The Limits of "Unlimited" Offers:

How Quantifying Constraints Can Increase Valuation

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Job Market Paper — Updated August 23, 2025

Link to preregistrations, data, materials, and code:

https://researchbox.org/1255&PEER_REVIEW_passcode=QBCJAH

Link to web appendix: https://www.dropbox.com/scl/fi/p6kkrakzbxvvuakvgxlqg/Geiser-JMP-Web-Appendix.pdf?rlkey=24k7hmka2ue7pw3ufhc2dwym4&st=0nlvcdb3&dl=0

ABSTRACT

Consumers are often drawn to offers that promise unlimited access to a product or service (e.g., unlimited monthly mobile plans). Because actual consumption opportunities are typically finite, most explicitly unlimited offers (e.g., "unlimited minutes per month") could be reframed as superficially limited (e.g., "44,640 minutes per month"). Although explicitly unlimited offers are seen as more subjectively valuable (i.e., attractive), superficially limited offers win out on monetary valuation (i.e., willingness to pay, estimated price). Two processes explain why superficially limited frames—despite imposing superficial constraints—elevate valuation. First, their high discrete usage limits serve as anchors that increase anticipated usage. Second, these limits permit comparisons with other (necessarily smaller) finite offers that are simpler to price. Consumers spontaneously recruit and scale up from these reference prices when assessing a superficially limited offer's monetary value. The extent to which a consumer's interest in or preference for an offer is predicted by subjective versus monetary valuation—and thus which offer frame dominates—depends on how preferences are elicited and what information consumers have access to (e.g., prices). This work moves research on unlimited offers in a qualitatively new direction and illustrates the theoretical and practical importance of distinguishing between subjective and monetary valuation.

Keywords: unlimited offers, framing, valuation, willingness to pay, pricing

Unlimited offers are widespread. Cell phone and internet providers, restaurants, gyms, and transportation companies offer unlimited packages, often as an alternative to paying per use. In theory, unlimited offers promise infinite use. In practice, however, there are only so many minutes in a day, so many meals one can eat, so many times one can visit the gym, and so many trips one can take. This means there are natural constraints on just how many times consumers can use these products and services. For example, because there are at most 44,640 minutes in a month, it is not possible for consumers to spend more than 44,640 minutes per month talking on the phone—even on a plan that promises "unlimited minutes."

Because unlimited offers come with natural constraints, it is typically possible to quantify the amount of usage such offers provide. In other words, an offer that promises "unlimited" use (an *explicitly unlimited* offer) can often be reframed as one that imposes a finite usage limit that is at or above the maximum amount one could possibly use (a *superficially limited* offer). In this research, we ask how framing an offer as superficially limited—rather than explicitly unlimited—influences its perceived value. At first glance, superficially limited offers may seem inherently inferior, especially given that explicitly unlimited offers are the marketplace norm. Why would marketers advertise usage constraints if they do not have to? When MoviePass began offering unlimited movies for $9.95 per month and when Frontier Airlines unveiled an "all-you-can-fly" pass for $599 per year, they presumably sought to capitalize on the intuitive appeal of unlimited use. Why work out the math of just how many movies one could possibly watch or flights one could realistically take if "unlimited" is already as good as it gets? Unlimited usage may be hard to value, but it is certainly more valuable than any finite quantity.

We propose, however, that consumers sometimes see superficially limited offers as even more valuable than explicitly unlimited offers. Specifically, although superficially limited offers

seem less *subjectively* valuable (i.e., attractive), they tend to be perceived as having higher *monetary* value (e.g., WTP, estimated prices). We theorize that two psychological processes explain why the distinguishing feature of superficially limited offers—the inclusion of a high discrete usage quantity—can increase valuation. We also identify a feature of the purchase context that determines the extent to which consumers' interest in an offer is predicted by subjective versus monetary valuation, and thus which offer frame elicits greater overall interest. In doing so, this research illustrates the theoretical and practical importance of distinguishing between subjective and monetary valuation.

TWO TYPES OF VALUATION

There are many ways in which consumers can express how much they value a product or service. They can rate how much they like it, indicate their willingness to pay for it, report how likely they are to purchase it, or select it from a set of options. According to the principle of procedure invariance in rational choice theory, consumers' relative preferences should not depend on how they are elicited (Holt 1986; Segal 1988; Tversky and Thaler 1990). In practice, however, different elicitation methods sometimes yield different patterns of valuation, which can give rise to preference reversals (Grether and Plott 1979; Tversky, Slovic, and Kahneman 1990).

Early demonstrations of preference reversals examined contexts in which consumers chose X over Y but also priced Y higher than X. In other words, people chose items that they believed to be less monetarily valuable (Grether and Plott 1979; Lichtenstein and Slovic 1971, 1973; Lindman 1971). One classic context in which preference reversals emerge is when people consider high-probability, low-payoff gambles (e.g., a 90% chance to win $10) versus low-

probability, high-payoff gambles (e.g., a 10% chance to win $90). In one study, 73% of participants consistently showed a preference reversal: Whenever they chose the high-probability, low-payoff gamble in a pair, they nevertheless demanded a higher selling price for the low-probability, high-payoff gamble (Lichtenstein and Slovic 1971). Preference reversals like these do not simply emerge in evaluations of gambles. They have also been observed in preferences for smaller-sooner versus larger-later rewards (Slovic, Griffin, and Tversky 1990), hedonic versus utilitarian products (O'Donnell and Evers 2019), and digital versus physical goods (Catapano, Shennib, and Levav 2022).

Preference reversals are interesting in their own right. For one, they challenge traditional economic assumptions about how consumers access and then reveal their preferences and reinforce that consumers partially construct their preferences on the spot, rather than consulting preexisting, well-formed, stable preference orderings (Bettman, Luce, and Payne 1998). But also, if different elicitation methods produce systematically different preferences, then these different methods must be prompting different approaches to valuation, the focus of the present work.

We argue that what is at the root of many preference reversals is an underlying dissociation between two types of valuation. Whereas some preference elicitation methods invite consumers to make holistic *subjective* assessments, others pick up on perceptions of *monetary* value. Subjective valuation can be probed with ratings of attractiveness or liking, and such valuations are typically reflected in choice (Hascher, Desai, and Krajbich 2021). For example, just as consumers often choose high-probability, low-payoff gambles more frequently than would be implied by their willingness to pay, they also rate such gambles as more attractive (Goldstein and Einhorn 1987). Subjective valuations often reflect the expected pleasure of owning or consuming a product (Amir, Ariely, and Carmon 2008). Such valuations are guided

by easy-to-assess, intuitive cues. For example, subjective valuations are disproportionately driven by attributes that are prominent (Tversky, Sattath, and Slovic 1988), vivid (Shiv and Huber 2000), or intuitively appealing (O'Donnell and Evers 2019).

By contrast, monetary valuations are revealed when consumers indicate how much they think a product is worth—either by reporting their willingness to pay (WTP) for it or estimating its price. Although WTP and market price are conceptually distinct, WTP is guided by *beliefs* about market price (Thaler 1985; Weaver and Frederick 2012), which can themselves be informed by reference prices, firm costs, and marketplace norms (Amir et al. 2008). In a classic demonstration of the importance of marketplace norms, consumers reported higher WTP for the same beer when it would be bought from a fancy resort hotel instead of a run-down grocery store (Thaler 1985). Relatedly, Catapano et al. (2022) found that consumers were willing to pay more for physical (vs. digital) goods than their choices would imply. In both cases, the amount that consumers were willing to pay for a product was guided by how much they expected it to cost. Two reasons have been proposed for this link. First, because WTP is expressed in monetary terms, it is disproportionately swayed by monetary attributes (e.g., a gamble's monetary payoff, a product's market price). This is one specific application of the compatibility principle: the notion that the weight of an input to valuation is enhanced by its compatibility with the output (Tversky et al. 1988). Second, according to Thaler's (1985) notion of transaction utility, a product's market price sets consumers' expectations for what is reasonable or fair to pay for it. Consumers may experience disutility if they pay more for a product or service than they think it is worth in the marketplace (Weaver and Frederick 2012).

We proceed by using the distinction between subjective and monetary valuation to understand how consumers value superficially limited offers relative to explicitly unlimited

offers. We theorize that each frame is appealing to consumers for different reasons. Because those reasons do not necessarily apply to monetary and subjective valuation in the same way, a systematic valuation dissociation can emerge between the two offer frames.

If different unlimited offer frames have divergent effects on subjective versus monetary valuation, as we predict, this raises the question of when and how each type of valuation influences consumers' overall interest. After all, both types of valuation matter. Although previous work suggests that consumers lean heavily on subjective valuation when choosing between unpriced options (Hascher et al. 2021), consumers who are deciding whether to make a purchase also have to take into account a product's monetary value. In contexts where consumers evaluate offers without knowing their prices—such as when comparing free options or when prices have not yet been provided—consumers' interest should be driven primarily by their assessment of an offer's subjective value. However, when considering an offer at a particular price, consumers can assess whether the offer represents a good deal and thus may rely more on their perception of its monetary value. Therefore, understanding when each type of valuation matters is important for predicting which offer frame will generate more interest.

UNLIMITED OFFERS

Consumers find unlimited offers highly attractive. Typically, this has been established by comparing interest in explicitly unlimited offers to offers that require paying per use. Many consumers choose unlimited access to a service even when they could have saved money by paying per use (Train 1991). This flat-rate bias (essentially, an economically unwise preference for unlimited offers) has been observed through consumers' seemingly excessive interest in

unlimited telephone services (Kridel, Lehman, and Weisman 1993; Train 1991), gym memberships (DellaVigna and Malmendier 2006), online grocery shopping subscriptions (Nunes 2000), and internet services (Lambrecht and Skiera 2006; Train, Ben-Akiva, and Atherton 1989).

Explicitly unlimited offers have clear intuitive appeal. They not only promise a constraint-free experience, but also inform consumers that they can avoid the pain of individual payments (Lambrecht and Skiera 2006). Unlimited offers also guarantee that consumers cannot accidentally rack up large pay-per-use bills, thereby offering a sense of safety to the risk-averse (Musiol and Steul-Fischer 2019). Accordingly, although explicitly unlimited offers may have high up-front costs, they also promise psychological benefits (Prelec and Loewenstein 1998).

Therefore, a straightforward initial assumption is that explicitly unlimited offers will be seen as highly valuable, because they directly promise a quantity of use that cannot be exceeded. Indeed, in terms of *subjective* valuation, we expect explicitly unlimited offers to fare well. After all, the "unlimited" label is a straightforward, easy-to-evaluate cue indicating that an offer is as good as it could possibly be, and thus it maps clearly onto consumers' intuitive sense of goodness versus badness. Such cues are weighted especially heavily in subjective valuation (Slovic et al. 2002, 2007). By contrast, when an unlimited offer is framed as superficially limited, the mere presence of a discrete usage limit may undermine these psychological benefits and thus reduce the offer's appeal. Whereas the attractiveness of an "unlimited" label is easy to assess, evaluating the attractiveness of an offer with a discrete usage limit may require the consideration of additional details. We thus expect that superficially limited offers will generally be perceived as less subjectively valuable than explicitly unlimited offers.

However, previous research suggests that consumers do not simply mindlessly gravitate toward purchasing unlimited offers. In fact, part of what drives the decision to purchase an

unlimited offer is how much consumers expect to use it (Lambrecht and Skiera 2006; Nunes 2000). For example, one reason that consumers often prefer unlimited over pay-per-use gym memberships is that they expect to visit the gym more often than they actually do (DellaVigna and Malmendier 2006). Such optimism may even be strategic, in that consumers may purchase an unlimited offer in the hopes that it will encourage greater use. If consumers value an unlimited offer in part because they overestimate how much they will use it, then factors that encourage even greater optimism about usage should boost valuation even further.

