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A meta-analysis on the effects of product scarcity

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Abstract

Product scarcity can influence purchase decisions, but this relationship is multifaceted due to the influence of various cues. This study aims to integrate knowledge of this subject through a meta-analysis. The findings suggest that the likelihood of purchasing a scarce product is greater under (i) scarcity conditions of excessive demand (rather than restricted supply) and variety (rather than a category), but not urgency (limited quantity and limited time) scarcity, and (ii) product conditions of enduring luxuries (as opposed to transitory luxuries) and the presence (rather than absence) of social signaling and seasonality. From a theoretical standpoint, this study offers a typology of product and scarcity cues and employs a meta-analysis to enhance our understanding of the relationships between product scarcity, product and scarcity cues, and purchase decisions, resulting in the establishment of *a heterogeneous theory of product scarcity*. From a managerial standpoint, the study suggests that product scarcity can affect purchase decisions and can be ethically utilized as a marketing strategy.

KEYWORDS

heterogeneity, meta-analysis, product cue, product scarcity, purchase decision, scarcity cue, theory development

1 | INTRODUCTION

Product and scarcity are important concepts at the intersection of psychology and marketing. A large body of knowledge exists on product (e.g., Kotler et al., 2006), scarcity (e.g., Brannon & Brock, 2001; Shi et al., 2020), and product scarcity (Barton et al., 2022; Hamilton et al., 2019). A *product* can be defined as *an offer or outcome of value creation to satisfy customer needs or wants*, whereas *scarcity* can be described as *the sensation of insufficiency that often reflects the gap between limited resources and limitless needs or wants*. Thus, *product scarcity* can be referred to as *a situation where products are limited, which could be actual or perceived and demand- or supply-induced in the short or long run*. The relationship between the perception of product scarcity (overabundance) and purchase decision is intrinsic, manifesting unconsciously, and thus, cannot be explained by economic rationality (Goldsmith et al., 2020; Hamilton et al., 2019; Shi et al., 2020). There is also evidence showing that the preference for scarce products occurs even among primates nearest humans, such as chimpanzees, reaffirming the economic irrationality of decisions influenced by product scarcity (John et al., 2018). Closer to the marketplace, countless evidence shows that consumers often value scarce products more than abundant ones (Cialdini, 2009; Goldsmith et al., 2020; Hamilton et al., 2019; Zeithaml, 1988). Therefore, the understanding of product scarcity and the strategic but ethical manipulation of it hold great promise and utility for marketing management (Hamilton et al., 2019; John et al., 2018).

Although research in marketing has shown that marketers are aware of product scarcity, there are still immense opportunities to enrich their understanding of its effect on purchase decisions when different product and scarcity cues are considered (Hamilton et al., 2019; Shi et al., 2020). Such opportunities for advancing product scarcity knowledge arise from several shortcomings. First, product and scarcity cues are often studied independently rather than collectively (Hamilton et al., 2019; John et al., 2018; Shi et al., 2020). Second, these cues have been studied across different contexts (e.g., across cultures, electronic and physical marketplaces, and externalities such as COVID-19; Koch & Benlian, 2015; Pantano et al., 2020; Park et al., 2020).

Postpandemic research has demonstrated the diverse impacts of scarcity on decision-making (Omar et al., 2021; Pereira et al., 2022; Raj et al., 2022). As a result, we contend that the COVID-19 pandemic has likely amplified the heterogeneity of scarcity effects. Perceived scarcity, stemming from external environmental constraints, influenced consumers' behavior during different stages of the pandemic, including reaction, coping, and long-term adaptation (Kirk & Rifkin, 2020; Pereira et al., 2022). Scarcity diminished as vaccination intentions were influenced by factors such as trust in doctors, compassion, and risk perception (Pereira et al., 2022). Consumers who had higher childhood socioeconomic status tended to perceive advertising messages more genuinely when faced with the threat of COVID-19 (Park et al., 2022). The pandemic also led to a scarcity of medical protective equipment, which in turn affected consumers' impulse buying behavior, driven by the fear of missing out and moderated by the bandwagon effect (Zhang et al., 2022). Perceived scarcity, alongside other factors like uncertainty, severity, and anxiety, prompted panic buying during the COVID-19 pandemic (Omar et al., 2021). More recently, the Ukraine and Russia conflict has further exacerbated the effects of product scarcity, causing prices to skyrocket due to the lack of supply to fulfill the world's growing demand (Lim et al., 2022). Therefore, addressing these heterogeneities is essential to establish the theoretical generalizability of the relationship between product scarcity and purchase decisions, as well as the moderating effects of various product and scarcity cues on this relationship.

One of the most profound strategies for addressing *heterogeneity*—that is, *a diverse state of reality*—involves the use of a meta-analysis (Kraus et al., 2022). Since data are already available in the literature but in an unconsolidated state, a meta-analysis leverages the effect sizes of heterogeneous but relevant studies in the field to establish the theoretical generalizability of a set of relationships. This results in both cost or resource efficiency and the development of knowledge. Along this line, Barton et al. (2022) recently published a meta-analytic study on the role of product scarcity in marketing, revealing the moderating role of product cues on the effect of scarcity cues on purchase intention. The present study purposefully and meaningfully extends Barton et al. (2022) in four major ways.

First, this study considers/introduces product scarcity as a macrovariable, providing a focal point to establish the theoretical generalizability of the product scarcity–purchase decision relationship. Thus, this study overcomes the inability to do so due to the shortcoming of treating product scarcity as a micro (second-order) variable as opposed to a macro (first-order) variable in Barton et al. (2022).

Second, this study considers/introduces product and scarcity cues as moderators as opposed to selectively chosen direct predictors and moderators of purchase decisions. This acknowledges and provides an equivalent treatment of product and scarcity cues as characteristics of product scarcity. Thus, this study overcomes the nonequivalent treatment of these characteristics/cues in Barton et al. (2022).

Third, this study offers useful theoretical distinctions that clearly distinguish the different types of products and scarcity cues, avoiding "apples-to-oranges" comparisons. Thus, this study overcomes the limitation of being unable to make the said comparisons as a result of listing and overlooking the theoretical within-category distinctions between the product and scarcity cues in Barton et al. (2022).

Fourth and finally, leveraging on the first three points of distinction, this study showcases the moderating role of product and scarcity cues on the product scarcity–purchase decision relationship. In this way, the present study represents a noteworthy and substantial extension of Barton et al. (2022), contributing by establishing the product scarcity–purchase decision relationship and the typology of product and scarcity cues. It also provides a nuanced theoretical setup for studying the relationships between product scarcity, the characteristics/cues of product scarcity, and purchase decision, and ultimately, the heterogeneity that exist across those relationships.

