer purchasing decisions, along with addressing the mechanisms and effects of the biases, concentrating primarily on the effects of anchoring, framing, loss aversion, and status quo bias.

2 Theoretical Framework and Cognitive Bias Mechanisms

The approach to studying consumer decision-making has completely changed over the last four decades, moving from models based on rational utility optimisations to systematic frameworks which acknowledge cognitive limitations. Where traditional economic thought entertained a "homo-economicus" idealised 'economic man', capable of comprehensive information evaluation and unwavering preference sequencing, behavioural economics today understands decision-making as deeply

Anja Vestergaard-Kirschbaum*
Email: a.vestergaard@ecbi.li
Affiliation: European School of Behavioral Economics, Fürst-Franz-Josef-Strasse 28, 9490 Vaduz, Liechtenstein

diverging from the perfectly rational frameworks. This shift has occurred due to increasing empirical evidence suggesting that consumers in fact, habitually breach the axioms of expected utility theory in the presence of choice.

Exploring both the behavioural and cognitive theories explains rationality gaps using the dual process theory of cognition which posits two distinct modes of thinking. Processes of system 1 function algorithmically, instantly, and require minimal mental energy—thinking based on memory and emotion. In contrast, system 2 processes are slower, require more resources, more demanding, thus enabling logic and reasoning, and evidence appraisal. Decisions are made almost exclusively from System 1 operations, with System 2 acting as a monitor that sometimes steps in to validate or override intuitive judgments. While this cognitive structure is largely beneficial, it has consistent weaknesses, or gaps concerning particular forms of decision bias, depicted in Figure 1.

As per Figure 1, the cognitive influencers impacting consumer behaviour biases may be grouped into three overarching spheres. To begin with, value assessment biases… Evaluation of product features by consumers is impactful and often misleading, owing to the distortion effect attributed to price. A classic example is the anchoring effect, which explains how initial information, regardless of its relevance, affects and shapes subsequent evaluation disproportionally. To provide an example, those consumers who first encounter a highly priced item will subsequently view mid-range priced products as more economically priced compared to those who were exposed to a low priced anchor first. Also, framing bias demonstrates loss of intra-option preference coherence whereby consumers tend to respond more positively to framed options as gains, ("90% fat-free") rather than equivalent losses ('contains 10% fat').

Perhaps the most far-reaching consumer bias is loss aversion, which concerns the disproportionate distortion of value given to gains and losses. The psychological effect of losing a hundred pounds to someone is worth roughly £100 compared to the pleasure of gaining the same amount. This form of market imbalance causes a lot of phenomena such as not letting go of losing investments, being resistant to product change despite better options, and being extremely responsive to timed sales. Loss aversion also has a specialised effect known as the endowment effect which explains free trial periods having more than 30% conversion rates where people believe items increase in subjective value the moment they own it.

A second domain includes biases in option evaluation. The status quo bias explains disproportionate consumer stickiness to defaults or current subscriptions, evidenced by inertia to change plans or providers even when it is financially beneficial to do so. The availability heuristic causes consumers to overweight easily recalled examples when estimating probabilities or risks, resulting in a market failure where heavily marketed but statistically rare product failures disproportionately influence purchasing behaviours. Confirmation bias causes selective attention to information that confirms pre-existing beliefs. Furthermore, the paradox of choice describes reduction in satisfaction and decision confidence, counter-intuitively, when presented with numerous alternatives.

Anja Vestergaard-Kirschbaum*
Email: a.vestergaard@ecbi.li
Affiliation: European School of Behavioral Economics, Fürst-Franz-Josef-Strasse 28, 9490 Vaduz, Liechtenstein

The third domain brings together temporal judgement biases that affect intertemporal choices. Hyperbolic discounting refers to the application of a steeply front-loaded discount rate applied to near-term rewards compared to distant ones. This explains time-inconsistency phenomena such as reversals in preference order like choosing smaller-sooner rewards versus larger-later rewards only when both options are postponed. Projection bias mispredicts future preference by overextending current emotions leading to regret of purchase for holiday homes bought during enjoyable stays, or cancelled gym memberships which were renewed after short-lived bursts of motivation.