Whereas it is often straightforward to assess an offer's subjective value, the process of determining an offer's *monetary* value can be more complex. For example, an all-inclusive vacation to Hawaii may sound quite subjectively appealing. However, to determine how much such a trip is worth, more details are needed. One might consider the scope or duration of the trip and the implications for how much it will cost (e.g., "The last all-inclusive resort we stayed at cost $500 a night."). Because formulating a monetary valuation requires people to consider additional details—relative to making a simple holistic assessment—it is important to consider how the framing of an unlimited offer shapes the monetary valuation process in particular.

We theorize that two processes make superficially limited offers seem especially valuable and thus work against the baseline intuitive advantage of explicitly unlimited offers. First, the high discrete usage quantity provided by a superficially limited offer serves as an anchor that increases anticipated usage, thus boosting the offer's perceived value (the *usage-based anchoring* account). Second, the presence of a discrete usage limit makes a superficially limited offer more comparable to other "limited" offers that are also described in terms of discrete usage quantities. As we will argue, this comparability is especially relevant when consumers are formulating monetary valuations (the *reference-offer* account).

Usage-Based Anchoring Account

Consumers determine the value of an unlimited offer in part based on how much they expect to use it (Lambrecht and Skiera 2006; Nunes 2000). The more people expect to use an offer, the more they can expect to benefit from it and thus the more they should value it. After all, someone who plans to visit the gym every day should expect to get more value out of an unlimited gym membership than someone who plans to visit the gym only once per week. Superficially limited offers, unlike explicitly unlimited offers, provide a numeric anchor that can guide consumers' estimates of how much they will use. Crucially, this will always be a *high* anchor, because it is at or above the maximum amount one could use. Although consumers could reframe an explicitly unlimited offer in superficially limited terms by calculating the maximum possible usage quantity, people tend to focus narrowly on the information provided to them rather than spontaneously considering alternative frames (Kahneman 2011). This means that when an unlimited offer is presented in a superficially limited (vs. explicitly unlimited) frame, consumers may expect to use it more and thus perceive it as more valuable.

Anchoring effects have been studied extensively in judgment and decision making research. When formulating numeric judgments (e.g., estimating how much they might use an unlimited offer), people often consider values that are unlikely to be the final answers to the question they are considering—and are sometimes completely irrelevant—but that exert an assimilative pull on responses nonetheless. In some cases, anchors are self-generated (Epley and Gilovich 2001, 2006; Inbar and Gilovich 2011), but in other cases, a numeric anchor is externally provided (Tversky and Kahneman 1974). Although there are many distinct mechanisms that can

produce anchoring effects (Brewer and Chapman 2002; Critcher and Gilovich 2008; Frederick and Mochon 2012; Mussweiler and Strack 1999; Strack and Mussweiler 1997; Tversky and Kahneman 1974), what unites these phenomena is that responses are distorted toward anchors (Critcher and Rosenzweig 2022). Furthermore, anchoring effects can still emerge—and are sometimes even stronger—when anchors are implausibly large (Mussweiler and Strack 2001; Strack and Mussweiler 1997), which will often be true of the usage limits specified by superficially limited offers. Anchoring effects have been observed in various consequential contexts, including negotiations (Galinsky and Mussweiler 2001), real-estate valuations (Northcraft and Neale 1987), and pay-what-you-want pricing (Jung, Perfecto, and Nelson 2016).

Our usage-based anchoring account diverges from most of the existing anchoring literature in two ways. First, anchoring effects are typically demonstrated by comparing high and low anchors (Tversky and Kahneman 1974). We instead compare the influence of a high anchor to no anchor, given that explicitly unlimited offers do not provide a discrete usage quantity. Although this type of anchoring effect is less commonly studied, it does have some precedent. For example, when in-store shoppers were told that they could purchase up to 12 cans of soup (a high limit), they purchased more cans than when no limit was present (Wansink, Kent, and Hoch 1998). Second, anchoring effects typically occur when a salient number pulls directly on the target judgment. For example, when participants in one study could pay what they wanted for a bundle of items, their payment amounts were drawn toward the starting point on the slider payment scale (Jung et al. 2016). By contrast, we hypothesize that anchors affect an *input* judgment (i.e., anticipated usage) that consumers spontaneously make while formulating a target judgment (i.e., valuation). If the high discrete usage limits supplied by superficially limited

offers serve as anchors that increase anticipated usage, then they may also have the downstream consequence of making superficially limited offers seem more valuable.

Reference-Offer Account

Whereas subjective valuations merely require holistic assessments, monetary valuations are more demanding. They force consumers to translate their attitudes toward and beliefs about a product into a price. In pricing unlimited offers, there is an additional challenge: One must price not merely a single unit of consumption (e.g., "What is a reasonable price for one gym visit?"), but a larger quantity (e.g., "What is a reasonable price for the ability to go to the gym as often as I want for the next month?"). Because superficially limited offers replace the vague concept of "unlimited" with a specific quantity, they make the evaluation target more concrete.

Although the usage limits supplied by superficially limited offers are precise, such offers are still likely difficult for consumers to value directly. After all, many quantitative attributes are difficult to evaluate in isolation (Hsee 1996). Such attributes acquire meaning through comparisons. For example, a dictionary with 20,000 entries will seem more valuable once it is evaluated alongside one with only 10,000 entries (Hsee et al. 1999). Although reference values are sometimes provided externally (Zha et al. 2021), consumers may also conjure them from memory (Stewart, Chater, and Brown 2006). In evaluating the size of a 24-inch computer monitor, for example, one might call to mind the size of other previously encountered monitors.

To gauge the value of a voucher providing 120 hours of internet access or a meal plan providing 21 meal swipes per week, one might first consider a smaller reference offer that is more familiar or interpretable. For example, consumers may recall what they have paid for 24

hours of internet access in the past or determine what price they think is reasonable or fair to pay for a single meal. Even if the meal plan is not seen as 21 times more valuable than the single meal, the intuitive allure of this proportional reasoning may lead consumers to assess the target offer's value by scaling up from such reference offers (Ariely et al. 2003). For example, when participants in one study were asked how much they would donate to help 20 needy children, they reported greater willingness to donate if they first considered how much they would donate to help a single child (Hsee et al. 2013). Consideration of a smaller reference opportunity that is expressed on the same scale as a larger target opportunity can thus encourage consumers to scale up proportionally from one to the other.

Unlike superficially limited offers, which specify a numeric usage limit, explicitly unlimited offers are not directly comparable to reference offers. After all, "unlimited" is not a finite quantity, and thus it is not on the same scale as any discrete usage quantity. This means that consumers should be less likely to spontaneously recruit a reference offer when valuing an explicitly unlimited offer as opposed to a superficially limited offer. Moreover, even if a reference offer does come to mind, consumers cannot proportionally scale up from the quantity of use it provides to "unlimited" usage. Our reference-offer account thus makes two key predictions. First, consumers should be more likely to spontaneously consider reference offers when considering superficially limited offers as opposed to explicitly unlimited offers. Second, when consumers do consider a reference offer (either spontaneously or when one is externally provided), this should increase their valuation of superficially limited offers more so than their valuation of explicitly unlimited offers.

Note that the reference-offer account applies specifically to monetary valuation, because subjective valuation does not follow the same proportional logic. If a consumer values a bottle of

wine at $10, it would be reasonable for them to value six bottles at approximately $60. But if they feel the bottle merits only a 1 on a 1-to-7 attractiveness scale, there is no reason to expect that they will value a half-dozen bottles as a 6 out of 7. Providing empirical support for this logic, Amir et al. (2008) found that providing reference-wage information influenced the amount participants were willing to accept to complete a task (i.e., monetary valuation) but did not influence predicted utility ratings (i.e., subjective valuation). We thus expect that consumers will be influenced by consideration of reference offers only when formulating monetary valuations.

OVERVIEW OF STUDIES

We present eight experiments that examine whether, when, and why consumers value superficially limited offers and explicitly unlimited offers differently. Studies 1a–b make use of a real unlimited movie theater subscription to test for the predicted dissociation between consumers' subjective and monetary valuations of superficially limited versus explicitly unlimited offers, including when monetary valuation is elicited in an incentive-compatible manner (study 1b). Study 2 examines a wider range of offer categories and tests whether the dissociation extends beyond one measure of monetary valuation (WTP) to another (estimated price). Study 3 examines whether these divergent effects on subjective and monetary valuation are driven by information contained in the frames themselves, or by the firm's choice to use one frame over the other (which could serve as a signal of the product or service's value). To distinguish between these possibilities, we vary whether participants are only shown the frame that the firm chose to use (as in previous studies) or whether participants are also provided with information on the alternate frame—the one that the firm did not select.

We test the usage-based anchoring account by examining whether superficially limited offers are expected to be used more than explicitly unlimited offers, and whether this boost in anticipated usage predicts increased valuation. Study 4 adds a superficially limited frame whose discrete limit is impossibly high, allowing us to test whether consumers' valuations are sensitive to the magnitude of this limit. Because extreme anchors can be especially influential, we expected that offers with impossibly high limits may be seen as even more monetarily valuable than standard superficially limited offers. Studies 5 and 6 examine the two predictions of our reference-offer account using a thought-listing protocol (study 5) and by manipulating whether reference prices are provided (study 6). Study 7 examines whether consumers' relative interest in each unlimited offer frame depends on whether they are provided with the offer's market price. We expect that the presence of pricing information makes monetary valuation more relevant, thereby increasing consumers' interest in superficially limited (vs. explicitly unlimited) offers.

All studies except for study 5 were preregistered on AsPredicted. We preregistered the coding procedure and analysis plan for study 5 after collecting the data but before beginning the coding procedure (and thus before we were able to conduct most of our primary analyses). Our preregistrations, materials, data, and analysis code are available on ResearchBox. Five supplemental studies (appendix studies A–E) are reported in the web appendix, along with additional analyses, measures, and minor deviations from our preregistrations.

STUDIES 1A–B

Studies 1a and 1b investigated how consumers' valuation of a real unlimited offer changes when the offer is presented in a superficially limited frame, rather than an explicitly

unlimited frame. Participants considered a movie theater subscription offered by a major U.S. theater chain, which we presented either as explicitly unlimited ("unlimited tickets to the movies every month") or superficially limited ("up to 100 tickets to the movies every month"). Participants both rated the attractiveness of the offer and indicated how much they would be willing to pay for it (hypothetically in study 1a, and with real money at stake in study 1b). Our central prediction was that participants would rate the explicitly unlimited offer as more attractive, yet would be willing to pay more for the superficially limited offer.

Participants also estimated how much they and others would use the movie subscription. This allowed us to explore whether the superficially limited (vs. explicitly unlimited) frame increases anticipated usage, and whether greater anticipated usage predicts higher valuation, as our usage-based anchoring account predicts.

Study 1a: Method

Participants and Design. We requested 800 U.S.-based participants from Amazon Mechanical Turk (MTurk) via CloudResearch. After applying preregistered exclusions, we were left with a final sample of 781 participants. Participants were randomly assigned to consider either an *explicitly unlimited* offer or a *superficially limited* movie theater subscription.

Procedure. To begin, participants indicated how often they personally "visit a movie theater" and "watch movies" compared to the average person (1 = "Much less", 4 = "About the same", 7 = "Much more"). We averaged these two items to create a *baseline consumption* composite for each participant (r = .48), which we preregistered to use as a covariate in order to control for baseline variation in interest across participants.

Participants considered a monthly subscription that a major U.S. theater chain was offering while the study was run. This subscription would allow subscribers to book a ticket for any 2D, regular-format showing at any of the chain's locations. The actual subscription was framed as *explicitly unlimited* ("unlimited tickets to the movies every month"). However, it also stipulated that subscribers could only book tickets for showtimes that were at least 90 minutes apart. This constraint—taking into account the theaters' typical showtimes—allowed us to create a *superficially limited* offer ("up to 100 tickets to the movies every month") that was in practice equivalent to the explicitly unlimited offer, in that it would impose no actual constraints on consumers' use. Table S1 provides more specific information on all offers used in all studies.