Against this backdrop, the goal of this study is to consolidate extant knowledge on the heterogeneity of the product scarcity–purchase decision relationship, particularly from the perspective of the moderating role of product and scarcity cues on that relationship. To do so, this study reviews the literature to locate a collection of profound product and scarcity cues and a set of relevant studies with the required statistical information to conduct a meta-analysis. In doing so, this study develops and establishes, with seminal evidence, *a heterogeneous theory of product scarcity*, which should provide a useful starting point to enrich understanding of the heterogeneity that exists between product scarcity and purchase decision as well as the equivalent implications for theory and practice.

2 | FUNDAMENTALS OF PRODUCT SCARCITY

As an integrated concept, product scarcity entails the infusion of two independent concepts: product and scarcity. As mentioned, product scarcity encapsulates *the extent to which products (i.e., the offer or outcome of value creation that satisfies customer needs or wants) are scarce (i.e., a sensation of insufficiency that often signifies limited resources and limitless needs or wants)*. At any point in time, product scarcity can be influenced by either the demand or supply for the

product (Verhallen & Robben, 1994; Worchel et al., 1975), wherein the presence of product scarcity reflects that demand is greater than supply for a product (Kemp & Bolle, 1999). From a theoretical perspective, Brock's (1968) commodity theory was first adopted by Lynn to explain purchase decisions in response to product scarcity. Shi et al. (2020) demonstrate the relevance of three additional theories—conformance theory (Jones, 1984), reactance theory (Brehm, 1989), and regret theory (Loomes & Sugden, 1982)—to explain the effect of scarcity on decision-making. While commodity theory offers a general explanation of scarcity, conformity theory, reactance theory, and regret theory focus on explaining demand-conforming behavior, behavioral reactions, and decision-based justifications in light of scarcity, respectively (Barton et al., 2022).

Noteworthily, some claim that product scarcity increases excitement, thereby reducing a person's ability to comprehend information (Suri et al., 2007), whereas others note that product scarcity encourages careful decision when making a purchase decision (Brannon & Brock 2001). Specifically, one of the six principles of persuasion that Cialdini (1993) proposed touches on the concept of scarcity, indicating that scarcity appeals foster instinctive and thoughtless responses because they stimulate arousal and restrict a person's desire to elaborate. This argument is in line with Sanbonmatsu and Kardes (1988), who suggest that increased arousal can impair a person's ability to carry out cognitive tasks, resulting in increasing reliance on instinctive processing and peripheral inputs. Zhu and Ratner report recent evidence on the same intuition that product scarcity ignites arousal among consumers. Nonetheless, a counter-argument is put forth by Brannon and Brock (2001) and Inman et al., wherein a rise in arousal due to product scarcity enhances a person's attention to task-relevant stimuli, resulting in greater systematic processing. When taken collectively, these findings signal that the effect of product scarcity remains inconclusive, rendering the need for additional, consolidative research. In the next sections that follow, a multifaceted discussion on product scarcity, product and scarcity cues, and purchase decisions is presented alongside the equivalent set of emergent hypotheses (Figure 1).

2.1 | Product scarcity as a predictor of purchase decision

The marketplace consists of abundant and scarce products (Hamilton et al., 2019; John et al., 2018). The perception of product scarcity occurs when a person, through sensory stimuli, perceives a shortage of a product (Shi et al., 2020). This perception can arise in the short run due to stockouts or in the long term due to legal restrictions (Hamilton et al., 2019). Regardless of temporal space, scarcity has the intrinsic value of providing pleasure (John et al., 2018). Noteworthily, scarcity changes the function of product demand and supply, including inducing the desire for complementarity (John et al., 2018), uncertainty reduction, uniqueness (Hamilton et al., 2019; John et al., 2018), or variety seeking (Shi et al., 2020). Due to this, scarcity perception can predict changes in product evaluations and sales (Hamilton et al., 2019; Shi et al., 2020). Consequently, marketers engage in promotional tactics to leverage the effects of product scarcity (Hamilton et al., 2019) to stimulate enthusiasm, increase demand, and improve sales performance (John et al., 2018; Shi et al., 2020) in the short run, ethically (e.g., without discrimination), as doing so in the long run (e.g., hoarding of essential products) is inarguably unethical.

Numerous scholars have investigated the effect of product scarcity on purchase decisions (Robinson et al., 2016; Roy &

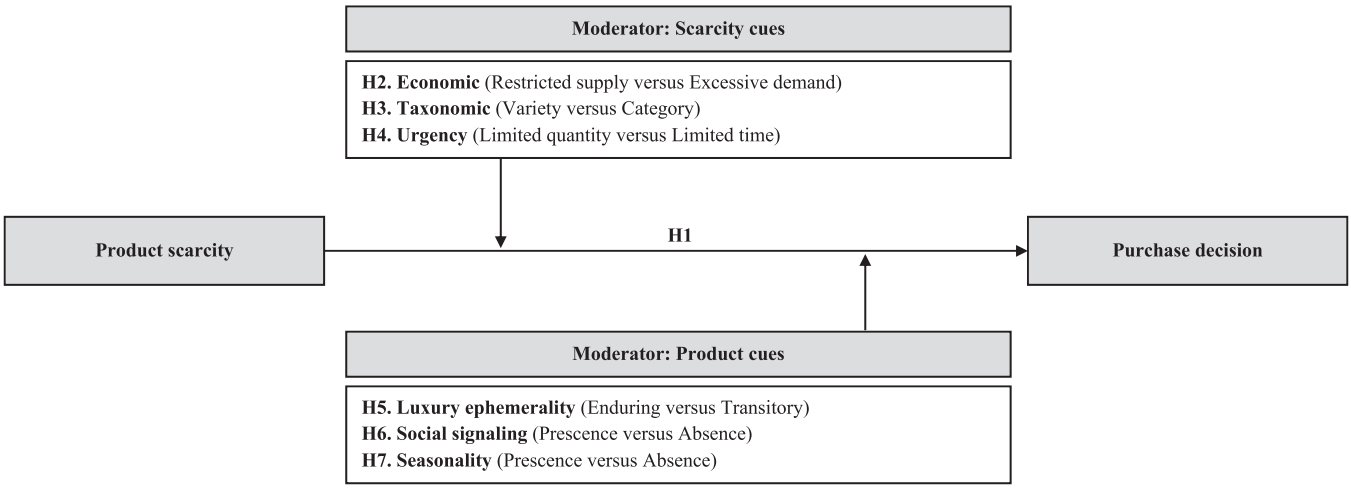

FIGURE 1 Theoretical model. Purchase decisions can manifest in different ways, including changes in product demand, desirability, evaluation, and value. These manifestations have been grouped under the term "purchase decision" due to the limited number of studies available for each manifestation. As more studies become available for each manifestation, future research may benefit from examining these manifestations separately.