These cognitive biases stem from underlying neurobiological substrates. Neuroimaging studies demonstrate distinct neural activations for gains versus losses, and the potential loss more than equates gain. The prefrontal cortex, which is critical for executive function and deliberation, uses fewer neural resources during decision contexts that involve a cognitive load, heightened emotion, or occur within time constraints. These are the conditions that give rise to biases.

Bias susceptibility is systematically conditioned by individual differences and contextual factors. Domain knowledge, ability to reflect, and numeracy are associated with lower susceptibility to certain biases due to reflecting cognitive load. Contextual moderators include cognitive load, emotional state, choice architecture, cultural background, and even class. For example, collectivist cultures display different patterns of loss aversion and status quo bias from individualist societies.

Figure 1 depicts the integrated framework that incorporates the interaction of cognitive biases within a dual-process model in consumer decision making across varying contexts. This framework brings to focus that cognitive biases are not just random errors; rather, they are systematic, persistent behaviours resulting from the adaptive design of human thinking. These mechanisms may have been useful in ancestral settings, but misfire in today's consumer environments that are abundant, complex, and laden with sophisticated attempts to exploit these psychological tendencies.

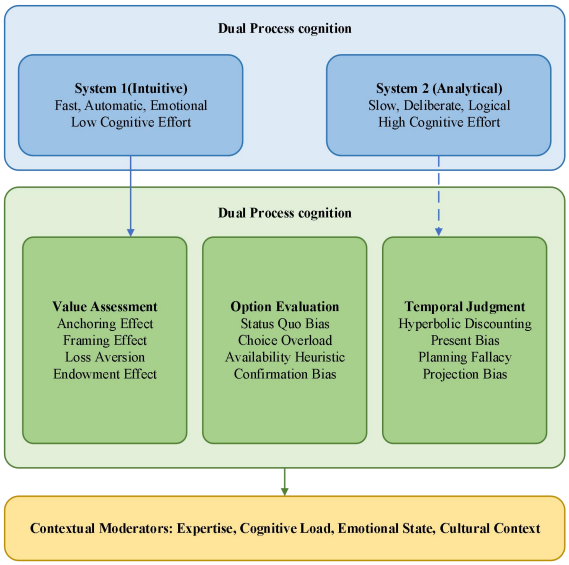

Figure 1: Integrated Framework of Cognitive Biases in Consumer Decision-Making

Anja Vestergaard-Kirschbaum*
Email: a.vestergaard@ecbi.li
Affiliation: European School of Behavioral Economics, Fürst-Franz-Josef-Strasse 28, 9490 Vaduz, Liechtenstein

3 Empirical Evidence and Consumer Behavior Case Studies

Cognitive biases have received strong empirical support in different contexts within consumer research. Experiments, field studies, and market surveys illustrate how these psychological biases affect buying behaviour—and, in many cases, have significant economic impacts. In this section, empirical data regarding four major biases are discussed, highlighting their relevance and impact through quantitative data and exemplar case studies.

Retail Pricing Strategies and Anchoring Effects

The Anchoring Bias impacts customers' willingness to pay (WTP) and their perceptions of pricing significantly. In one of his early experiments, Ariely et al showed that participants who were shown their social security numbers prior to bidding on certain products displayed a difference of 60-120% in WTP when compared to those who were not shown the high anchors. Laboratory experiments conducted demonstrate that the placing of "original" prices on sales tags boosts the likelihood of purchase by 27-35% in comparison to identical prices plastered on discounts devoid of reference markers.

Effect sizes (Cohen's d) ranging from 0.62 to 0.89 have been observed with stronger results for hedonic products as opposed to utilitarian ones, with a comprehensive meta-analysis of 83 retail pricing studies revealing persistent anchoring effects among differing product categories. Each of these remarked effects carry value in the lack of consumer expertise, although domain knowledge does refine magnitudes of effects present. Prior imaging studies have shown that price anchors trigger the prefrontal areas responsible for numeracy, hinting that anchoring works by facilitating value-anchoring during later stages of estimation for consistent values.

Product Framing and Consumer Perception

Attribute framing influences evaluations significantly across different contexts within a singular system. When the label "75% lean" and "25% fat" is given to the same minced beef, consumers rate the former as tastier and healthier by significant margins (mean difference of 1.82 points on a 7-point scale). In the financial domain, "90 percent success rate" cited in an advertisement attracted 32 percent more participants towards its corresponding investment opportunities than identical options described as having a "10% failure rate." These effects can be observed within healthcare decision-making, where descriptions framed in survival as opposed to mortality result in 38–54% preference reversals.