Participants indicated how much they valued the monthly subscription offer in both monetary and subjective terms. First, they indicated their WTP per month for the subscription using an open-ended text box: "In U.S. dollars, what is the most you would be willing to pay for this subscription?" Second, they rated the subscription's attractiveness: "How attractive is this subscription to you?" (1 = "Not at all attractive", 7 = "Very attractive").

Next, participants indicated their WTP for one movie ticket, which we preregistered to use as a covariate in order to control for individual differences in valuation. They completed two measures of anticipated usage, one that assessed their anticipated personal usage ("How many movies do you think you would see per month if you had access to this subscription?") and one that assessed how much they thought a typical person would use ("How many movies do you think a typical person would see per month if they had access to this subscription?"). These two items were standardized and then averaged to create an *anticipated usage* composite ($r = .57$).

Study 1a: Results

We regressed each valuation measure on offer frame (-0.5 = explicitly unlimited, +0.5 = superficially limited), with the baseline consumption composite and unit WTP as covariates to control for baseline variation in participants' interest. Consistent with our preregistration, we first conducted a natural-log transformation of WTP and unit WTP (after adding 1 to all responses to prevent undefined log-transformations of 0) to reduce skew. To aid with interpretability, we apply back-transformations before reporting means. We used the same procedure in all subsequent studies for measures of monetary valuation (i.e., WTP and estimated price).

Attractiveness. Participants rated the superficially limited offer that promised "up to 100 tickets to the movies every month" (M = 3.27, SD = 1.90) as less attractive than the explicitly unlimited offer that promised "unlimited tickets to the movies every month" (M = 4.00, SD = 1.81), b = -0.66, SE = 0.12, $t(777)$ = -5.54, $p < .001$, d = -0.40.

Willingness to Pay. Participants' monetary valuations showed the opposite pattern. Despite rating the superficially limited offer ("up to 100 tickets to the movies every month") as less attractive, participants reported being willing to pay more for it than for the explicitly unlimited offer ("unlimited tickets to the movies every month"), b = 0.37, SE = 0.07, $t(777)$ = 5.15, $p < .001$, d = 0.37 (figure 1). Whereas participants reported that they would be willing to pay $22.26 for the explicitly unlimited offer, they reported a WTP of $31.86 for the superficially limited offer. In the web appendix, we report direct tests of the dissociation between subjective and monetary valuation for this and all subsequent studies that included both types of measures.

Anticipated Usage. We also examined whether the superficially limited offer was expected to be used more than the explicitly unlimited offer, and whether this statistically mediated the effect of frame on monetary valuation (consistent with the usage-based anchoring

account). We used the same set of predictors as in the last two analyses, but predicted anticipated usage instead of valuation. This revealed that anticipated usage was greater for the superficially limited offer than for the explicitly unlimited offer, $b = 0.44$, $SE = 0.06$, $t(777) = 7.19$, $p < .001$, $d = 0.52$. When we added anticipated usage to the model that predicted WTP, greater anticipated usage was associated with higher WTP, $\beta = 0.15$, $b = 0.20$, $SE = 0.04$, $t(776) = 4.94$, $p < .001$. In this model, although the offer's frame remained a significant predictor of WTP, this effect was somewhat weaker, $b = 0.28$, $SE = 0.07$, $t(776) = 3.83$, $p < .001$, $d = 0.27$. To test for mediation, we used the PROCESS macro (model 4) to conduct a bootstrapped mediation analysis with 10,000 samples (Hayes 2017). The 95% confidence interval for the indirect effect of frame on WTP through anticipated usage did not contain zero (95% CI: [0.048, 0.138]). This evidence is consistent with the mediation predicted by the usage-based anchoring account.

Study 1b: Method

Participants and Design. We requested 400 U.S.-based participants from MTurk via CloudResearch. After applying preregistered exclusions, we were left with a final sample of 393 participants. Each participant was randomly assigned to consider either an *explicitly unlimited* or a *superficially limited* movie theater subscription.

Procedure. The procedure was similar to that used in study 1a, except in this study we elicited participants' monetary valuation in an incentive-compatible manner. At the start of the study, participants entered the first two digits of their ZIP code and were told that this information would be used to ensure that any special offers they were presented with could be used in their location. After completing the same two *baseline consumption* items used in study

1a (r = .48), participants learned they would be entered in a random drawing that could earn them a monetary prize.

Like in study 1a, participants reported the most they would be willing to pay for the explicitly unlimited or superficially limited movie subscription. In this study, however, participants knew that their responses had potentially real consequences. If participants won the random drawing, they could use the monetary endowment to purchase a one-month movie theater subscription. Participants learned that if their stated WTP was equal to or greater than the (unspecified) price we were authorized to sell it for, they would receive the subscription and the remainder of their earnings; otherwise, they would simply receive the full monetary prize as a bonus. We emphasized that this meant it would make sense for participants to report their true WTP. As in study 1a, participants also rated the offer's attractiveness, indicated their WTP for one movie ticket, and completed the same two anticipated usage items (r = .53).

Study 1b: Results

Attractiveness. Participants again rated the superficially limited offer that promised "up to 100 tickets to the movies every month" (M = 3.74, SD = 1.84) as less attractive than the explicitly unlimited offer that promised "unlimited tickets to the movies every month" (M = 4.05, SD = 1.79), b = -0.33, SE = 0.17, $t(389)$ = -1.99, p = .047, d = -0.20.

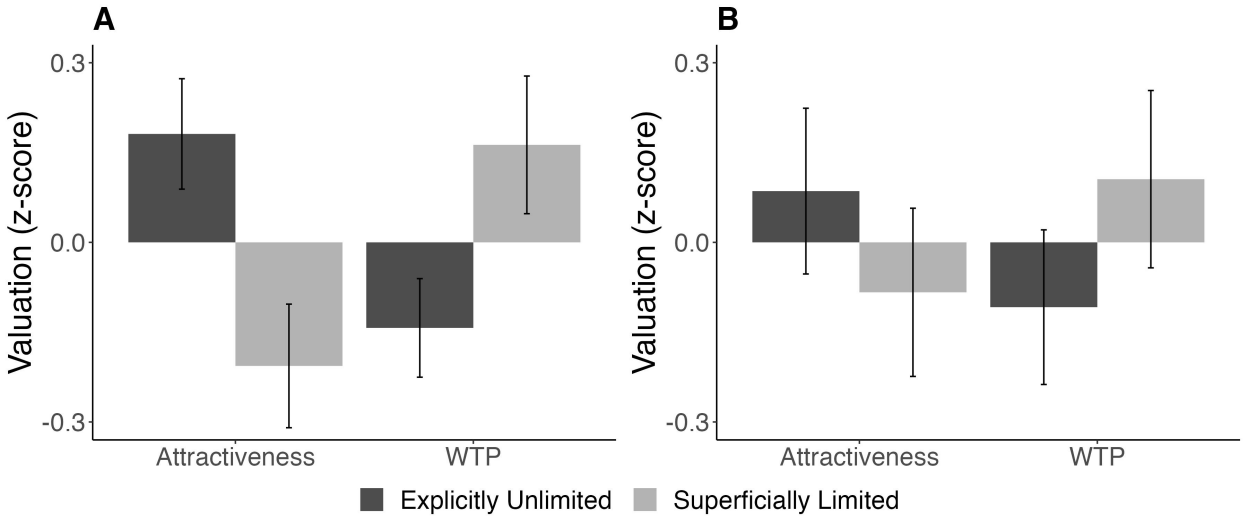
Willingness to Pay. Even with real money at stake, participants showed the reverse pattern for monetary valuation. Despite rating the superficially limited offer ("up to 100 tickets to the movies every month") as less attractive, participants reported that they would be willing to pay more for it than for the explicitly unlimited offer ("unlimited tickets to the movies every

month"), $b = 0.22$, $SE = 0.11$, $t(389) = 2.05$, $p = .041$, $d = 0.21$ (figure 1). Whereas participants were willing to pay an average of $18.18 for the explicitly unlimited offer, they were willing to pay $23.45 for the superficially limited offer.

Anticipated Usage. The offer's frame again influenced anticipated usage. The superficially limited offer led to greater anticipated usage than the explicitly unlimited one, $b = 0.31$, $SE = 0.09$, $t(389) = 3.54$, $p < .001$, $d = 0.36$. When we added anticipated usage to the WTP model, greater anticipated usage predicted higher WTP, $\beta = 0.09$, $b = 0.13$, $SE = 0.06$, $t(388) = 2.03$, $p = .043$. Moreover, the effect of offer frame on WTP became marginally significant, $b = 0.18$, $SE = 0.11$, $t(388) = 1.67$, $p = .097$, $d = 0.17$. The 95% confidence interval for the indirect effect of anticipated usage on WTP did not contain zero (95% CI: [0.005, 0.105]), consistent with mediation (and with the usage-based anchoring account).

FIGURE 1

SUBJECTIVE AND MONETARY VALUATION AS A FUNCTION OF OFFER FRAME (STUDIES 1A–B).



NOTE.—Error bars represent 95% confidence intervals for the model-predicted values.

Discussion

Studies 1a–b tested how reframing an actual explicitly unlimited offer as superficially limited influenced valuation. An unlimited movie theater subscription was seen as more monetarily valuable when it was presented in a superficially limited frame, despite seeming more subjectively valuable when it was presented in an explicitly unlimited frame. Participants were willing to pay more for the superficially limited offer even when WTP was elicited in an incentive-compatible manner (study 1b). Appendix study A ($N = 178$ lab-based participants) replicated the effect on WTP. Like study 1b, we elicited WTP in an incentive-compatible manner; however, unlike in study 1b, we also told participants that the subscription was offered by Regal Cinemas, which had locations in the region (including one in an adjacent city). Appendix study B ($N = 193$ lab-based participants) replicated the monetary-valuation dissociation using a set of six offers spanning different offer categories. Altogether, these studies demonstrate that monetary and subjective valuation can diverge and that consumers do not simply perceive one frame as unconditionally more valuable than the other.

Studies 1a–b also provided initial support for the usage-based anchoring account: Participants expected the superficially limited offer to be used more than the explicitly unlimited offer, and this effect statistically mediated the effect of offer frame on valuation. We continued to find support for the usage-based anchoring account in our subsequent studies (studies 2–7 and appendix studies B–D). To summarize, across these nine studies, the offer's frame had a significant effect on anticipated usage in the predicted direction in 9 of 9 relevant tests; anticipated usage, with the condition(s) controlled, significantly ($p < .05$) predicted monetary valuation in 8 of 10 relevant tests and marginally ($p < .10$) so in 1 of the 2 remaining tests. As we

also discuss in the web appendix, greater anticipated usage predicted not only greater monetary valuation, but also greater subjective valuation. We focus on the monetary valuation effects because it is only on monetary valuation that superficially limited offers overcome the intuitive advantage of explicitly unlimited offers and are perceived as even *more* valuable than explicitly unlimited offers. For subjective valuation, the usage-based anchoring process may simply reduce the size of explicitly unlimited offers' advantage, akin to a suppressor effect.

STUDY 2

Using a wider range of offer categories, study 2 examined whether the dissociation between monetary and subjective valuation of superficially limited (vs. explicitly unlimited) offers extends to another form of monetary valuation: estimated prices. Because consumers determine how much they are willing to pay for a product in part based on their beliefs about how much the product costs in the marketplace (Thaler 1985; Weaver and Frederick 2012), we expected that participants' greater WTP for superficially limited offers would be traceable to their beliefs that superficially limited offers are more expensive.

Method

Participants. We requested 600 U.S.-based participants from MTurk via CloudResearch. After applying preregistered exclusions, we were left with a final sample of 593 participants.

Procedure. Participants considered six offers, each of which would permit unlimited use of a product or service: a coffee subscription, a monthly train pass, TV episodes on an airplane, a

data-usage plan for a tablet on a trip, a mobile phone plan for international calling, and an audiobook subscription. For each participant, three offers were randomly selected to be presented in an *explicitly unlimited* frame, and the other three were presented in a *superficially limited* frame. The six offers were presented in random order.