Sharma, 2015). Noteworthily, the perception of product scarcity has been found to enhance willingness to pay, improve the likelihood of selecting unfamiliar brands, and influence the choices for different products (e.g., accessories, clothing, electronics, food and beverages, toiletries, and utensils) (Koch & Benlian, 2015; Robinson et al., 2016; Roy & Sharma, 2015; Shi et al., 2020). Hence:

H1. Product scarcity positively influences purchase decisions.

2.2 | Scarcity cues as moderators of the product scarcity–purchase decision relationship

Scarcity cues shape perceptions of product scarcity. This study proposes that scarcity cues can manifest in three variants: economic, taxonomic, and urgency. Economic scarcity cues are derived from the economic fundamentals of demand and supply, and thus, can take the form of restricted supply and excessive demand. Taxonomic scarcity cues are derived from the science of classification, and thus, can take the form of variety and category scarcity. Meanwhile, urgency scarcity cues are derived from a sense of limitation, and thus, can take the form of limited quantity and limited time. The literature underpinning each scarcity cue is elaborated on and discussed in the next sections.

2.2.1 | Economic scarcity cues

Economic scarcity cues can be inferred from two perspectives: excessive demand (demand-generated scarcity) versus restricted supply (supply-generated scarcity) (Hamilton et al., 2019). A demand-generated shortage occurs when a person realizes that the current supply of products is inadequate to meet its demand (Hamilton et al., 2019). This form of scarcity can occur through "while stocks last" strategies. In contrast, a supply-generated shortage occurs when suppliers restrict the availability of products in the marketplace. This form of scarcity can occur through "limited edition" strategies. In this regard, both excessive demand and restricted supply perspectives of economic scarcity generate distinct inferential processes of a scarcity despite their mutual ability to increase product desirability (Hamilton et al., 2019). Demand-generated scarcity generates perceptual evidence of product popularity, occurring at times when consumers pursue a goal of conformity (Roy & Sharma, 2015). Of note, high self-monitoring and prevention-motivated consumers are more likely to purchase products due to excessive demand). In contrast, supply-generated scarcity generates perceptual evidence of product exclusivity, expressing uniqueness and attaining social status (Hamilton et al., 2019). Low self-monitoring and promotion-motivated consumers are more likely to purchase products due to restricted supply. Hence:

H2. The effect of product scarcity on the purchase decision is moderated by the difference in economic scarcity cues (excessive demand vs. restricted supply).

2.2.2 | Taxonomic scarcity cues

The effect of scarcity can also be understood through the conditions that enhance its presence (Arens & Hamilton, 2016;). Two taxonomical forms of scarcity exist: variety and category scarcity (Hamilton et al., 2019). In particular, variety scarcity occurs when a specific brand (e.g., Frosted Flakes), variant (e.g., original flavor), or size (e.g., mini pack) of the desired product is scarce (Hamilton et al., 2019). In contrast, category scarcity occurs when products in the desired product category (e.g., breakfast cereals) are scarce (Ratneshwar & Shocker, 1991). Both variety and category perspectives of taxonomic scarcity can impact purchase decisions (Arens & Hamilton, 2016). On the one hand, variety scarcity through the stockout of the desired brand can change evaluative target judgments, such as deferring consumption or choosing a substitute (Hamilton et al., 2019). On the other hand, category scarcity can increase the desire to buy the preferred product and reduce the desire to buy the least preferred product (Arens & Hamilton, 2016). In that sense, category scarcity can induce a purchase decision of a preferred product (e.g., Frosted Flakes) or substitute (e.g., different brand) in preferred product categories (e.g., breakfast bars or breakfast cereals) (Hamilton et al., 2019). Therefore:

H3. The effect of product scarcity on the purchase decision is moderated by the difference in taxonomic scarcity cues (variety vs. category).

2.2.3 | Urgency scarcity cues

Situations that espouse a sense of urgency can generate the perception of scarcity in two ways: limited quantity or limited time (Aggarwal et al., 2011; Hamilton et al., 2019). In particular, scarcity caused by limited quantity occurs when the number of products available is restricted or runs low (e.g., only 100 products available) (Dörnyei, 2020). In contrast, scarcity caused by limited time occurs when the product is only available for a specific time period (e.g., 24 hours) (Aggarwal et al., 2011; Dörnyei, 2020). Both limited quality and limited time perspectives of urgency scarcity can impact purchase decisions although differently (Hamilton et al., 2019). On the one hand, limited-quantity shortages create a greater sense of competition than limited-time shortages. On the other hand, limited-time shortages tend to generate greater intent among inconspicuous buyers than limited-quantity shortages (Aggarwal et al., 2011). Thus:

H4. The effect of product scarcity on the purchase decision is moderated by the difference in urgency scarcity cues (limited quantity vs. limited time).

2.3 | Product cues as moderators of the product scarcity–purchase decision relationship

Product cues can also shape perceptions of product scarcity. This study proposes that product cues can manifest in three variants: luxury ephemerality, social signaling, and seasonality. Luxury ephemerality product cues are derived from the endurance of luxury, and thus, can be enduring or transitory. Social signaling product cues are derived from the beneficial signals that a product portrays to others, and thus, this cue may or may not be present. Seasonality product cues are derived from periodic fluctuations, and thus, may or may not be present. The literature underpinning each product cue is elaborated on and discussed in the next sections.

2.3.1 | Luxury ephemerality product cues

The perception of luxury can influence the feeling of scarcity and consequently evoke different behavioral reactions (Janssen et al., 2014). The ephemerality of luxury implies that luxury may be enduring or transitory (Janssen et al., 2014). Enduring luxury is long-lasting and durable, emphasizing the idea of long-term orientation (e.g., jewelry) (Berthon et al., 2009). In contrast, transitory luxury is short-term oriented and tends to be associated with conspicuous consumption and hedonism (e.g., pampering services) (Berthon et al., 2009; Janssen et al., 2014). The default for most luxury products is their endurance given that such products are exclusive and expensive, and thus, generate the perception of scarcity. In that sense, these products are often perceived to be limited in supply, difficult to source, and require a greater investment (Berthon et al., 2009). Nonetheless, the transitory nature of luxury may also give off a perception of scarcity as such luxuries may only be available for a limited quantity or time. Hence:

H5. The effect of product scarcity on the purchase decision is moderated by the difference in luxury ephemerality (enduring vs. transitory).

