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The Importance of Selling Formats: When Integrating Purchase and Quantity Decisions Increases Sales

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Customers must often decide on the quantity to purchase in addition to whether to purchase. The current research introduces and compares the quantity-sequential selling format, in which shoppers resolve the purchase and quantity decisions separately, with the quantity-integrated selling format, where shoppers simultaneously consider whether and how many to buy. Although retailers often use the sequential format, we demonstrate that the integrated format can increase purchase rates. A field experiment conducted with a large technology firm found that quantity integration yielded considerably higher sales, amounting to an increase of over $1 million in annual revenue. To demonstrate robustness and explore various contributing mechanisms, a series of lab experiments test and control for different elements of the selling formats. The results suggest that quantity integration can change the psychology of making a purchase: the integrated format anchors customers later in the decision-making funnel than the sequential format, and additional implementation elements (e.g., the specific call-to-action used) may contribute to an increased effect. More broadly, this work sheds light on mechanisms underlying the influence of selling formats and the importance of how everyday choices are structured.

Keywords: framing effects, consumer choice, purchase likelihood

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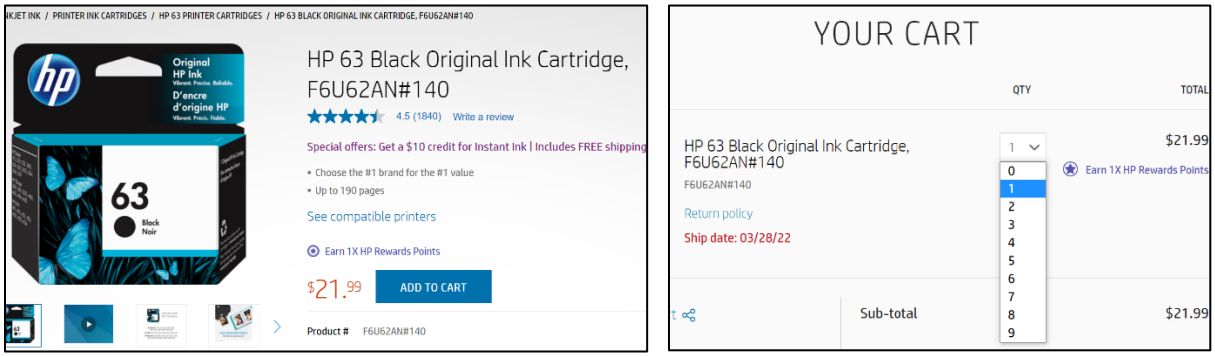
1. Introduction

All purchasing interactions have some design, whether purposeful or unintentional. In the marketing realm, these designs are termed "selling formats." Selling formats establish the flow for shoppers' decision-making processes and accordingly may influence buying decisions. This paper investigates one understudied aspect of selling formats: how they guide customers to answer (a) whether or not to make a purchase, and (b) how much of the product to buy. One possible strategy is what we term a "quantity-sequential" selling format. As one example, HP Inc. adopts a sequential flow on its product pages: customers who land on a product's page will see information about the product, alongside a single "add to cart" button. If customers decide to buy the item, they can later adjust the quantity on the shopping cart page (Figure 1). On the other hand, HP could have just as easily adopted a simultaneous strategy, which we term the "quantity-integrated" selling format. That is, HP could guide customers to resolve the "whether to buy" and "how much to buy" decisions together by displaying buttons of "Add 1 to Cart," "Add 2 to Cart," and "Add 3 to Cart" (Figure 2). Which strategy yields higher sales?

Figure 1. Example Quantity-Sequential Selling Format, HP Printer Ink



Note. The left image is a screenshot of a product information page shown to customers on HP's website. The right image is a screenshot of the shopping cart page after adding this item to the cart. Web locations: https://store.hp.com/us/en/pdp/hp-63-black-original-ink-cartridge and https://store.hp.com/us/en/AjaxOrderItemDisplayView. Both screenshots were taken on March 25, 2022.