After reading a description of an offer, participants first estimated the price of the offer: "In U.S. dollars, what do you estimate is the price of this voucher?" They then indicated their WTP for the offer: "In U.S. dollars, what is the most you would be willing to pay for this voucher?" Responses to each monetary valuation measure were elicited using an open-ended numeric text box that permitted responses greater than or equal to 0. Finally, participants rated the attractiveness of the offer: "How attractive is this voucher to you?" (1 = "Not at all attractive", 7 = "Very attractive").

After evaluating all six offers, participants completed three additional measures for each offer (one offer at a time): WTP for one unit of the product or service (which we preregistered as a covariate in our main analyses), and estimates of how much they and a typical consumer would use the offer. The two anticipated usage items were standardized within each offer and then averaged (r = .98) to create an *anticipated usage* composite for each participant for each offer.

Results and Discussion

We used linear mixed-effects regressions with random intercepts for participant and offer category to predict each valuation measure. Each model included two predictors: offer frame (-0.5 = explicitly unlimited, +0.5 = superficially limited) and unit WTP. As preregistered, we first ln-transformed WTP, estimated price, and unit WTP to reduce skew. For this and all subsequent

studies with multiple offers, we standardized attractiveness, WTP, and estimated price within each offer category to ensure that our results would not be disproportionately driven by higher-variance offer categories. This is particularly important for monetary valuation, because the variance in WTP and price estimates can differ substantially across different offer categories. In the web appendix, we report raw means and effects for each offer in each study.

Attractiveness. Explicitly unlimited offers were perceived as more attractive (M = 4.10, SD = 1.96) than superficially limited offers (M = 3.82, SD = 1.91), b = -0.13, SE = 0.03, t(3047.84) = -4.59, $p < .001$ (figure 2).

Willingness to Pay. As preregistered, we excluded the 7 observations for which the (ln-transformed) WTP response was more than 3.5 standard deviations from the mean for that particular offer category. Despite rating explicitly unlimited offers as more attractive, participants reported that they would be willing to pay more for superficially limited offers, b = 0.15, SE = 0.03, t(3027.96) = 5.45, $p < .001$. For this and all subsequent studies that included multiple offers, we capture effects on WTP and estimated price by reporting (back-transformed) means for a representative offer category, as a complement to the standardized values depicted in figures. We identified each study's representative effect by testing for an effect of offer frame within each offer category, determining which offer categories yielded effects at least as large as the overall effect, and then selecting the one that was most similar in magnitude to the overall effect. In this study, the representative effect was that of the monthly train pass: Participants reported that they would be willing to pay \$62.15 for this offer when it was superficially limited ("62 one-way trips, for use over one month") but only \$51.74 when it was explicitly unlimited ("Unlimited one-way trips, for use over one month").

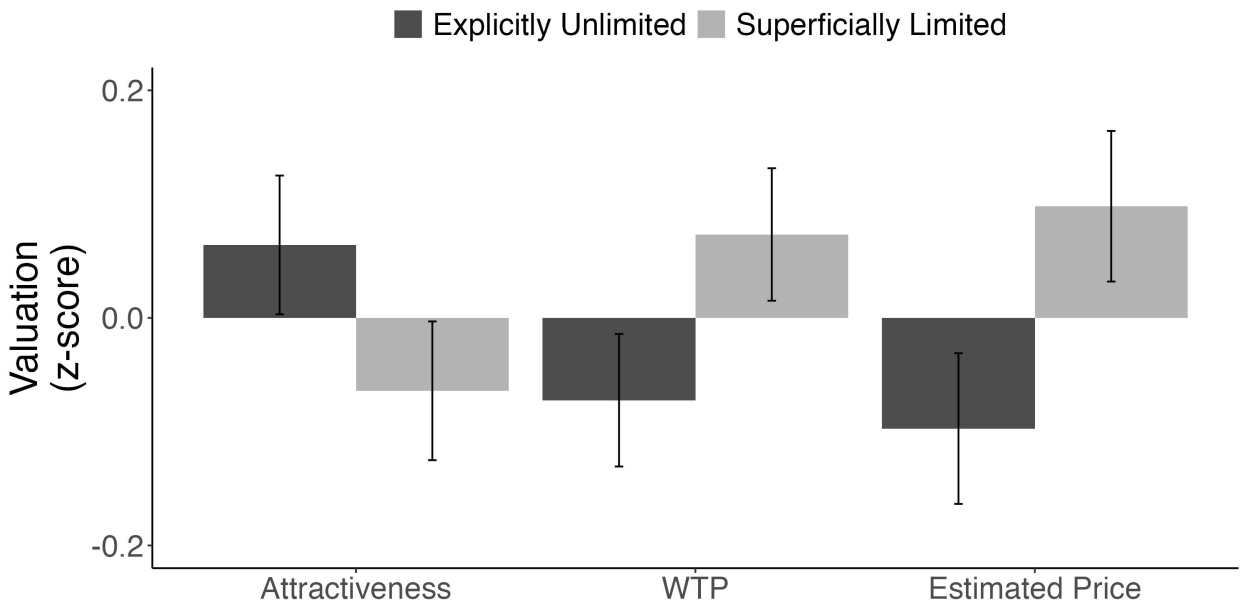
Estimated Price. Next, we tested whether the same pattern emerged on the new measure of monetary valuation. As preregistered, we excluded the 9 observations for which the (ln-transformed) price estimate was more than 3.5 standard deviations from the mean for that particular offer category. In line with the WTP results, participants estimated higher prices for superficially limited offers than for explicitly unlimited offers, $b = 0.20$, $SE = 0.06$, $t(3044.19) = 7.52$, $p < .001$. Participants expected the superficially limited train pass to be priced at $84.10, but expected the explicitly unlimited train pass to be priced at only $70.00.

Given that previous work suggests WTP is largely a function of estimated price (Thaler 1985; Weaver and Frederick 2012), we sought to test whether estimated price mediates the effect of offer frame on WTP. We returned to the model predicting WTP and added estimated price as a predictor. Estimated price strongly predicted WTP, $b = 0.55$, $SE = 0.01$, $t(3413.43) = 40.05$, $p < .001$. However, when controlling for estimated price, the effect of offer frame on WTP was no longer significant, $b = 0.04$, $SE = 0.02$, $t(3006.11) = 1.66$, $p = .098$ (Sobel $z = 7.37$, $p < .001$).

Summary. Unlimited offer frames have similar influences on WTP and its known precursor, estimated market prices. This suggests the key process question is why unlimited offer frames affect estimated prices, which have predictable downstream consequences on another marker of monetary valuation (WTP). As we shift to more precisely probing these mechanisms, we thus use estimated price as our index of monetary valuation in most subsequent studies.

FIGURE 2

SUBJECTIVE AND MONETARY VALUATIONS AS A FUNCTION OF OFFER FRAME (STUDY 2).



NOTE.—Error bars represent 95% confidence intervals for the model-predicted values.

STUDY 3

Study 3 investigated whether the dissociation between subjective and monetary valuation persists when consumers are shown both frames simultaneously. Given that participants in our previous studies only saw the offer frame that the firm chose to use, it is unclear whether the effects we have observed are driven by the information contained in the frames themselves (as we propose) or by inferences that consumers make based on the firm's choice to use one frame over another. For example, even if consumers recognize the equivalence between the two frames, they might infer that a product advertised as "unlimited" is lower-quality than one advertised with a discrete usage limit, or they might draw negative inferences about firms that impose usage

constraints. By contrast, we theorize that it is the recognition that an offer is "unlimited" that makes it seem especially attractive, and the recognition of just how much one could use the offer that makes it seem especially monetarily valuable. This implies that each offer frame should exert similar effects on valuation regardless of whether it is communicated by the firm itself or as a redescription of the firm's chosen frame. In other words, the dissociation between subjective and monetary valuation should disappear when consumers see both frames simultaneously: Quantifying the (high) amount of usage provided by an "unlimited" offer should increase its perceived monetary value, and communicating that an offer with a discrete usage limit is essentially "unlimited" should increase its perceived subjective value.

Method

Participants and Design. We requested 600 U.S.-based MTurk participants via CloudResearch. After applying preregistered exclusions, we were left with 551 participants. Participants were randomly assigned to one of two *dual-frame* conditions: present or absent.

Procedure. Participants considered a set of six offers similar to those used in study 2. For each participant, three offers were randomly selected to be framed as *explicitly unlimited* while the other three were framed as *superficially limited*. When the dual frame was *present*, we also translated the focal offer frame into the alternate frame—the one not depicted on the offer itself. The alternate frame was described in text immediately below the offer (figure 3). For example, in the superficially limited (explicitly unlimited) condition, participants in the dual-frame-present condition read, "Because there are 120 hours in a 5-day period, this offer is essentially equivalent to unlimited (120 hours) of internet access." The six offers were presented in a random order.

FIGURE 3

EXAMPLE OFFERS IN THE DUAL-FRAME-PRESENT CONDITION (STUDY 3)

NOTE.— Explicitly unlimited offer (left panel) and superficially limited offer (right panel).

For each offer, participants completed the same estimated price and attractiveness measures used in study 2. After evaluating all six offers, participants also completed the same set of additional measures about each offer (one offer at a time) as in study 2: their WTP for one unit of the service, as well as estimates of how much they and a typical consumer would use the offer. The two anticipated usage items were standardized within each offer category and then averaged (r = .61) to create an *anticipated usage* composite.

Results and Discussion

Attractiveness. The focal offer frame influenced attractiveness ratings, b = -0.10, SE = 0.03, $t(2821.50) = -3.90$, $p < .001$, but this effect depended on whether the alternate frame was also present, b = 0.19, SE = 0.05, $t(2821.29) = 3.60$, $p < .001$ (figure 4). Participants in the dual-

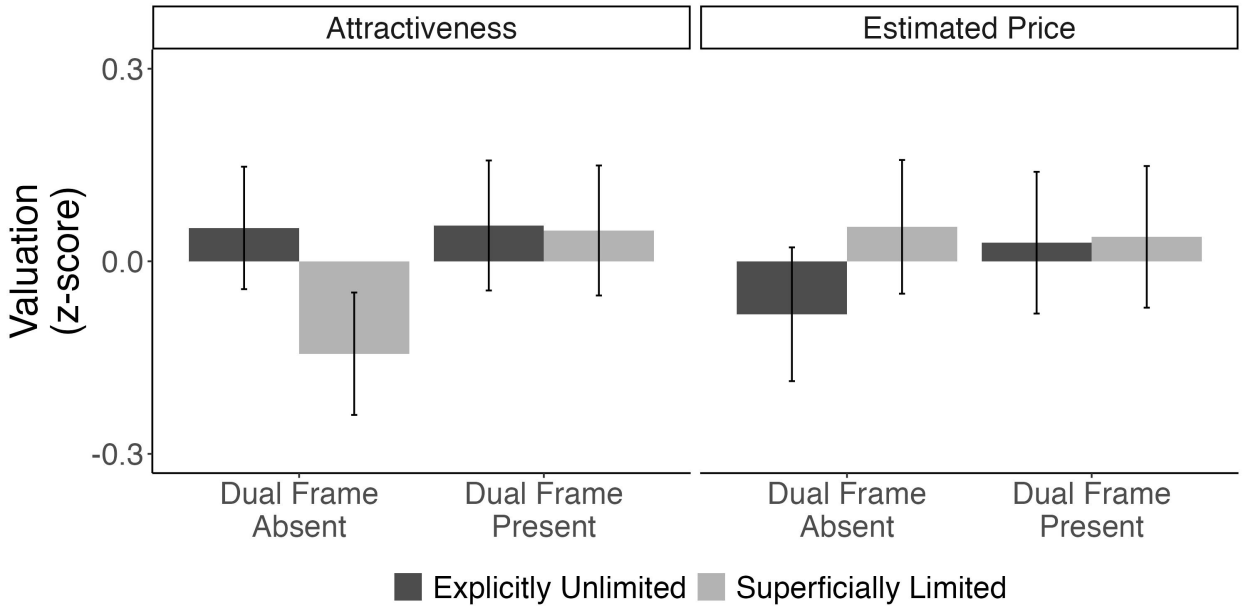
frame-absent condition, who saw only the focal offer frame, rated explicitly unlimited offers as more attractive (M = 4.70, SD = 1.86) than superficially limited offers (M = 4.30, SD = 1.97), b = -0.20, SE = 0.04, t(2822.24) = -5.46, $p < .001$. However, participants in the dual-frame-present condition, who saw both frames, did not rate explicitly unlimited offers as any more or less attractive (M = 4.66, SD = 1.91) than superficially limited offers (M = 4.64, SD = 1.90), $|t| < 1$.