2.3.2 | Social signaling product cues

Social signaling benefits can also be a driver of perceived scarcity (Goldsmith et al., 2020; Hamilton et al., 2019). The consumption of products such as apparel, automotive, and jewelry, which tend to be produced in limited quantities, can signal social benefits (e.g., social status) (Hamilton et al., 2019). In this regard, the purchase of such products can change due to limited supply (hedonic reasons). Meanwhile, the consumption of some products such as eating a cookie or using a utility product, which tends to be produced in greater quantities, does not provide social benefits (e.g., social status) (Hamilton et al., 2019). In this regard, the purchases of such products do not vary due to limited supply but rather excessive demand (utilitarian reasons). More importantly, the perception of product scarcity can be influenced by social signaling benefits for several reasons (Goldsmith et al., 2020; Hamilton et al., 2019), particularly when purchasing a product satisfies a need for belonging and, at the same time, generates ostentation of high social status (Goldsmith et al., 2020). Having a product can increase popularity and acceptance, compliance, or conformance with a group (Hamilton et al., 2019; Shi et al., 2020). Finally, a consumer may be admired, respected, and socially envied when purchasing a product that represents status symbols. Therefore:

H6. The effect of product scarcity on purchase decisions is moderated by the difference in social signaling (presence vs. absence).

2.3.3 | Seasonality

Seasonality of products (e.g., fashion apparel or football jerseys) can directly influence the perception of scarcity (Amaldoss & Jain, 2010; Soysal & Krishnamurthi, 2012). Products in seasonal markets are sold and consumed over a finite season, and thus, after this period, the product will not be available or have little to no value (Swami & Khairnar, 2003). Such products often use dynamic markdown price policies that can affect demand in two ways: limited availability and possible dependence on total consumption utility at the time of purchase (Soysal & Krishnamurthi, 2012). Such policies can directly influence buyers' expectations and sellers' sales performance through buyer-biased demand estimates, stockout risk, and signaling abilities (Soysal & Krishnamurthi, 2012). Thus:

H7. The effect of product scarcity on purchase decisions is moderated by the difference in seasonality (presence vs. absence).

3 | METHODOLOGY

3.1 | Corpus curation (search strategy)

The curation of a corpus of relevant studies was done based on four major criteria: content relevance, content adequacy, content rigor, and content comprehension (Rosenthal & DiMatteo, 2001). The methodological decisions were constructed based on the guidelines and practices for meta-analytic studies (Bergmann et al., 2023; Moher et al., 2009). In particular, only articles related to product scarcity, product and scarcity cues, and purchase decision (content relevance), including statistical information to calculate effect sizes (content adequacy), published in peer-reviewed journals utilizing conditional/experimental design (content rigor), and written in English (content comprehension) were included in the corpus for a meta-analysis. After brainstorming among experts, followed by forward and backward search and reading of a random selection of articles on product scarcity, the following search keywords were

used: "abundan*," "category," "cue*," "decision," "demand," "economic*," "ephemeral*," "enduring," "excess*," "limit*," "luxury," "popular*," "product," "purchase," "quantity," "restrict*," "scarc*," "season*," "social," "signal*ing," "supply," "taxonom*," "time," "transitory," "urgen*," and "variety." The search keywords (input) along with the search criteria (screening) were applied in a search across leading databases (e.g., ABI/INFORM, EBSCO, Google Scholar, JSTOR, ProQuest, ScienceDirect, Scopus, and Web of Science) and publishers (e.g., Emerald, Elsevier, SAGE, Springer, Routledge, Taylor and Francis, and Wiley). Following the consolidation and screening of search results, a total of 37 articles was retained, and the statistical information of a total of 335 effect sizes was recorded with an intercoder agreement of 96%. All discrepancies were discussed and resolved before progressing to the meta-analysis (Rust & Cooil, 1994).

3.2 | Corpus analysis (meta-analysis)

Following the meta-analytic procedure of Hedges and Olkin (1985), a statistical analysis was performed. First, the effect size (Cohen's *d*) was computed following the formula by Hunter and Schmidt (2004). Second, the heterogeneity among studies was evaluated using the *Q* and I^2 tests (Higgins et al., 2003). The *Q* statistic, as proposed by Lau et al. (1998), is a test statistic used to determine if there is a significant difference among studies, wherein a *p* value of less than 0.05 indicates a significant level of heterogeneity among those studies. The I^2 statistic, developed by Huedo-Medina et al. (2006), is a measure of the proportion of total variation across studies that is due to heterogeneity rather than chance. The I^2 statistic, calculated from the *Q* statistic, can range from 0% to 100%, with 0% indicating no heterogeneity and 100% indicating maximum heterogeneity. Studies with I^2 of 25%, 50%, and 75% or more reflect low, moderate, and high levels of heterogeneity, respectively (Higgins et al., 2003). The analysis investigated the direct relationship between product scarcity and purchase decision, as well as the moderating effect of scarcity, that is, economic (restricted supply vs. excessive demand), taxonomic (variety vs. category), and urgency (limited quantity vs. limited time), and product cues, that is, luxury ephemerality (enduring vs. transitory), social signaling (presence vs. absence), and seasonality (presence vs. absence) on that direct relationship.

4 | RESULTS

4.1 | Mean effect (H1)

The combined studies' mean effect of product scarcity on purchase decisions was calculated. The random-effects model indicates that the mean effect is 0.2776 (95% confidence interval [CI] of 0.2243 and 0.3209; $z = 11.06$; $p < 0.001$), implying that product scarcity can influence the purchase decision. This finding reaffirms the understanding that product scarcity can influence purchase decisions in different ways, including changes in product evaluation (Hamilton et al., 2019), desirability (Cialdini, 1993), value, and demand (Sevilla & Redden, 2014). Thus, H1 is supported.

4.2 | Heterogeneity level (H1)

The treatment effect against a measure of study precision effect of product scarcity for all 335 data points (effect sizes) can be visually represented using a funnel plot (Figure 2), which can be used for detecting bias or systematic heterogeneity. The funnel plot shows the standardized mean difference for each data point plotted against its inverse sampling error variance. The assumption of homogeneous

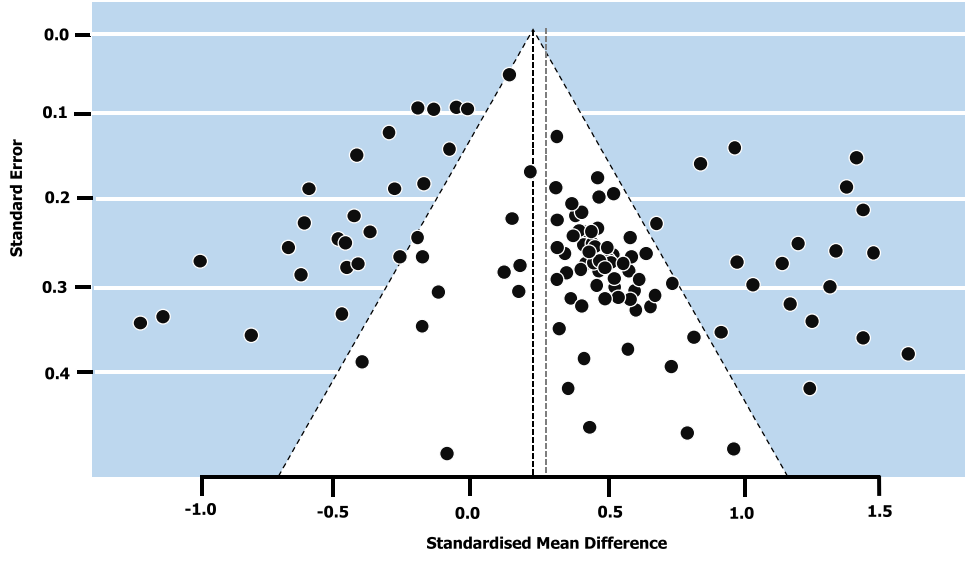

FIGURE 2 Funnel plot.