Sustainable studies focused on a single field showcase the framing effect of "saving money" compared to "saving the environment" as applied to the purchase of moderately energy-efficient appliances. The former greatly appealed to liberal consumers while causing a decline in purchase likelihood among conservatives (-17%). These results highlight the important interplay of pre-existing structural factors and consumers within framing to yield diverse market responses.

Loss Aversion in Purchase Decisions

Loss aversion is evident in the asymmetric response by consumers to price changes. Econometric analysis of retail scanner data shows that quantity demanded responds

Anja Vestergaard-Kirschbaum*
Email: a.vestergaard@ecbi.li
Affiliation: European School of Behavioral Economics, Fürst-Franz-Josef-Strasse 28, 9490 Vaduz, Liechtenstein

2.4 times more to an increase in price compared to an equivalent decrease in price. This is in line with prospect theory's assertion that losses outweigh equivalent gains. In auction experiments, participants showed a consistent discrepancy in willingness-to-accept and willingness-to-pay—where WTA is 1.5 to 2.7 times higher than WTP across different product types.

Loss aversion's corollary, the endowment effect, creates notable conversion funnels for trial offers marketed as free. A field experiment controlling for other factors found that consumers who were given one-month free trials converted at a 61% higher rate and exhibited 32% less price sensitivity than those who were offered discounted subscriptions that were economically equivalent to the free trial offer. In the same vein, retail settings saw buy rate increases of 28-47% from limited time offers fuelled by regret anticipated due to missing out.

Digital Choice Architecture and Decision Biases

The digital world allows for the unprecedented observation and measurement of cognitive biases on a wide scale. For instance, examining 2.8 million e-commerce transactions provides evidence that default options have a remarkable impact on purchase behaviour—with opt-in options increasing selection by 65-428% across different categories. In Figure 2, I show a comparative analysis of the effect sizes of various cognitive biases in different marketing contexts based on the most recent meta-analytic data. It illustrates how loss aversion yields the strongest impact in brick-and-mortar stores, while portrayal of choice bounties shows exceptionally strong impact in online stores.

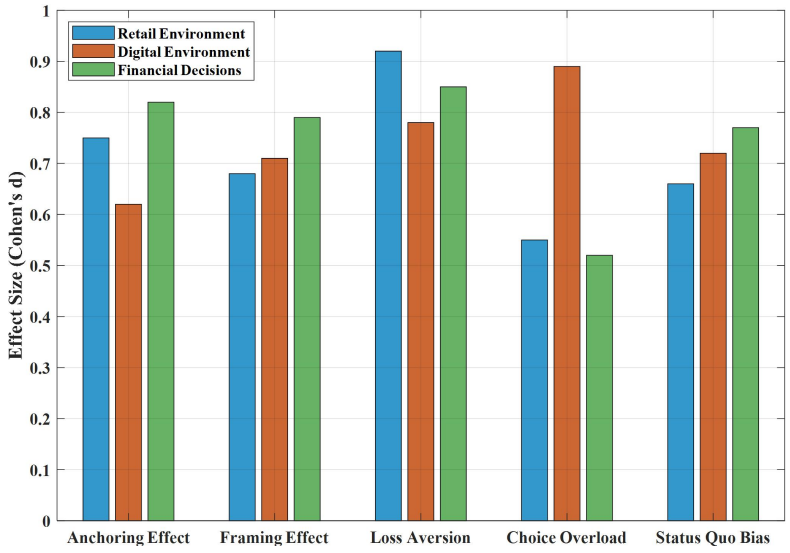

Figure 2: Comparative Effect Sizes of Cognitive Biases Across Consumer Contexts

4 Theoretical Implications and Strategic Applications

Analysing cognitive biases in the context of consumer decision-making elicits deep theoretical, practical, and ethical reflexivity. This concluding part aims to bring together the principal observations of prior analyses and contemplate their implications with greater emphasis on theory contextualisation and applied

Anja Vestergaard-Kirschbaum*
Email: a.vestergaard@ecbi.li
Affiliation: European School of Behavioral Economics, Fürst-Franz-Josef-Strasse 28, 9490 Vaduz, Liechtenstein

dimensions.