Estimated Price. As preregistered, we excluded the 26 observations for which the (ln-transformed) price estimate was more than 3.5 standard deviations from the mean for that particular offer category. The focal offer frame influenced estimated prices, b = 0.07, SE = 0.02, t(2769.28) = 3.14, p = .002, but this effect hinged on whether the alternate frame was also present, b = -0.13, SE = 0.05, t(2768.97) = -2.75, p = .006. In the dual-frame-absent condition, superficially limited offers elicited higher estimated prices than explicitly unlimited offers, b = 0.14, SE = 0.03, t(2769.02) = 4.28, $p < .001$. The representative effect in this condition was the one-week international cell phone minutes plan, which was expected to cost $38.63 when it was superficially limited ("11,000 voice minutes, for use over one week") and $33.49 when it was explicitly unlimited ("Unlimited voice minutes, for use over one week"). When both frames were present, however, participants' price estimates for superficially limited and explicitly unlimited offers did not significantly differ, $|t| < 1$.

Summary. This study found that the dissociation between subjective and monetary valuation disappeared once both offer frames were present. This rules out the possibility that differences in valuation between offer frames are driven by a signal sent by the firm's choice to use one frame over the other. Rather, it is the promise of "unlimited" use that makes an offer seem attractive, and the high discrete usage limit that makes an offer seem monetarily valuable.

FIGURE 4

SUBJECTIVE AND MONETARY VALUATION AS A FUNCTION OF OFFER FRAME AND PRESENCE OF THE DUAL FRAME (STUDY 3).



NOTE.—Error bars represent 95% confidence intervals for the model-predicted values.

In the marketplace, there is another type of unlimited offer that—like the dual-frame unlimited offers used in study 3—not only promises "unlimited" use but also calls attention to a discrete (and typically high) usage quantity: unlimited offers that impose throttling (i.e., restrictions beyond a certain usage threshold). Using variants of the movie theater subscription used in studies 1a and 1b, we presented participants in web appendix study C (N = 594 U.S.-based MTurk participants) with either an explicitly unlimited, a superficially limited, or a throttled offer. Like a dual-frame offer, the throttled offer promised "unlimited tickets to the movies," while also warning that "beyond 100 tickets, any subsequent ticket(s) that month must be booked within 15 minutes of showtime," thus also calling attention to the high discrete usage quantity of 100 tickets. As foreshadowed by study 3, participants rated this variant on a dual-

frame offer to be just as attractive as the explicitly unlimited offer (and more attractive than the superficially limited offer), but were also willing to pay just as much for it as for the superficially limited offer (and more than for the explicitly unlimited offer). Currently, there is no version of this subscription available in the marketplace that imposes throttling. The results of appendix study C suggest that this may be a missed opportunity. Although throttled offers that currently exist in the marketplace typically impose throttling at a usage quantity that is below the maximum amount one could use—which means throttled offers would be dominated by superficially limited offers—our results suggest that there are circumstances in which firms may benefit from making these throttling quantities more prominent.

STUDY 4

Study 4 examined whether the dissociation between monetary and subjective valuation persists when the superficially limited offer's usage limit is impossibly high, a question that is especially relevant to our usage-based anchoring account. Thus far, we have set the usage limit for superficially limited offers to be equal to or just above the maximum amount one could possibly use. Our evidence suggests that such limits increase valuation in part through their effect on anticipated usage. If the discrete usage limit were transparently set much higher than the maximum amount one could use (which we term an *impossibly high limit*), consumers may immediately reframe it as "unlimited" or simply view it as uninformative, thus not factoring it into their usage estimates. As a result, offers with impossibly high limits may have a smaller advantage in monetary valuation than standard superficially limited offers. However, given that implausible anchors can be just as influential and sometimes even more influential than plausible

ones (Mussweiler and Strack 1999; Strack and Mussweiler 1997), discrete usage limits may have similar or even stronger effects on anticipated usage and valuation when they are impossibly high. Observing stronger effects for offers with impossibly high limits (vs. standard superficially limited offers) would also suggest that the magnitude of the discrete usage limit—and not the mere presence of such a limit—matters.

Method

Participants. We requested 600 U.S.-based MTurk participants via CloudResearch. After applying preregistered exclusions, we were left with a final sample of 598 participants.

Procedure. Participants considered six offers similar to those used in previous studies: a meal plan, a coffee and tea subscription, access to movies on a flight, a mobile phone plan for international travel, a monthly train pass, and an audiobook subscription. Two of the offers were presented in an *explicitly unlimited* frame (e.g., "unlimited audiobooks for use over 2 weeks"), two were presented in a standard *superficially limited* frame (e.g., "68 audiobooks for use over 2 weeks"; additional information made clear there was time to start and listen to only 68 books), and the remaining two were presented in a superficially limited frame but had *impossibly high limits* (e.g., "999 audiobooks for use over 2 weeks"). We randomly varied for each participant which two offers were presented in each frame. The six offers were presented in a random order.

Unlike in previous studies, this study provided an explanation for each offer's stated limit. In all conditions, participants were explicitly told that the offer's stated limit would allow them to use as much as they wanted. For explicitly unlimited offers, we explained that the limit would be set to "unlimited" in the firm's system. Meanwhile, for standard superficially limited

offers and offers with impossibly high limits, we explained that the firm's system required a finite number to be specified. For superficially limited offers, participants were told that the specified limit was "the highest number one could possibly use" (note, however, that this quantity was calculable in all conditions). For offers with impossibly high limits, participants were told that the specified limit was "an impossibly high number."

For each offer, participants completed the same estimated price and attractiveness measures used in studies 2 and 3. Next, they completed additional measures for each offer (one offer at a time), including WTP for one unit of the service and estimates of how much both they and a typical person would use the offer. The two anticipated usage items were standardized within each offer category and then averaged (r = .44) to create an *anticipated usage* composite.

Results and Discussion

Attractiveness. Relative to explicitly unlimited offers (M = 4.48, SD = 1.87), participants rated both superficially limited offers (M = 4.24, SD = 1.89), b = -0.11, SE = 0.03, t(3079.84) = -3.25, p = .001, and offers with impossibly high limits (M = 4.34, SD = 1.94), b = -0.07, SE = 0.03, t(3081.16) = -2.11, p = .035, as less attractive (figure 5). Offers with impossibly high limits were seen as no more or less attractive than superficially limited offers, b = 0.04, SE = 0.03, t(3078.69) = 1.15, p = .252. This means that although the presence of a discrete usage limit lowered subjective valuation, the magnitude of this limit did not matter.

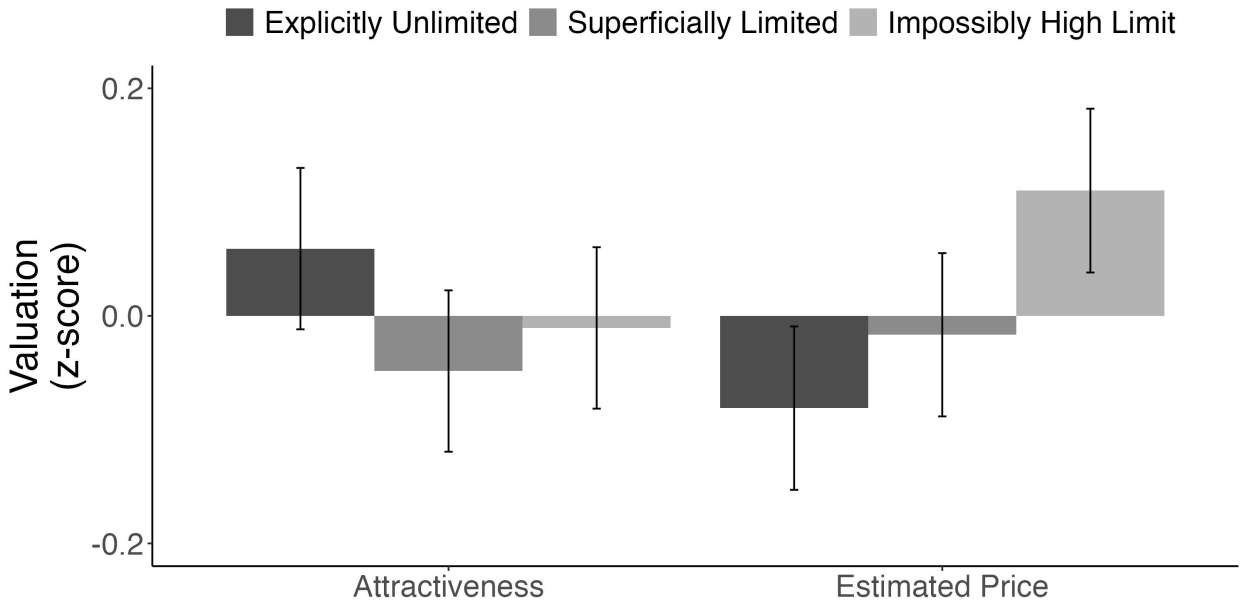
Estimated Price. As preregistered, we excluded the 29 observations for which the (ln-transformed) estimated price was more than 3.5 standard deviations from the mean within that particular offer category. Relative to explicitly unlimited offers, estimated prices were higher for

both superficially limited offers, $b = 0.06$, $SE = 0.03$, $t(3042.75) = 2.07$, $p = .038$, and offers with impossibly high limits, $b = 0.19$, $SE = 0.03$, $t(3046.53) = 6.12$, $p < .001$. Unlike subjective valuations, monetary valuations were sensitive to the magnitude of the discrete usage limit: Offers with impossibly high limits elicited higher price estimates than standard superficially limited offers, $b = 0.13$, $SE = 0.03$, $t(3044.22) = 4.06$, $p < .001$. The representative effect was the monthly meal plan, which participants expected to be priced at $115.40 when it was explicitly unlimited ("Unlimited meal swipes, for use over one month"), $126.19 when it was presented in a standard superficially limited frame ("93 meal swipes, for use over one month"), and $144.32 when it had an impossibly high limit ("999 meal swipes, for use over one month"). This suggests that price estimates were not merely sensitive to the presence or absence of a discrete usage limit. Instead, as the magnitude of the discrete usage limit grew, price estimates grew as well.

Anticipated Usage. If the discrete limits serve as high anchors that increase valuation (in line with our usage-based anchoring account), then offers with impossibly high limits may elevate anticipated usage and valuation even more so than standard superficially limited offers. To test for this possibility, we conducted a similar linear mixed-effects regression with anticipated usage predicted by frame. As in previous studies, standard superficially limited offers were expected to be used more than explicitly unlimited offers, $b = 0.08$, $SE = 0.03$, $t(2858.36) = 2.51$, $p = .012$. Of particular interest, offers with impossibly high limit were expected to be used even more than both explicitly unlimited offers, $b = 0.17$, $SE = 0.03$, $t(2867.20) = 4.93$, $p < .001$, and superficially limited offers, $b = 0.08$, $SE = 0.03$, $t(2862.34) = 2.44$, $p = .015$. In other words, the presence of a discrete limit increased anticipated usage, but this increase was even larger when the magnitude of this limit was far greater than what one could realistically use.