variance points to scatter, such that studies with a minor error are close to the mean effect size. The funnel plot shows that the data points are dispersed away from the *y*-axis, signaling heterogeneous variance. In addition, the null hypothesis of $r^2 = 0$ can be tested using the *Q* statistic among the effect sizes (Higgins et al., 2003). The null hypothesis of homogeneity among the effect sizes through the χ^2 distribution suggests that the variance between studies may partly stem from systematic differences and not just from random variation ($\chi^2(224) = 875.83$; $p < 0.001$). The I^2 statistic that quantifies the proportion of between-study variance due to heterogeneity independent of the number of studies is 68%, signaling moderate to high heterogeneity (Huedo-Medina et al., 2006). Taken collectively, these statistics of the heterogeneity of the data points indicate the need to test moderators to understand the underlying variance between the studies.

4.3 | Moderating effect (H2–H7)

Moderators associated with product scarcity can induce variance in the data set. Hence, the moderating effects of scarcity (economic [restricted supply vs. excessive demand], taxonomic [variety vs. category], and urgency [limited quantity vs. limited time]) and product (luxury ephemerality [enduring vs. transitory], social signaling [presence vs. absence], and seasonality [presence vs. absence]) cues are investigated and reported in Table 1 following the assessment of the direct effect and heterogeneity level.

4.3.1 | Moderators: Scarcity cues

In terms of *economic scarcity cues*, the moderator estimates in the metaregression showed that excessive demand is a more profound cue than restricted supply for boosting the effect of product scarcity on purchase decision ($\beta = -0.346$; SE(β) = 0.054; CI 95% = −0.4519, −0.2401; $z = -6.4029$; $p < 0.001$). This finding is in line with the random-effects model, wherein the effect of product scarcity on the purchase decision is greater when product scarcity is inferred due to excessive demand ($k = 58$; standardized mean difference (SMD) = 0.5484; CI 95% = 0.4412, 0.6557) than restricted supply ($k = 107$; SMD = 0.1859; CI 95% = 0.1362, 0.2355). These findings are represented in the graph that relates Cohen's *d* to product scarcity standardization, showing that the effect sizes associated with product scarcity through excessive demand are larger than those associated with restricted supply (Figure 3). This finding provides additional evidence to the findings on product scarcity of previous studies by reaffirming that the popularity of products signaled through excessive demand influences purchase decision more than the exclusivity of the product signaled through restricted supply. Thus, H2 is supported.

In terms of *taxonomic scarcity cues*, the moderator estimates in the metaregression showed that variety scarcity is a more profound cue than category scarcity for boosting the effect of product scarcity on purchase decision ($\beta = 0.2615$; SE(β) = 0.0716; CI 95% = 0.1212, 0.4018; $z = 3.6532$; $p < 0.001$). This finding is in line with the random-effects model, wherein the effect of product scarcity on the purchase decision is greater when product scarcity is inferred due to variety ($k = 31$; SMD = 0.387; CI 95% = 0.3244, 0.4495) than category ($k = 260$; SMD = 0.1609; CI 95% = 0.1129, 0.2089). These findings are represented in the graph that relates Cohen's *d* to product scarcity standardization, showing that the effect sizes associated with product scarcity due to variety are larger than those due to category (Figure 3). This finding indicates that variety scarcity can enhance perceptions of product scarcity, probably because the scarcity of a specific brand tends to alter evaluative target judgments (Hamilton et al., 2019). Product scarcity by category, however, does not exert a great influence on perceptions of product scarcity, probably because it can lead to purchasing of substitutes (Arens & Hamilton, 2016). Thus, H3 is supported.

In terms of *urgency scarcity cues*, the moderator estimates in the metaregression showed no significant differences in effects between limited quantity and limited time on the product scarcity–purchase decision relationship ($\beta = 0.1030$; SE(β) = 0.0649; CI 95% = −0.0242, 0.2302; $z = 1.5866$; $p = 0.1126 > 0.05$). This finding is in line with the

TABLE 1 Estimates in the metaregression.

Moderators	β	SE	95% CI	*z*-value	*p*-value
Scarcity cues					
H2. Economic (excessive demand [0] vs. restricted supply [1])	−0.346	0.054	−0.4519, −0.2401	−6.4029	***
H3. Taxonomic (category [0] vs. variety [1])	0.2615	0.0716	0.1212, 0.4018	3.6532	***
H4. Urgency (limited quantity [0] vs. limited time [1])	0.1030	0.0649	−0.0242, 0.2302	1.5866	0.1126^{ns}
Product cues					
H5. Luxury ephemerality (enduring [0] vs. transitory [1])	−0.3627	0.0457	−0.4523, −0.2730	−7.9306	***
H6. Social signaling (presence [0] vs. absence [1])	−0.1875	0.0763	−0.3371, −0.0379	−2.4561	*
H7. Seasonality (presence [0] vs. absence [1])	−0.4398	0.0846	−0.6552, −0.2741	−5.2017	***

Abbreviations: CI, confidence interval; ns, not significant.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