The evidence presented in this paper supports the claim that traditional consumer behaviour models require refinement and optimisation. Although the traditional models based on utility maximisation are useful as normative benchmarks, they do not appropriately describe the decision-making processes in today's markets. The systematic deviations observed across various contexts underscore the pervasive bounded rationality hypothesis, suggesting that modelers are free to incorporate cognitive biases. This integration of theory necessitates methodological pluralism: the use of computational modelling in conjunction with laboratory experiments, field studies, and even neuroimaging, to construct more integrative models that rationally explain—as well as account for non-rational consumer thinking.

Pervasive consequences of cognitive biases undermine theories of market efficiency and welfare optimisation. Rather, the valuation consumers place on goods and services as a result of framing, anchoring, or temporal discounting leads to misvaluation. These outcomes would, perhaps, significantly deviate from the usual equilibrium achieved. This form of deviation poses a challenge to fundamental neoclassical economic theory that relies on stable preferences and maximisation behaviour. Furthermore, these effects mean that consumer surplus—precisely defined as the difference between what consumers are willing to pay and the actual market price—an arguably beneficial welfare metric, needs reconstruction surrounding systematic judgement errors that evoke regret or discontent post-consumption.

Practically, these frameworks facilitate advancements in the fields of marketing, design, and retailing. The extraordinary range over product categories, situations, and the cognitive bias effects provide actionable intelligence in the form of targeted corrective action. As an illustration, the understanding of loss aversion's amplified effects within high involvement purchases justifies the accentuation of risk reduction messages for those contexts as well as enhanced messaging for money-back guarantees. Better expense and interface design applied to complicated product categories stands to offer not only competitive advantage but also enhanced consumer welfare, especially considering the effectiveness of cognitive organisation tools in curtailing choice overload.

The most critical concentration should be in the realms of the internet, as they provide definable spaces for targeted efforts towards mitigating within-scope biases, albeit in conjunction with some unhelpful streamlining. The use of internet structures for bias mitigation shows expressive bias architectures that can identify specific gap injuries and employ tailored assistive decisions. Commercial use ethics regarding psychologically informed design poses the psycho-commercial ethics dilemma. Perhaps it is best posed as a question: where do perpetrating exploitative "bias-territories" lie? Do so-called "nudges" step over the line from permissible influence to undue manipulation?

Ideal approaches for further developing this issue involve designing more sophisticated models which consider pre-existing individual biases. The stability of biases over time, the persistence of their effects across multiple decision points, and the phenomenon of multiple simultaneous biases operating and interfering with each

Anja Vestergaard-Kirschbaum*
Email: a.vestergaard@ecbi.li
Affiliation: European School of Behavioral Economics, Fürst-Franz-Josef-Strasse 28, 9490 Vaduz, Liechtenstein

other pose interesting questions. Longitudinal consumer tracking studies would fill gaps created by the short-term observational and lab-based approaches that dominate the available literature. Also, emerging capabilities in neurosciences raise new possibilities for studying neural grounds of biases and their potential pathways for reduction.

The growing integration of artificial intelligence into the consumer decision ecosystem creates new problems and possibilities. In the case of algorithm-driven recommendation systems, the need to serve user preferences can deepen existing biases, but at the same time, those systems can be designed to implement debiasing strategies based on solid evidence more effectively than ever before. Crafting advanced machine learning systems that detect and mitigate biases and systematic decision mistakes represents a fertile new direction for applied consumer research.

The study of cognitive biases in the context of consumption illuminates key features of human thought processes, and at the same time, provides useful tools for enhancing business practice. By integrating psychological science and behavioural economics, this area of research advances our understanding of bounded rationality—the limits to reasoning—how it operates in routine economic exchanges and, in turn, moves the focus from a purely consumer perspective to broader areas, such as public policy, health care strategies, and financial well-being.

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Anja Vestergaard-Kirschbaum*
Email: a.vestergaard@ecbi.li
Affiliation: European School of Behavioral Economics, Fürst-Franz-Josef-Strasse 28, 9490 Vaduz, Liechtenstein

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Anja Vestergaard-Kirschbaum*
Email: a.vestergaard@ecbi.li
Affiliation: European School of Behavioral Economics, Fürst-Franz-Josef-Strasse 28, 9490 Vaduz, Liechtenstein