Figure 2. Hypothetical Quantity-Integrated Selling Format, HP Printer Ink

Note. To accommodate additional quantity options, the website could also consider a fourth button such as "Add 4 or more to cart"; alternatively, customers could simply click one of the presented "add" buttons multiple times.

One possibility is that the sequential format is superior. It guides customers to tackle just one question at a time, and this simplicity may facilitate choice. Marketers may share this intuition, as sequential formats are widely used (see Appendix A for additional examples). By contrast, the integrated format requires customers to grapple with two questions at once, and this complexity could reduce purchasing (Tversky and Shafir 1992). Yet another possibility is that because the two formats ultimately guide customers to resolve the same questions (whether and how much to buy), it may not make a difference. However, in one large-scale field experiment conducted with HP Inc., and in 36 controlled lab studies with over 20,000 participant observations, we find that the integrated format substantially increases customers' likelihood of purchasing. We term this difference the "quantity integration effect." A pooled analysis of our lab studies reveals a remarkably large effect size: the integrated format yielded an average 14 percentage-point increase in purchase likelihood over the sequential format and, consequently, a 28% relative increase in expected revenue, and the field experiment found a 12% relative increase in conversion and a corresponding 15% relative increase in revenue. Interestingly, there is heterogeneity in the size of this effect, which we probe in exploratory analyses. These analyses highlight an additional moderator, price: the effect appears larger for higher-priced goods. In the next section, we introduce one novel psychological mechanism that contributes to this effect. We subsequently support it with empirical evidence while pointing to additional mechanisms that may also contribute to the effect.

2. Theorizing

Normatively, individuals' choices should be insensitive to how choices are presented (von Neumann and Morgenstern 1947). Yet subtle presentational differences have been shown to systematically alter decisions (Kahneman and Tversky 1979; Tversky and Kahneman 1981; Puto 1987; Johnson et al. 1993; Fox and Rottenstreich 2003). In the marketing realm, the design of a purchasing flow (i.e., the selling format) can alter customers' choices by changing what customers focus on (e.g., Wernerfelt 1994; Park, Jun, and MacInnis 2000; Levav, Reinholtz, and Lin 2012). For example, rearranging the order of attribute decisions in a multistage purchase process can alter how consumers mentally represent the available products, changing which factors they consider when choosing (Schrift et al. 2018; Thomadsen et al. 2018). In this work, we similarly contend that how the selling format presents the purchase and quantity decisions can change what factors customers consider.