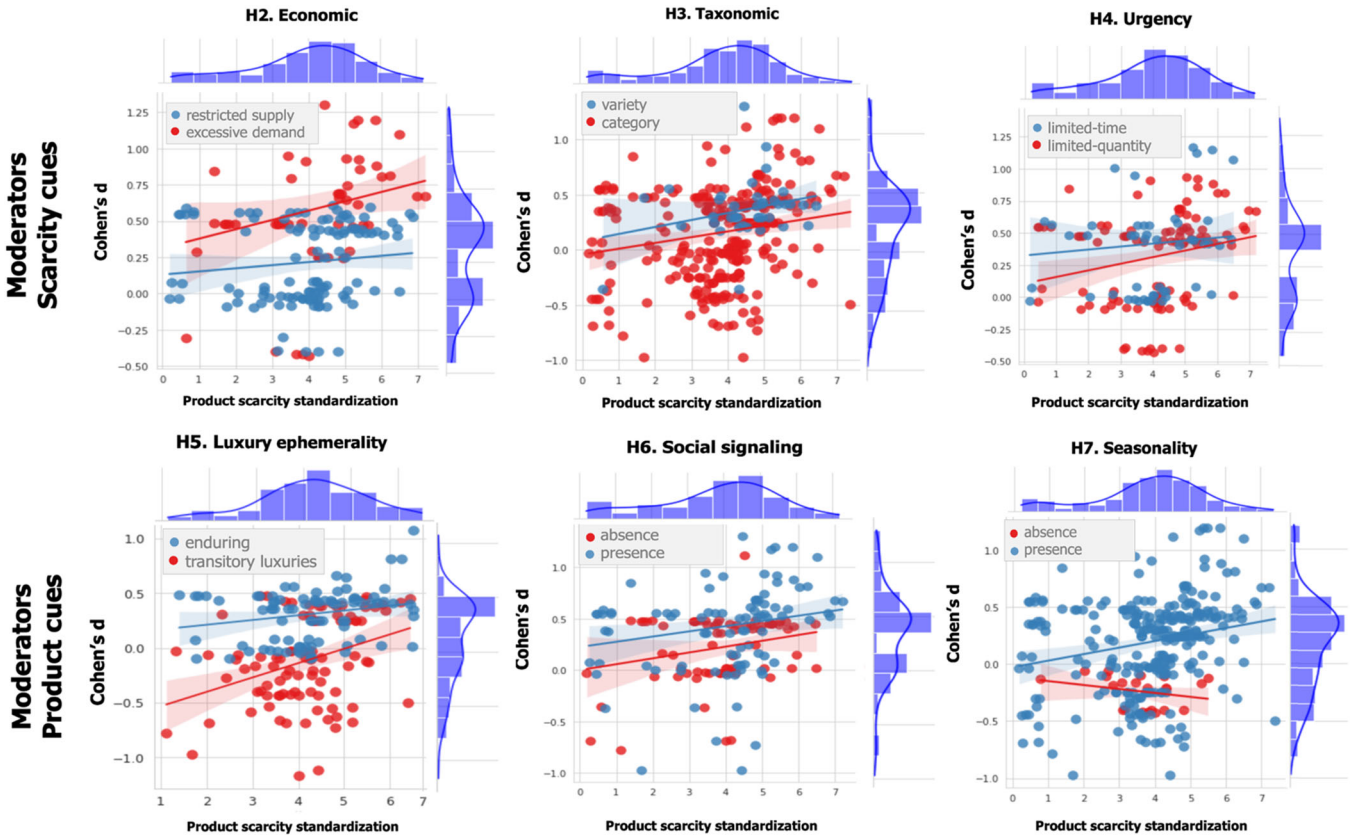

FIGURE 3 Cohen's *d* and product scarcity standardization.

random-effects model, which did not show that the effects of heterogeneity in product scarcity on purchase decisions can be represented by the differences between limited quantity ($k = 96$; SMD = 0.287; CI 95% = 0.2137, 0.3604) and limited time ($k = 51$; SMD = 0.3952; CI 95% = 0.2893, 0.5011). These findings are represented in the graph that relates Cohen's *d* to product scarcity standardization, showing that the effect sizes associated with product scarcity due to limited quantity and limited time do not really differ (Figure 3). This finding is important as it implies that the engagement in limited quantity and limited time will produce more or less the same result in influencing the effect of product scarcity on purchase decisions, providing a basis to justify investments into either one of these cues that is more cost-effective than the other. Thus, H4 is not supported.

4.3.2 | Moderators: Product cues

In terms of *luxury ephemerality product cues*, the moderator estimates in the metaregression showed that enduring luxuries are more profound than transitory luxuries for boosting the effect of product scarcity on purchase decision ($\beta = -0.3627$; SE(β) = 0.0457; CI 95% = −0.4523, −0.2730; $z = -7.9306$; $p < 0.001$). This is in line with the random-effects model, wherein the effect of product scarcity on the purchase decision is greater when product scarcity is inferred due to enduring ($k = 87$; SMD = 0.265; CI 95% = 0.2154, 0.3147) rather than transitory ($k = 93$; SMD = −0.085; CI 95% = −0.1568, −0.0134) luxuries. These findings are represented in the graph that relates Cohen's *d* to product scarcity standardization, showing that the effect sizes associated with product scarcity due to enduring luxuries are larger than those due to transitory luxuries (Figure 3). This finding indicates that enduring luxuries send a stronger signal of scarcity than transitory luxuries due to their exclusive and expensive nature, and thus, tend to be limited in supply, difficult to source, and require a greater investment (Berthon et al., 2009). Thus, H5 is supported.

In terms of *social signaling product cues*, the moderator estimates in the metaregression showed that the presence of social signaling is more profound than its absence for boosting the effect of product scarcity on purchase decision ($\beta = -0.1875$; SE(β) = 0.0763; CI 95% = −0.3371, −0.0379; $z = -2.4561$; $p < 0.05$). This is in line with the random-effects model, wherein the effect of product scarcity on the purchase decision is greater when product scarcity is inferred due to the presence ($k = 82$; SMD = 0.4575; CI 95% = 0.3612, 0.5539) rather than the absence ($k = 64$; SMD = 0.2742; CI 95% = 0.1613, 0.3878) of social signaling. These findings are represented in the graph that relates Cohen's *d* to product scarcity standardization, showing that the effect sizes associated with product scarcity due to the presence of social signaling are larger than those due to the absence of social signaling (Figure 3). This finding highlights that social signaling benefits can strengthen the effect of product scarcity because these products can satisfy the need for belonging and

generate ostentation of high social status (Goldsmith et al., 2020) while evoking popularity and compliance with a group (Hamilton et al., 2019; Shi et al., 2020). Thus, H6 is supported.

In terms of *seasonality product cues*, the moderator estimates in the metaregression showed that the presence of seasonality is more profound than its absence for boosting the effect of product scarcity on purchase decision ($\beta = -0.4398$; SE(β) = 0.0846; CI 95% = −0.6552; −0.2741; $z = -5.2017$; $p < 0.001$). This is in line with the random-effects model, wherein the effect of product scarcity on the purchase decision is greater when product scarcity is inferred due to the presence ($k = 253$; SMD = 0.197; CI 95% = 0.1498, 0.2443) rather than the absence ($k = 22$; SMD = −0.2245, CI 95% = −0.3015, −0.1476) of seasonality. These findings are represented in the graph that relates Cohen's *d* to product scarcity standardization, showing that the effect sizes associated with product scarcity due to the presence of seasonality are larger than those due to the absence of seasonality. This finding provides additional evidence to the findings on the product scarcity of previous studies (Soysal & Krishnamurthi, 2012) by reaffirming that the nature of seasonal products (e.g., consume, sold, and valuable over a finite season) and the markdown price policy that occurs in seasonal products can shape product scarcity expectations and influence purchase decision. Thus, H7 is supported.

The direct and moderating effects between product scarcity, product and scarcity cues, and purchase decisions are illustrated in Figure 4.