FIGURE 5

SUBJECTIVE AND MONETARY VALUATION AS A FUNCTION OF OFFER FRAME (STUDY 4).



NOTE.—Error bars represent 95% confidence intervals for the model-predicted values.

Second, when we added anticipated usage to the original model predicting estimated price, it was a significant predictor, $b = 0.11$, $SE = 0.02$, $t(3336.94) = 6.81$, $p < .001$. Moreover, the difference in price estimates for standard superficially limited versus explicitly unlimited offers became only marginally significant, $b = 0.06$, $SE = 0.03$, $t(3041.91) = 1.78$, $p = .075$. The difference in price estimates for offers with impossibly high limits versus explicitly unlimited offers, $b = 0.17$, $SE = 0.03$, $t(3047.35) = 5.54$, $p < .001$, and for offers with impossibly high limits versus superficially limited offers, $b = 0.12$, $SE = 0.03$, $t(3043.46) = 3.79$, $p < .001$, remained significant but were reduced. Sobel tests comparing superficially limited and explicitly unlimited offers ($z = 2.35$, $p = .019$), offers with impossibly high limits and explicitly unlimited offers ($z = 3.99$, $p < .001$), and offers with impossibly high limits and superficially limited offers

($z = 2.30$, $p = .022$) were all significant. The effect of providing a high discrete usage limit on anticipated usage thus helped to explain why superficially limited offers and offers with impossibly high limits were so highly monetarily valued.

STUDY 5

Having shown that superficially limited offers in part acquire perceived value by elevating anticipated usage, we turn our attention to the reference-offer account. Specifically, we theorized that consumers would be more likely to call to mind (and rely on) reference offers when formulating monetary valuations for superficially limited (vs. explicitly unlimited) offers. This is because the discrete usage limits provided by superficially limited offers can be directly compared with reference offers. Because such reference offers would necessarily be smaller, scaling up proportionally from the price of a reference offer to the assumed price of a superficially limited offer should make the latter seem especially monetarily valuable.

Study 5 used a thought-listing protocol as an initial test of this idea. After participants estimated the prices of various unlimited offers, they explained how they formulated their estimates. Research assistants blind to our hypotheses coded these responses for evidence of spontaneous recruitment of a reference offer. From these, we could test two possibilities. First, we tested whether participants were more likely to call to mind reference offers when considering superficially limited (vs. explicitly unlimited) offers. Second, we assessed whether recruitment of a reference offer predicted greater monetary valuations for those considering superficially limited offers (but less so for those considering explicitly unlimited offers).

Method

This study was not preregistered before data collection. However, we preregistered our coding procedure and analysis plan on AsPredicted before beginning the coding procedure (and thus before we were able to conduct most of the primary analyses).

Participants and Design. One-hundred ninety-nine participants who were undergraduates at a U.S. university took part in the study as part of an hour-long session for which they received either marketing course credit or $15. Excluding the 20 participants who failed an attention check left us with a final sample of 179 participants.

Procedure. Participants considered a set of six offers from the same categories as those in study 3. For each participant, we randomly varied which three offers were presented in an *explicitly unlimited* frame and which three were presented in a *superficially limited* frame.

After considering each offer, participants completed the estimated price measure used previously. And after estimating the prices of all six offers, participants completed a free-response task that asked them to describe the process they used to formulate each price estimate:

> "Now we would like to better understand just *how* you formulated an estimate of each voucher's price. Perhaps you simply came up with a price *intuitively*, with the price coming to you out of thin air. Instead, perhaps you drew on certain information that you had (or at least thought you knew) that helped you to formulate the specific price you estimated."

Participants then saw the following prompt: "For each voucher, please describe specifically what was going through your head, including any specific information you thought about or relied upon when forming the price estimate." They provided a response for each offer they had seen

earlier. The prompt for each offer reminded them of their earlier response: "Describe how you went about estimating that the price set by the company was most likely [$X]."

Finally, participants completed additional measures about each offer (one offer at a time; see web appendix), including their willingness to pay for a single unit of the service.

Results and Discussion

We first excluded the 9 observations for which the (ln-transformed) price estimate was more than 3.5 standard deviations from the mean for that particular offer category.

Estimated Price. We began by testing for an effect of offer frame on monetary valuation. We conducted a linear mixed-effects regression with estimated price predicted by offer frame and unit WTP, including random intercepts for participant and offer category. As in previous studies, participants estimated higher prices for superficially limited offers than for explicitly unlimited offers, $b = 0.25$, $SE = 0.05$, $t(909.96) = 5.25$, $p < .001$. The representative effect was the three-day international data plan, which was expected to be priced at $37.00 when superficially limited and $27.72 when explicitly unlimited (back-transformed means).

Thought-Listing Protocol. We next tested: (1) whether participants were more likely to show evidence of considering reference offers (in their thought listings) when considering superficially limited (vs. explicitly unlimited) offers, and (2) whether those who did versus did not show evidence of considering reference offers were differentially influenced by the offer's frame. We first had four research assistants (who were blind to participants' conditions and our hypotheses) code participants' free responses to indicate whether participants showed evidence

of calling to mind a reference offer while estimating the price of the target offer. See the web appendix for more details on the coding procedure and sample coded responses.

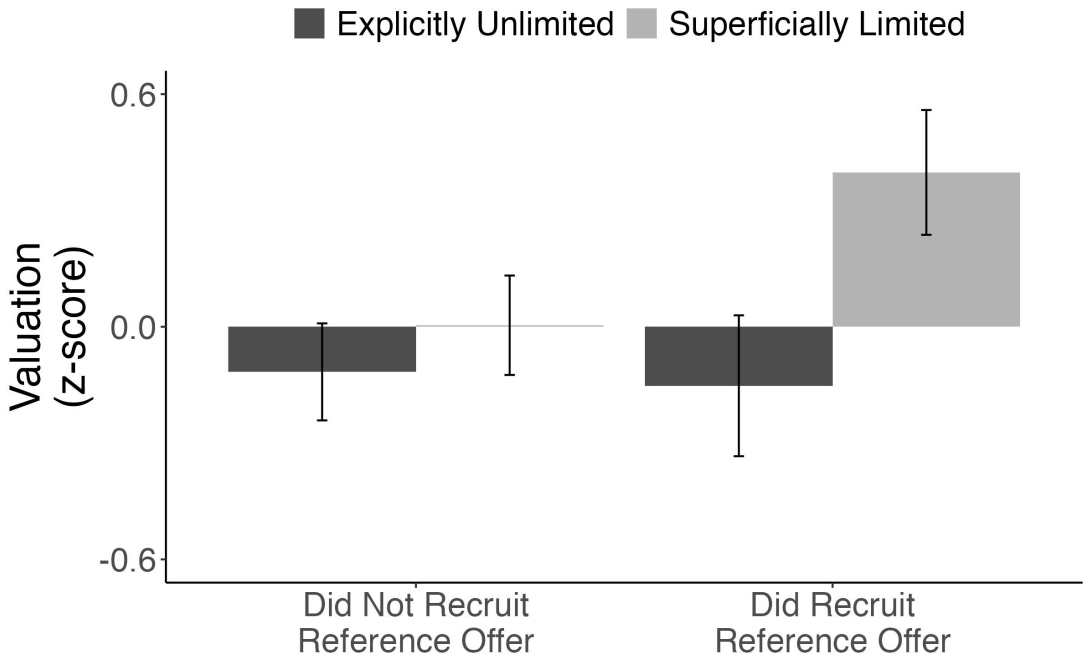
To test the first possibility, we conducted a mixed-effects logistic regression with a variable indicating whether a participant's thought listing indicated use of a reference offer (1 = yes, 0 = no) predicted by offer frame (-0.5 = explicitly unlimited, +0.5 = superficially limited), with random intercepts for participant and offer category. Participants were more likely to recruit a reference offer when estimating the price of a superficially limited offer (29.8%) compared to an explicitly unlimited offer (20.5%), $b = 0.83$, $SE = 0.17$, $z = 4.84$, $p < .001$.

To test the second possibility, we conducted a linear mixed-effects regression with estimated price predicted by offer frame, recruitment of a reference offer (-0.5 = no, +0.5 = yes), and their two-way interaction, with random intercepts for participant and offer category. The interaction between offer frame and recruitment of a reference offer was significant, $b = 0.43$, $SE = 0.12$, $t(977.25) = 3.60$, $p < .001$ (figure 6). We decomposed this interaction in two ways.

First, we examined the effect of offer frame on valuation among those who did versus did not consult a reference offer. When participants did not show evidence of using a reference offer, they expected superficially limited offers to be priced somewhat higher than explicitly unlimited offers, $b = 0.11$, $SE = 0.06$, $t(928.69) = 1.96$, $p = .050$. But when they did recruit a reference offer, the effect of offer frame was even larger, $b = 0.54$, $SE = 0.10$, $t(963.58) = 5.31$, $p < .001$.

FIGURE 6

MONETARY VALUATION AS A FUNCTION OF OFFER FRAME AND WHETHER PARTICIPANTS RECRUITED A REFERENCE OFFER (STUDY 5).



NOTE.—Error bars represent 95% confidence intervals for the model-predicted values.

Second, we examined the association between the apparent recruitment of a reference offer and monetary valuation among those considering offers in each frame. When considering a superficially limited offer, participants who showed evidence of recruiting a reference offer made significantly higher price estimates than those who did not, $b = 0.41$, $SE = 0.08$, $t(981.41) = 5.12$, $p < .001$. But when considering an explicitly unlimited offer, those who did and did not show evidence of recruiting a reference offer did not differ in their price estimates, $|t| < 1$.

Summary. This study provides initial support for our reference-offer account. Participants seemed not only more likely to call to mind reference offers when considering superficially

limited offers than when considering explicitly unlimited offers, but the use of such reference offers was predictive of greater monetary valuation only for superficially limited offers.

STUDY 6

Study 6 built on the previous study by experimentally manipulating whether participants were provided with the price of a reference offer. Although study 5 suggested that consumers are more likely to spontaneously call to mind reference offers when evaluating superficially limited offers, it used a correlational approach to infer the differential influence of reference offers across offer frames. Study 6 instead allowed for a causal test of whether considering the price of a reference offer increases the perceived monetary value of superficially limited offers more so than explicitly unlimited offers. Unlike study 5, this study also measured subjective valuation, which allowed us to examine whether consideration of a reference price affects monetary valuation in particular. This pattern of results would support the idea that the reference-offer account contributes to the monetary-subjective valuation dissociation.

Method

Participants and Design. We requested 400 U.S.-based MTurk participants via CloudResearch. After applying preregistered exclusions, we were left with a final sample of 398 participants. Participants were randomly assigned to one of two *reference price* conditions: present or absent.

Procedure. Participants considered six offers similar to those used in study 2. For each participant, three were randomly selected to be framed as *explicitly unlimited*, whereas the other three were framed as *superficially limited*. Participants were told for each offer that the firm had historically only charged per use, but it recently began to supplement its pay-per-use offer with another offer. The six offers were presented in random order.

When a reference price was *present*, participants were provided with information about the pay-per-use price of the product or service (e.g., "The price for 2-week access to one audiobook is $5."). These reference offer prices were based on the median unit WTP response for that particular offer category in previous studies. This minimized the likelihood that these reference prices supplied new information, in the aggregate, about the product or service's quality. When the reference price was *absent*, participants were not provided with the pay-per-use price (but were still informed that the pay-per-use option existed).

For each offer, participants completed the estimated price and attractiveness measures used in previous studies. Next, participants responded to additional items about each offer (one offer at a time), including WTP for one unit of the service and estimates of how much they and a typical person would use the offer. The two anticipated usage items were standardized within each offer category and then averaged to create an *anticipated usage* composite ($r = .75$).