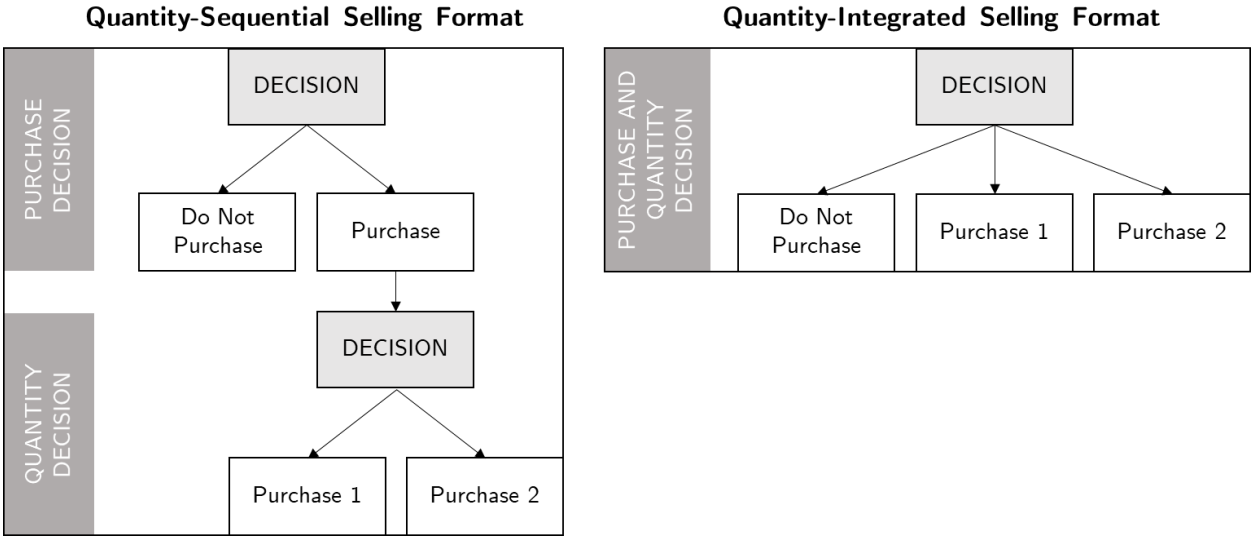
Decades of marketing research have conceptualized the prototypical buying decision process as a series of five stages, each including a different set of considerations: need/problem recognition → information search → evaluation of alternatives → purchase → post-purchase (Dewey 1910; Howard and Sheth 1969; Kotler and Keller 2012; Lemon and Verhoef 2016). For example, a customer who is running low on spare printer ink may: wonder whether to purchase some; consider whether she has enough information about where, how, or what to buy; search for options (e.g., buying replacement cartridges from the original producer vs. from a third-party manufacturer); evaluate this consideration set; and finally decide whether to buy now, wait for later, or abandon purchasing altogether.[1] Importantly, she may exit at any point along the buying process; for instance, she could leave in the initial stages if she does not have enough time to devote to the decision, or could leave in later stages because she expects the price to fall (Greenleaf and Lehmann 1995). Of course, this model is a simplified abstraction of the actual shopping experience, and customers do not always proceed through the stages in a neat linear progression. For example, a customer may skip straight from need recognition to purchase, as when impulse buying a favorite candy. A customer could also repeat considerations, move

[1] As noted, this process also includes a post-purchase stage, which addresses customers' word of mouth, re-purchase, and other post-purchase behaviors. In this paper, we focus on customers' purchase decisions and hence do not explore post-purchase actions, an area for future research.

backward to earlier considerations, and so on. Yet in general, this theory yields the useful prediction that customers who reach later-stage considerations will be more likely to purchase, on average.

We propose that whether customers encounter a sequential or an integrated selling format can influence which buying-process considerations they focus on (for similar logic, see Parker and Schrift 2011). We highlight this difference as one potential mechanism contributing to the quantity integration effect. The integrated format presents a choice set with unique quantity alternatives along with the option not to buy, where any choice can finalize the choice process (Figure 3). This choice resembles the evaluation-of-alternatives stage and hence may naturally cue considerations from this stage (Fox and Rottenstreich 2003). When evaluating alternatives, customers tend to focus on questions relevant to option evaluation (e.g., "Is any of these alternatives worth buying?"), and considerations from earlier stages are less salient (e.g., "Do I know enough information about buying in this general product category?"; Payne 1976).