5 | CONCLUSION

The goal of this study was to consolidate existing knowledge of the heterogeneous relationship between product scarcity, the cues of product scarcity, and purchase decisions by developing and testing *a heterogeneous theory of product scarcity* through a meta-analysis. The results indicate that product scarcity generally encourages purchase decisions positively, especially in the presence of excessive demand, variety scarcity, enduring ephemerality, social signaling, and seasonality. The contributions of this study and the implications of its findings are discussed.

5.1 | Theoretical implications

From *a theoretical perspective*, this study contributes a well-structured typology of product and scarcity cues, which provides a nuanced theoretical setup for understanding the relationships between product scarcity, the cues of product scarcity, and purchase decisions. Through the meta-analysis, this study also contributes a consolidated understanding with empirical metaevidence on the theoretical generalizability of the direct relationship between product scarcity and purchase decision and the moderating role of product and scarcity cues on that relationship, thereby revealing the heterogeneity that exists across those relationships. The theoretical implication of each finding is further espoused as follows.

First, the results of the main effect support the notion that product scarcity positively influences purchase decisions. Noteworthily, this finding offers preliminary support for a series of plausible explanations which include, but are not limited to, an awareness of high levels of product acceptability in the marketplace, an increase in perceived value when product absence is noticed, and fear of not having the product even if its purchase may be unnecessary. These may be due to the recognition of greater demand, increased need for social conformance, or potential stockout, among others. The finding and its plausible explanations are in line with previous studies,

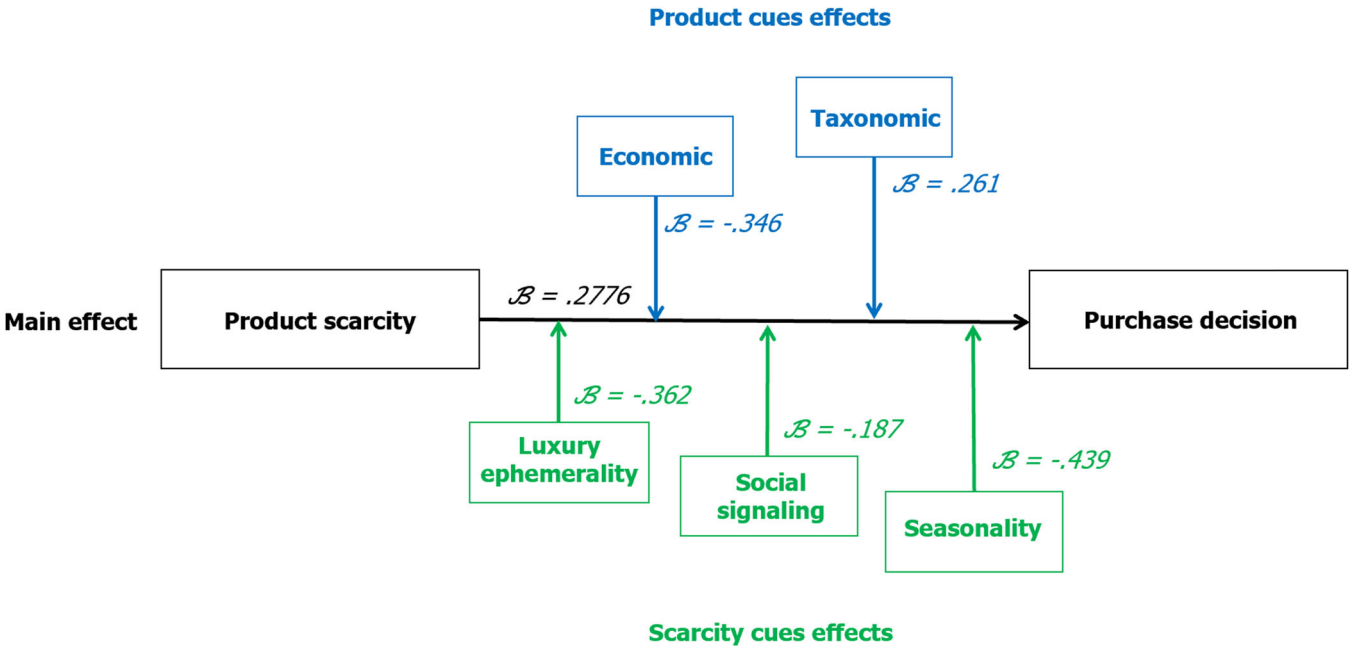

FIGURE 4 Direct and moderating effects of product scarcity and its cues on the purchase decision.

showing that product scarcity has an intrinsic value in providing heuristics that inform purchase decisions (Hamilton et al., 2019; John et al., 2018; Shi et al., 2020).

Second, the results of moderating effects support the notion that economic (restricted supply vs. excessive demand) and taxonomic (variety vs. category) scarcity cues influence the direct effect of product scarcity on purchase decisions, though urgency scarcity cues (limited quantity vs. limited time) did not produce the same effect. These findings are important and valuable as they provide empirical metaevidence that the heterogeneity in product scarcity and its effect on purchase decisions can be explained by scarcity cues, thereby resolving ambiguous conclusions found in independent studies. In particular, the study shows that excessive demand has greater potential than restricted supply (economic scarcity cues), demonstrating the influential power of popularity in shaping product scarcity perceptions and corresponding purchase decisions (Roy & Sharma, 2015). Variety scarcity has greater potential than category scarcity (taxonomic scarcity cues), indicating that product brands play a critical role in shaping evaluative target judgments (e.g., deferring consumption or choosing a substitute) (Hamilton et al., 2019). Meanwhile, limited quantity and limited time do not differ in their potential (urgency scarcity cues), revealing that the sense of urgency does not significantly differ across quantifiable and periodic situations in contrast to extant understanding derived from independent studies (Aggarwal et al., 2011; Hamilton et al., 2019) in strengthening the perception of product scarcity and its effect on the purchase decision.

Third and finally, the results of moderating effects also support the notion that luxury ephemerality (enduring vs. transitory), social signaling (presence vs. absence), and seasonality (presence vs. absence) product cues influence the direct effect of product scarcity on the purchase decision. These findings are also equally important and valuable as those on scarcity cues as they provide empirical metaevidence that the heterogeneity in product scarcity and its effect on purchase decisions can be explained by product cues, thereby resolving the inconclusive findings found in independent studies. In particular, the study shows that enduring luxuries have greater potential than transitory luxuries (luxury ephemerality product cues), accentuating the stronger signal of scarcity sent by enduring than transitory luxuries due to the former's exclusive and expensive nature that tends to be associated with limited supply, sourcing difficulty, and greater investment (Berthon et al., 2009). The presence of social signaling has greater potential than the absence of social signaling (social signaling product cues), highlighting the heightened value of scarce products that can satisfy the need for belonging, generating ostentation of popularity and high social status, and facilitating compliance with a group (Goldsmith et al., 2020; Hamilton et al., 2019; Shi et al., 2020). The presence of seasonality has greater potential than the absence of seasonality (seasonality product cues), reaffirming the nature of seasonal products (e.g., consume, sold, and valuable over a finite season; markdown price policy) (Soysal & Krishnamurthi, 2012) in strengthening the perception of product scarcity and its effect on the purchase decision.