Results and Discussion

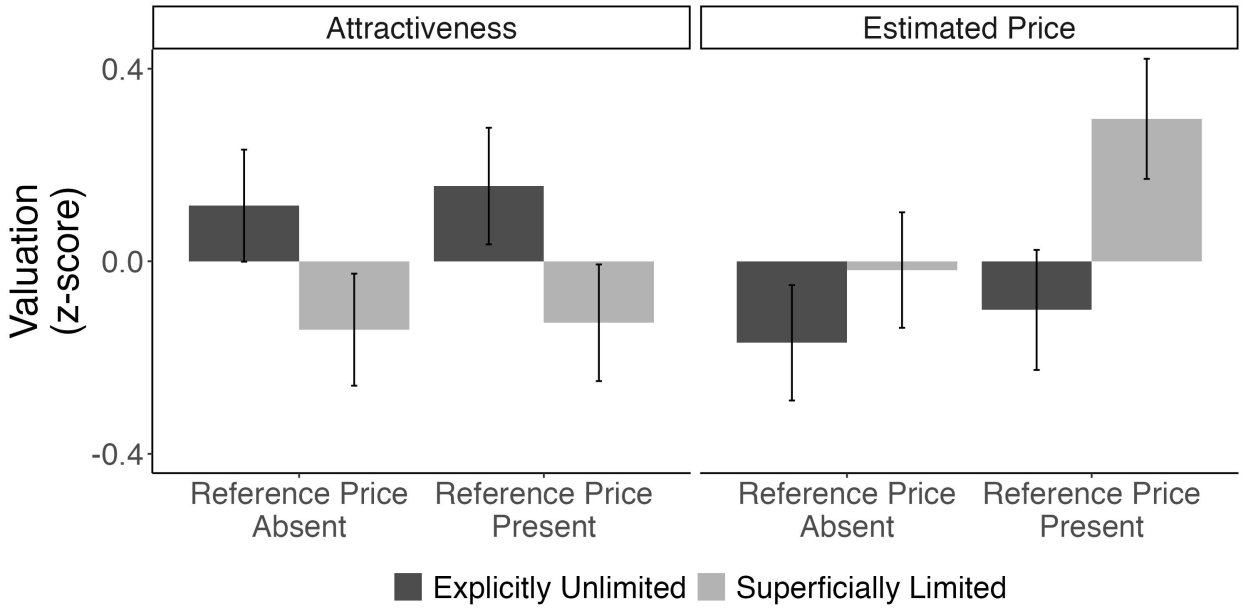
Attractiveness. Explicitly unlimited offers were rated as more attractive ($M = 4.47$, $SD = 1.89$) than superficially limited offers ($M = 3.97$, $SD = 1.92$), $b = -0.27$, $SE = 0.03$, $t(2036.36) = -8.99$, $p < .001$. This effect did not depend on the presence of a reference price, $|t| < 1$ (figure 7).

Estimated Price. As preregistered, we excluded the 16 observations for which the (ln-transformed) price estimate was more than 3.5 standard deviations from the mean for that particular offer category. Overall, participants estimated higher prices for superficially limited offers than explicitly unlimited offers, $b = 0.27$, $SE = 0.03$, $t(2009.50) = 9.64$, $p < .001$. The magnitude of this effect depended on whether a reference price was provided, $b = 0.25$, $SE = 0.06$, $t(2008.23) = 4.33$, $p < .001$. When no reference price was provided, superficially limited offers elicited higher price estimates than explicitly unlimited offers, $b = 0.15$, $SE = 0.04$, $t(2010.25) = 3.83$, $p < .001$, replicating the results of previous studies. But when a reference price was provided—thereby guaranteeing that everyone had access to it—the size of this effect more than doubled: Superficially limited offers were expected to be priced substantially higher than explicitly unlimited offers, $b = 0.40$, $SE = 0.04$, $t(2007.59) = 9.70$, $p < .001$. The representative effect in the reference-price-present condition was the two-week audiobook subscription. Whereas participants who did not receive a reference price expected this subscription to be priced at \$19.83 when it was explicitly unlimited ("Access to unlimited audiobooks") and \$22.75 when it was superficially limited ("Access to up to 75 audiobooks"), those who were told that two-week access to one audiobook costs \$5 expected it to be priced at \$18.16 when it was explicitly unlimited and \$29.22 when it was superficially limited.

We also decomposed the interaction in a complementary way. For superficially limited offers, the presence of a reference price significantly increased price estimates, $b = 0.31$, $SE = 0.09$, $t(338.39) = 3.56$, $p < .001$. But for explicitly unlimited offers, introducing a reference price had no effect, $|t| < 1$. As foreshadowed by study 5, which found that participants who spontaneously recruited a reference price while considering superficially limited offers made especially high price estimates for those offers, this study identifies a causal effect.

FIGURE 7

SUBJECTIVE AND MONETARY VALUATION AS A FUNCTION OF OFFER FRAME AND THE PRESENCE OF A REFERENCE PRICE (STUDY 6).



NOTE.—Error bars represent 95% confidence intervals for the model-predicted values.

Summary. These results provide complementary support for the reference-offer account. Providing participants with the prices of reference offers increased superficially limited offers' perceived monetary value (but not their perceived subjective value). Meanwhile, for explicitly unlimited offers, neither monetary nor subjective valuations were influenced by reference prices. In other words, reference prices amplified the monetary-subjective valuation dissociation.

STUDY 7

In our final study, we examined downstream consequences of the monetary-subjective valuation dissociation for consumers' interest in a real unlimited offer. Specifically, participants

reported their interest in an unlimited beverage subscription offered by a fast-casual chain with locations in every continental U.S. state. The offer was framed as either explicitly unlimited or superficially limited. Participants then chose whether to receive a link to the offer, and we tracked whether they clicked on this link as a convergent measure of interest.

We also examined whether consumers' relative interest in each offer frame depends on whether they have access to the offer's price. Given that choices—at least when price is not an issue—tend to be better predicted by subjective than monetary valuation (Hascher et al. 2021), we expected the explicitly unlimited offer to evoke more interest. But once a price is supplied, consumers can easily evaluate an offer in light of their own monetary valuation. Because superficially limited offers are valued monetarily more highly than explicitly unlimited offers, the addition of the price may pique more interest when it is attached to a superficially limited offer. We thus expected that providing pricing information would counteract the advantage of the explicitly unlimited offer, perhaps even generating *greater* interest in the superficially limited (vs. explicitly unlimited) offer. To more directly test our theoretical logic, we attempt to trace these effects to a shift in the extent to which consumer interest is driven by subjective valuation (when a price is not supplied) to monetary valuation (once a price is supplied).

Method

Participants and Design. We requested 1,600 U.S.-based MTurk participants via CloudResearch. After applying preregistered exclusion criteria, we were left with 1,577 participants. Participants were randomly assigned to one of four conditions in a 2 (offer frame: explicitly unlimited vs. superficially limited) X 2 (price: present vs. absent) full-factorial design.

Procedure. All participants considered a monthly beverage subscription that was being offered at the time the study was run by a well-known fast-casual restaurant chain. The actual subscription promised subscribers unlimited coffee, tea, lemonade, and soda. But it came with a catch: It could be redeemed only once every two hours. This means that there was a limit to how many beverages one could redeem per month. Whereas some participants were presented with the *explicitly unlimited* frame that the chain actually used ("unlimited drinks every month"), others were presented with an equivalent *superficially limited* frame ("up to 200 drinks every month"), which we created based on the chain's locations' typical business hours.

Before seeing the target offer, participants indicated how often they personally "consume" and "purchase" any of the four types of beverages included in the subscription (i.e., coffee, tea, lemonade, and soda) compared to the average person (1 = "Much less", 4 = "About the same", 7 = "Much more"). We averaged these two items to create a *baseline consumption* composite for each participant (r = .83). Participants were then exposed to the focal offer. They completed the estimated price and attractiveness measures used in previous studies.

Next, participants saw a social media advertisement for the same subscription. For those in the price *absent* condition, the price of the subscription was not mentioned. For participants in the price *present* condition, however, the ad stated that the price of the subscription was $39.99 per month. We selected this price on the basis of an initial study (appendix study D), which showed that this value was approximately halfway between the median price estimates for those who saw the explicitly unlimited or the superficially limited version of a similar offer.

Participants reported how interested they were in the offer using two items: "How good do you think this offer is?" (1 = "Not very good", 7 = "Very good") and "How interested are you in this offer?" (1 = "Not at all", 7 = "Very much"). We averaged the two responses to create an

interest-in-offer composite (r = .75). Next, they indicated how many beverages they would redeem per month and how many beverages a typical person would redeem per month if given access to the subscription. We averaged these to create an *anticipated usage* composite (r = .70).

Finally, participants were informed that the subscription was actually available at a fast-causal restaurant chain in the U.S. They indicated whether they wanted to receive a link to the offer ("Yes" or "No"). Those who indicated "Yes" were provided with a link, and we tracked whether each participant clicked on it. This convergent measure allowed us to gauge whether participants were genuinely interested in the offer, as opposed to merely self-reporting interest.

Results and Discussion

Attractiveness. As predicted, the superficially limited offer that promised "up to 200 drinks every month" was rated as less attractive (M = 3.73, SD = 1.98) than the explicitly unlimited offer that promised "unlimited drinks every month" (M = 4.06, SD = 1.94), b = -0.32, SE = 0.09, $t(1574)$ = -3.48, $p < .001$, d = -0.18.

Estimated Price. By contrast, participants expected the superficially limited offer ("up to 200 drinks every month") to be priced significantly higher than the explicitly unlimited offer ("unlimited drinks every month"), b = 0.70, SE = 0.06, $t(1574)$ = 12.42, $p < .001$, d = 0.63. Whereas the explicitly unlimited offer was expected to be priced at $31.42, the superficially limited offer was expected to be priced at $64.46.

Self-Reported Interest in Offer. We then tested whether consumers' interest in the offer depended on whether the advertisement mentioned the offer's price. We regressed the interest-in-offer composite on offer frame (-0.5 = explicitly unlimited, +0.5 = superficially limited), the

presence of pricing information (-0.5 = absent, +0.5 = present), and the two-way interaction of these variables, controlling for the baseline consumption composite. We observed a marginal main effect of offer frame, $\beta = 0.04$, $b = 0.16$, $SE = 0.09$, $t(1572) = 1.86$, $p = .063$, and a significant effect of the presence of pricing information, $\beta = -0.05$, $b = -0.18$, $SE = 0.09$, $t(1572) = -2.09$, $p = .037$. But crucially, the predicted interaction between these two factors emerged, $\beta = 0.11$, $b = 0.77$, $SE = 0.17$, $t(1572) = 4.40$, $p < .001$ (figure 8).

When the offer's price was not shown, participants expressed marginally greater interest in the explicitly unlimited offer that promised "unlimited drinks every month" ($M_{est} = 4.29$, $SE = 0.09$) than the superficially limited offer that promised "up to 200 drinks every month" ($M_{est} = 4.07$, $SE = 0.09$), $b = -0.22$, $SE = 0.12$, $t(1572) = -1.82$, $p = .070$, $d = -0.09$. After all, the explicitly unlimited offer was seen as the more attractive one. But when the offer's price was shown, this effect reversed: Participants expressed greater interest in the superficially limited offer that promised "up to 200 drinks every month for $39.99" ($M_{est} = 4.27$, $SE = 0.09$) than in the explicitly unlimited offer that promised "unlimited drinks every month for $39.99" ($M_{est} = 3.73$, $SE = 0.09$), $b = 0.54$, $SE = 0.12$, $t(1572) = 4.39$, $p < .001$, $d = 0.22$. Once the offer could also be assessed in terms of monetary valuation, the superficially limited offer—which participants assumed would be priced substantially higher—became much more appealing.