Figure 3. The Two Selling Formats



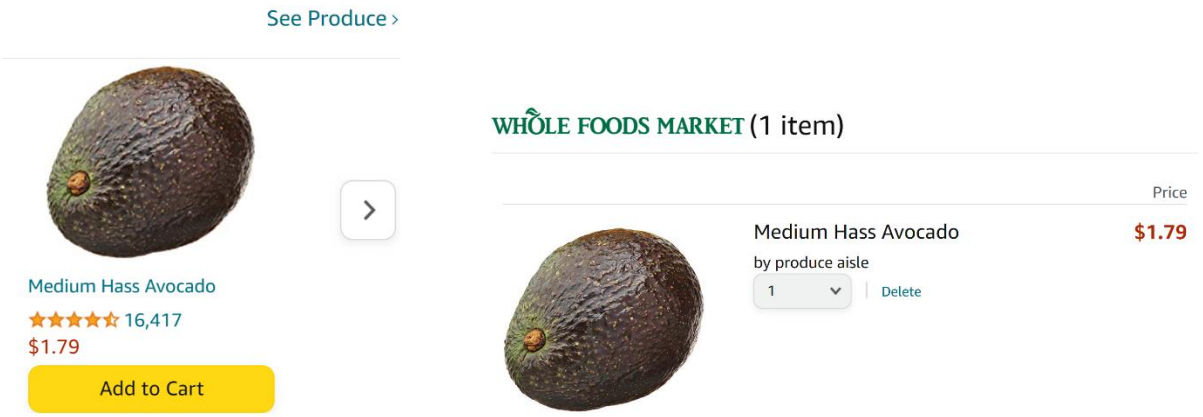
Note. The left figure depicts a typical quantity-sequential format, in which customers first choose whether to purchase and then choose the quantity. The sequential format could also present these two decisions on the same page or even beside each other. What defines this format is simply that customers can consider the purchase decision separately from considering quantities. In contrast, what defines a quantity-integrated format, as shown in the right figure, is that the notion of quantity is integrated directly into the customer's purchase consideration.

By contrast, the sequential format does not immediately present a choice set of different choice alternatives to evaluate. Rather, it first asks customers to consider more generally whether

or not to make a purchase. For that reason, we propose it will be less likely to cue alternative evaluation and equivalently more likely to focus customers on earlier-stage considerations. In other words, rather than a customer asking herself, "Do I want to purchase HP 63 black ink cartridges right now from HP's site for $20.99?" she may instead ask herself, "Am I aware of all my options, and do I feel ready to shop for printing supplies?" (see Kahneman and Frederick 2002 for similar logic about question substitution). Any such earlier-stage considerations could serve as additional "exit points" from the buying process, before the customer would even reach evaluation-of-alternatives. As a result, customers who start earlier in the process should, on average, be less likely to end up purchasing. To be clear, these comparisons are relative, and considerations from any stage can arise in either format. We simply propose a relative difference in the formats' tendencies to focus customers on later- versus earlier stage considerations and, accordingly, their relative likelihoods of resulting in purchase versus exit. Further, it is important to reiterate that our theory concerns purchase likelihood: whether customers will make a purchase or not. It does not offer a prediction about the intensive margin, that is, the average quantity purchased among buyers. Even so, because the integrated format boosts the extensive margin, it should also yield higher total quantity sold.

Sometimes, customers encounter a selling format while in the process of search, as in the HP individual product pages depicted in Figures 1 and 2. Other times, customers encounter a selling format at earlier stages, as when not thinking about wanting avocados until seeing them on a grocery website (Figure 4). In either setting, the integrated format should be relatively more likely than the sequential format to evoke alternative evaluation, reducing the salience of earlier-stage concerns and hence increasing purchase likelihood. This theorizing also yields a boundary condition. When customers have already recognized a need and have already engaged in (internal or explicit) search prior to encountering the selling format, they are likely to approach the selling format while already in the mode of alternative evaluation. A customer visiting a grocery site to buy avocados for her signature guacamole is unlikely to reevaluate her need, regardless of the selling format. That is, customers whose need is dire enough and who have enough knowledge to start directly from alternative evaluation should not be sensitive to quantity integration. We test a tentative proxy for this boundary condition in the field experiment.

Figure 4. Example of Quantity-Sequential Selling Format, Amazon.com



Note: The left image is a screenshot of a webpage shown to customers who visit the Whole Foods Market virtual storefront on Amazon's website. The right image is a screenshot of the shopping cart page after adding this item to the cart; here, customers can adjust the quantity by clicking the drop-down menu. Web locations: https://www.amazon.com/alm/storefront?almBrandId=VUZHIFdob2xlIEZvb2Rz and https://www.amazon.com/cart/localmarket. Both screenshots were taken on Mach 28, 2022.