5.2 | Managerial implications

From *a managerial standpoint*, this study affirms that product scarcity can influence purchase decisions and, by extension, the sales and profits of marketing organizations. Product scarcity can be influenced by product and scarcity cues, implying that product scarcity can be leveraged and manipulated, ethically and strategically. In this regard, the findings from this study, which are supported by empirical metaevidence, can be extrapolated into a series of practical recommendations that marketing managers can confidently rely upon to leverage the effect of product scarcity in encouraging purchase decisions that would be in favor of the marketing organization.

First, excessive demand exerts a more potent influence on perceptions of product scarcity than restricted supply does (known as the economic scarcity cues effect). Consequently, marketing managers should focus on cultivating the perception of a critical mass of consumers or users for their products, rather than limiting the supply of those products.

Second, variety scarcity has a more substantial impact on perceptions of product scarcity than category scarcity (known as the taxonomic scarcity cues effect). As such, marketing managers can be more effective by presenting options within the same brand (e.g., Frosted Flakes), variant (e.g., original flavor), or size, rather than offering different options within the scarce product category.

Third, limited quantity and limited time do not significantly differ in their effects on perceptions of product scarcity (known as the urgency scarcity cues effect). With this in mind, marketing managers can optimize cost-efficiency by choosing the cue that demands the least investment for their marketing endeavors.

Fourth, enduring luxuries have a more pronounced impact on perceptions of product scarcity than transitory luxuries do. As a result, marketing managers can achieve greater success by emphasizing and positioning their products based on exclusivity and premium quality, rather than relying solely on the hedonic features of the product, when aiming to establish and reinforce perceptions of product scarcity.

Fifth, the presence of social signaling has a more considerable effect on perceptions of product scarcity than the absence of social signaling. Therefore, marketing managers can be more effective by informing and educating their target segments about the social signaling benefits (e.g., group membership or social status) associated with purchasing and using their products, to enhance perceptions of product scarcity.

Lastly, the presence of seasonality has a stronger influence on perceptions of product scarcity than the absence of seasonality. In light of this, marketing managers can capitalize on seasonality to promote scarce products, accentuating the limited availability and the "living in the moment" value of purchasing and consuming such products during the designated season.

Taken collectively, this study sheds light on the heterogeneity in the product scarcity–purchase decision relationship and how this heterogeneity can be leveraged by activating and investing in the

right product and scarcity cues that would strengthen the effect of product scarcity on the purchase decision. This *heterogeneous theory of product scarcity* contributes to marketing theory and a valuable set of strategic directions to leverage product scarcity for marketing practice.

5.3 | Limitations and future research directions

Notwithstanding the extant contributions of this study to marketing theory and practice, several limitations exist, which can pave new pathways for exciting and meaningful future research on product scarcity.

First, the collection of product and scarcity cues in this study is limited to six variants (three variants each for the type of cue). The logic behind having six variants of product and scarcity cues is rooted in several key considerations. To begin, these variants were developed using a consistent and thorough process that involved both brainstorming and backward/forward reading. This approach helped to ensure that all variants were rooted in sound reasoning and relevant to the study. Moreover, these variants were put together as a starting point to demonstrate that these cues can contribute to heterogeneity in purchase decisions. They were not intended to be definitive or exhaustive, but rather to provide a foundation for further research. Last but not least, it is important to note that while these variants were chosen because they were believed to be meaningful, this does not mean that they are the only cues that can influence purchase decisions. Future research should continue to explore other cues that may be relevant and can contribute to the heterogeneity of purchase decisions. In this regard, future research is encouraged to explore additional variants of product and scarcity cues to expand the depth of each type of cue. Such research would inarguably be exploratory in nature, and thus, should leverage off exploratory techniques (e.g., qualitative research methods) before progressing to confirmatory techniques (e.g., association-centric quantitative research methods and causal-centric conditional or experimental research methods), including those that would enhance rigor (e.g., neuroscience).

Second, the heterogeneity unpacked in this study is limited to the product and scarcity cues perspective. In this regard, future research is encouraged to explore alternative perspectives that could explain the heterogeneity in the effect of product scarcity on the purchase decision. This could take the form of a market segmentation (profiling) lens (Jopp et al., 2022) or a world events perspective (e.g., crises, externalities, internationalization statuses, or trends) (Lim, 2022), and be studied independently (e.g., individual or multistudy experiments) or collectively (e.g., meta-analytic or review studies) (Kraus et al., 2022).

Third, the context of product scarcity and purchase decisions is kept generic in this study. In this regard, future research is encouraged to dive into context-specific investigations of product scarcity and purchase decisions to provide a more refined understanding of the heterogeneous product scarcity effects and the equivalent implications specific to the context studied. This may be limiting (context-specific) but, nonetheless, hold greater utility (context-specific suggestions) and validity (context-specific evidence).

Fourth, the different stages of the buying decision process (i.e., need recognition, information search, evaluation of alternatives, purchase decision, and postpurchase evaluation) and the customer journey (i.e., awareness, consideration, retention, decision, and advocacy) were not considered in the present study and thus could be explored in tandem with product scarcity in future research. Noteworthily, past studies have shown that product scarcity can have varying effects depending on how far customers are in their decision-making and shopping journey (Hamilton et al., 2019; Shi et al., 2020). In this regard, the stages of the buying decision process and customer journey could act as a potential moderator of the product scarcity effect in tandem with a variety of customer behaviors from a broader perspective. These include aspects like beliefs, attitudes, intentions, and behavior, as well as a depth standpoint such as the "what" (e.g., brand, quantity, or variant), "when" (e.g., time, day, month, or year), "where" (e.g., brick-and-mortar or online outlet), "who" (e.g., oneself or others), and "how" (e.g., cash, credit, electronic or mobile wallet, or points) of the purchase decision for scarce products.

Fifth and finally, there is a need to incorporate new elements that reflect current, emerging, or underexplored realities to advance understanding of product scarcity and purchase decisions. This could lead to the exploration of potential differences in effects that could arise from different behavioral controls (Lim & Weissmann, 2023), intergenerational cohorts and shifts (Lim et al., 2023), personalization techniques (Chandra et al., 2022), marketing-mix configurations (Lim, 2023), and usage of new-age technologies (Lim et al., 2023), including the metaverse (Kraus et al., 2023), among others. Though this goes beyond the scope of the present meta-analysis, which is reliant on available evidence, it is hoped that such elements can be explored in a future meta-analysis as a result of the explicit call herein for greater research in this direction.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study can be made available from the authors upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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