Why did the presence of pricing information change the amount of interest elicited by each offer frame? We have argued that pricing information changes the extent to which consumers' interest is determined by monetary versus subjective valuation. To test this more directly, we added eight terms to the model: main effects of attractiveness and estimated price, as well as the interactions between each of these variables and our manipulations—both individually (thereby creating four two-way interaction terms) and together (thereby creating two

three-way interaction terms). When pricing information was supplied, participants' interest in the offer became more predicted by their initial assessment of its price (b = 0.03 to b = 1.03), β = 0.33, b = 1.00, SE = 0.06, t(1564) = 18.10, p < .001, and less predicted by their initial rating of its attractiveness (b = 0.71 to b = 0.41), β = -0.16, b = -0.30, SE = 0.03, t(1564) = -9.74, p < .001. Given that each offer frame fares better on a different type of valuation, these shifts in the importance of subjective and monetary valuation may explain why superficially limited offers elicited greater interest once pricing information was provided.

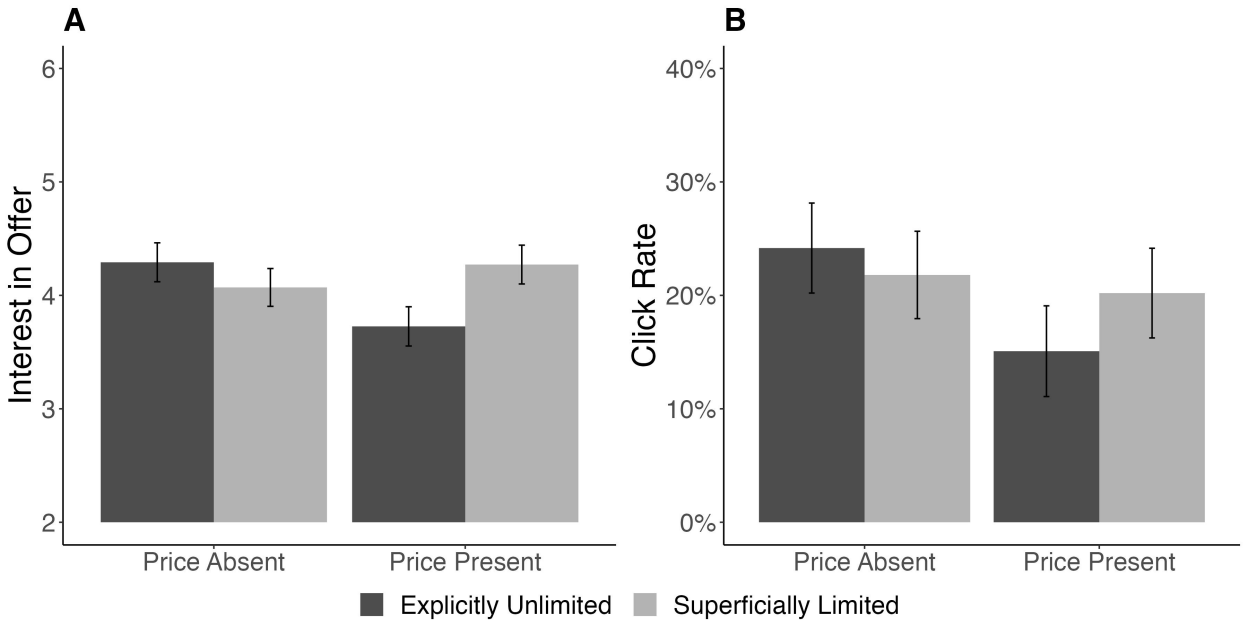
Although including measures of subjective and monetary valuation allowed us to conduct these more nuanced process tests, one concern is that asking participants to assess the offer's subjective and monetary value before reporting their interest in the offer might have artificially drawn their attention to subjective and monetary valuation. We thus conducted appendix study E to replicate study 7 without first measuring subjective and monetary valuation. Here, we again observed an interaction between offer frame and the presence of pricing information, β = 0.12, b = 0.84, SE = 0.17, t(1568) = 4.96, p < .001. Whereas participants were significantly more interested in the explicitly unlimited offer when it was advertised without pricing information, b = -0.36, SE = 0.12, t(1568) = -2.89, p = .004, d = -0.15, they were significantly more interested in the superficially limited offer when it was advertised at a price of $39.99 per month, b = 0.49, SE = 0.12, t(1568) = 4.15, p < .001, d = 0.21.

Behavioral Interest. Finally, we conducted a logistic regression to test for a similar pattern on participants' propensity to click on a link to the real offer, a convergent indicator of interest. The overall click rate did not differ significantly for the superficially limited versus explicitly unlimited offer, b = 0.11, SE = 0.13, z = 0.87, p = .387. Participants did click on the link less often when the ad included pricing information, b = -0.35, SE = 0.13, z = -2.71, p =

.007. Of greater interest, the effect of offer frame depended on the presence of pricing information, though this effect was only marginally significant, $b = 0.50$, $SE = 0.26$, $z = 1.95$, $p = .051$ (figure 8). When the offer was advertised without pricing information, participants were no more likely to click on a link to the explicitly unlimited offer (23.8%) than the superficially limited offer (21.4%), $z = 0.82$, $p = .412$. But when the offer was advertised at a price of $39.99 per month, participants clicked on a link to the superficially limited offer marginally more often (19.8%) than the explicitly unlimited offer (14.7%), $z = 1.88$, $p = .061$.

FIGURE 8

SELF-REPORTED INTEREST AND CLICK RATE AS A FUNCTION OF OFFER FRAME AND THE PRESENCE OF PRICING INFORMATION (STUDY 7).



NOTE.—Error bars represent 95% confidence intervals for the model-predicted values.

Summary. Study 7 showed that consumers' relative interest in explicitly unlimited versus superficially limited offers can depend on the presence of pricing information. Participants who saw an ad that did not include pricing information were somewhat more interested in the explicitly unlimited offer of "unlimited drinks every month," relying primarily on how attractive the offer seemed. By contrast, when the same subscription was advertised at a price of $39.99 per month, participants reported greater interest in the superficially limited offer of "up to 200 drinks every month," giving more weight to their assessment of the offer's monetary value.

GENERAL DISCUSSION

Eight experiments demonstrated a robust dissociation between consumers' subjective and monetary valuations of superficially limited (vs. explicitly unlimited) offers. Across a range of contexts, superficially limited offers—despite being seen as less subjectively valuable than explicitly unlimited offers—were seen as more monetarily valuable. This boost in monetary valuation emerged in participants' stated WTP (studies 1a, 2), actual WTP (study 1b), and price estimates (studies 2–7). These effects are triggered by information in the offer frames themselves, not by inferences about what type of firm would use each frame (study 3). As reported in the web appendix, consumers who reported consuming the target product or service more frequently to begin with—those most likely to be in the market for unlimited offers—were just as susceptible to these framing effects as those with lower baseline consumption.

Although explicitly unlimited offers are clearly valuable based on their stated promise of unconstrained use, we documented two processes that lead superficially limited offers to acquire value. First, consumers expect to use superficially limited offers more (studies 1a–7), even when

their stated limits are impossibly high (study 4), which in turn predicts increased valuation. Second, superficially limited offers include discrete usage limits that make them more comparable to other (smaller) discrete-limit offers. When considering superficially limited offers, participants were more likely to call to mind such reference offers spontaneously (study 5). Recruiting or being provided with the price of a reference offer elevated just how monetarily valuable superficially limited offers seemed (studies 5–6). This process is unique to monetary valuation, and thus helps to fuel the monetary-subjective valuation dissociation.

Study 7 examined one factor that changes the extent to which consumers' interest in an offer is predicted by each type of valuation, and thus which offer frame elicits greater overall interest. When an offer was advertised without pricing information, participants' interest was predicted by subjective valuation (on which explicitly unlimited offers dominate). But when participants were provided with the price of the offer, their interest was predicted more by monetary valuation (on which superficially limited offers have an advantage). This demonstrates how the monetary-subjective valuation dissociation can give rise to a preference reversal.

We organize what follows around this paper's five major theoretical contributions, with discussion of their practical implications and related open questions. First, previous theorizing on unlimited offers has focused on what makes such offers more appealing than pay-per-use offers, even when consumers could save money by paying per use. By contrast, we investigate how logically equivalent ways of framing an unlimited offer can yield different patterns of valuation.

Second, our usage-based anchoring account suggests that anchors can operate earlier in the judgment-formation process than previously appreciated. Specifically, anchors can influence answers to a question consumers spontaneously ask themselves (e.g., how much an offer will be used), which then affects a focal judgment (e.g., valuation). To develop a more complete

understanding of how anchors influence consumer behavior, researchers should devote more attention to what numeric questions consumers spontaneously ask themselves. Third, the reference-offer account—which applies to monetary but not subjective valuation—identifies one psychological process that can underlie valuation dissociations and, in turn, preference reversals.

Fourth, we bring theoretical order to extant literature by distinguishing between two types of valuation: monetary and subjective. Most of our empirical work examined each type of valuation as a dependent variable. However, as our final study illustrates, the relative importance of each type of valuation as an *input* to preferences can depend on the context. Through this lens, preference reversals—systematic shifts in consumers' preferences that depend on how they are elicited (e.g., Catapano et al. 2022; O'Donnell and Evers 2019)—can be traced to fundamental differences in the extent to which different elicitation methods encourage reliance on monetary versus subjective valuation. We encourage consumer researchers to clarify whether novel effects they identify are operating on subjective valuation, monetary valuation, or both. As we discuss next, this can help to determine whether an effect is likely to emerge in a particular context.

Fifth, we identify one factor that changes the extent to which consumers' interest is predicted by subjective versus monetary valuation. When consumers knew an offer's price, their interest in the offer became less predicted by subjective valuation and more predicted by monetary valuation. We suspect that different preference-elicitation contexts exist on a continuum. On one end are choices that consumers make without considering prices, either because all options are free (e.g., a loyal customer selecting which free gift offer they prefer) or because prices have not yet been provided (e.g., the price-absent condition in study 7). Here, preferences should be driven almost entirely by subjective valuation. On the other end of the continuum are contexts like auctions, in which consumers express preferences by providing

monetary valuations directly. Many other marketplace contexts fall somewhere in between. Given that researchers often elicit consumers' preferences by offering them choices between unpriced offers (e.g., "Would you prefer to receive product A or product B?"), we suspect that the existing literature may overestimate the importance of factors that influence subjective valuation while underestimating the importance of factors that influence monetary valuation. Our research provides a launching pad for future empirical and theoretical development on the relative contribution of each type of valuation to consumers' preferences across contexts.

To understand when consumers are likely to prefer a superficially limited or an explicitly unlimited offer, two factors are likely relevant. First, if pricing information is withheld until later in the buying process (e.g., after they click on an ad), the explicitly unlimited frame may encourage initial interest. But once pricing information is available, a superficially limited frame may help to close the sale. In other words, firms may benefit from shifting from one frame to another, or adding a superficially limited frame only once they supply a price. The second factor is whether an offer's market price falls above or below expectations. If an offer is priced especially low (as in appendix study D), pricing information should increase interest regardless of how the offer is framed. But if the price is higher than expected for the explicitly unlimited frame and lower than expected for the superficially limited frame (as in study 7 and appendix study E), pricing information should encourage greater interest in the superficially limited offer.

That said, it is also important to consider what happens after the point of purchase. One reason superficially limited offers are valued so highly is because they are expected to be used more. However, it is an open question how consumers will respond if their actual usage falls short of expectations. One realistic possibility is that consumers will not track their usage or will

fail to recall their initial usage expectations, which may reduce this potential threat to repeat purchasing. Longitudinal research would be necessary to track these dynamics over time.

Finally, it is worth emphasizing that the benefits of each offer frame are not counteracted by the addition of the other frame. Study 3 showed that adding an “unlimited” label to a superficially limited offer increased subjective valuation, and quantifying the amount of usage supplied by an explicitly unlimited offer increased monetary valuation; we observed no negative effects on the other type of valuation. This suggests that it may be optimal for marketers to use both offer frames where possible.

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