This paper provides suggestive evidence that this buying-process mechanism is one factor contributing to the proposed quantity integration effect, which is likely multiply determined. There are several additional differences between the two selling formats, each of which could impact purchasing. We highlight four of these in Table 1: the call to action, which is the phrasing of the question inviting customers to buy; the information conferred by the formats about available/normative quantities; the number of choice options presented; and the time/effort to make a choice. We present a more detailed table elaborating on these differences and potential associated mechanisms in Appendix F. We can control for or eliminate some of these differences and still find that the integrated format outperforms the sequential format, suggesting that the effect persists above and beyond the influence of these factors. The final column of this table summarizes this empirical evidence.

Table 1. Differences between the formats and their potential contributions to the effect.

Difference	How This Could Influence Purchasing	Our Empirical Evidence
I. Call to action (CTA): what is the customer asked to do?	Marketers may ask different questions when deploying different selling formats, which may cue different considerations (Schwarz 1999), activate conversational norms of appropriate responding (Grice 1975), or leak information about what other customers tend to do (McKenzie and Nelson 2003).	Effect arises when no CTAs are used (field experiment) and when holding CTAs constant across formats (Experiments 1–3). Using different questions in each format enhances the effect (pooled analysis).
II. Information about quantity limits and	Including quantities in a choice set may leak information about the maximum quantity available for purchase, the normalcy of purchasing multiple units, or the retailer or experimenter's expectations	Effect persists when stating a quantity maximum in both formats (Experiment 2) and providing a maximum does not impact the effect size (pooled analysis).

normative quantities	(Tannenbaum et al. 2021; Prelec et al. 1997; Lieberman, Duke, and Amir 2019).	Experiments A1 and A2 in Appendix F directly test for information leakage/norm inferences.
III. Number of choice options	A difference in the number of presented choice options may lead to (a) greater attention to higher quantities or (b) compromising on middle quantities (Simonson 1989; Armel et al. 2008; see also Brenner, Rottenstreich, and Sood 1999).	Effect persists when equating the number of choice options in the two formats (Experiment 3, and Experiments AE and AF in Appendix F), and the number of choice options does not impact the effect size (pooled analysis).
IV. Process costs/ Effort required	Complexity avoidance (Tversky and Shafir 1992) and effort minimization (Shugan 1980) make opposite predictions: whereas the integrated format has more options in a given choice (reducing purchasing), the sequential format has more steps (reducing purchasing).	In Appendix F, effect persists when equating search/clicking costs (Experiment AE), controlling decision time (Experiment AB), and placing sequential steps on the same vs. different screens (Experiment U).

3. Data

We first present a large-scale field experiment with HP Inc. to compare the quantity-integrated and quantity-sequential selling formats. The field experiment also tests for a boundary condition. Next, we present 36 controlled lab experiments. The goal of these experiments is to (a) address limitations of the field setting, (b) explore generalizability by testing various ways of implementing the two selling formats, (c) provide support for our theorical mechanism, and (d) test for robustness while outlining other potential boundary conditions.

We highlight three lab experiments in the main text. Experiment 1 replicates the field effect in the lab, using an explicit call to action (Table 1, Difference I) with stimuli adapted from Domino's Pizza. Next, Experiment 2 provides support for our proposed mechanism while also addressing limitations regarding information about quantities (Table 1, Difference II). Experiment 3 then addresses additional limitations by holding constant the number of choice options in both formats (Table 1, Difference III). Thereafter, the pooled analysis summarizes all lab experiments we have conducted. We jointly analyze them to estimate the magnitude of the quantity integration effect, and we probe heterogeneity in the size of the effect to explore boundary conditions and robustness over time. Data, materials, and code for this paper are available at: https://researchbox.org/602&PEER_REVIEW_passcode=VPHOPH.

3.1 Field Experiment

We partnered with HP Inc. to conduct a large-scale randomized experiment. Visitors to HP's website were randomly assigned to either the quantity-sequential or the quantity-integrated selling format, and we observed how this influenced their likelihood of making a purchase (i.e., conversion rates). Together with HP managers, we identified a managerially important product category. We also included a second product category in which, according to HP personnel, customers are relatively more likely to shop for items at the moment of need, when their supply has been depleted. In this case, customers should be unlikely to exit the buying process over early-stage concerns regardless of which selling format they see. (Of course, product category is only a proxy for customers' underlying need/urgency. The two categories may also differ in other ways, which we discuss in the following sections.) We predicted that the integrated (vs. sequential) format would stimulate greater purchasing in the first product category but should make little difference in the latter category.

3.1.1Context, Design, and Implementation

HP Inc. is one of the world's largest personal computer and printer manufacturers by market share and revenue (Gartner 2019; Market Research Future 2019). It sells a range of products, and one of its largest categories is printers, sold to both consumers and corporations. Printers require various supplies that can be purchased from HP's site directly or from secondary retailers (e.g., Amazon, Best Buy, Staples, or Costco) or third parties (e.g., aftermarket cartridges, cartridge refills, counterfeits).

On HP's website, customers can purchase supplies through a few navigation pathways. Our experiment focuses on the site's "Supplies Finder" search interface. The Supplies Finder presents a search bar where customers can type in cartridge or printer models and find a list of matching products. Typically, a search term will pull up multiple matching results at once. This finder presents each listed item alongside the product's image, name, price, other attributes (e.g., color), and the buttons for purchasing (i.e., the selling format).

Our experiment involved modifying this selling format. HP's existing format had been selected as the optimal interface after extensive A/B testing. It is a sequential format in which the purchase and quantity decisions are resolved with separate buttons, as shown in Figure 5A: plus and minus arrows allow customers to adjust to the desired purchase quantity (subject to a limit: upon hitting nine, the words "9 maximum" appear), and an "Add to cart" button adds the specified quantity to the cart. This setting is a particularly conservative point of comparison, as

(a) it presents the two steps of the sequential format right beside each other, and (b) customers wishing to purchase one unit have to make only a single click.

Figure 5A. Schematic of Quantity-Sequential Finder Interface, Field Experiment

Our proposed integrated format simply combined the quantity and purchase decisions into a single action, presenting buttons that each specified a different purchase quantity: "Add 1 to cart," "Add 2 to cart," and "Add 3 to cart" (see Figure 5B). In this way, customers could simultaneously indicate whether and how many to buy. If a button was clicked, its text would change to "Add [*N*] more." For example, clicking "Add 1 to cart" would add one item to the shopping cart and change the button text to "Add 1 more." Text would also appear beneath these buttons stating the nine-item maximum purchase quantity and the current cart quantity: "[*N*] in cart. 9 maximum."

Figure 5B. Schematic of Quantity-Integrated Finder Interface, Field Experiment

The Supplies Finder covers two largest subcategories of supplies. The first subcategory, henceforth known as "Category A," contains over 250 individual products (stock keeping units [SKUs]). Per HP personnel, Category A tends to be purchased by business customers who carry a stock of the product. When approaching the HP website, then, Category A shoppers may be open to the idea of buying but not necessarily committed to it. Category A is thus the focal point for this test. One important note is that our dataset excludes customers who have long-term procurement/supplies contracts or subscription plans with HP, who do not visit the website to place orders each time. The second subcategory, henceforth known as "Category B," contains over 400 individual products (SKUs). HP personnel suggested that Category B items are more commonly purchased by individual consumers at the moment of need—when their supply is nearly depleted. We expected that these shoppers would be unlikely to focus on early-stage considerations regardless of selling format and, accordingly, that the quantity integration effect would be attenuated. For additional context, Category A products tend to be more expensive (in our dataset, mean price = $142.05, median price = $101.49) than Category B products (in our dataset, mean price = $42.30, median price = $37.49). Both categories offer products either as single units or in multipacks. Category A products tend to last longer than Category B ones. The customer lifetime value of Category A customers is much larger than that of Category B customers. Importantly, since both categories comprise supplies, there is no choice of category after a customer has purchased the capital equipment, so the categories are largely independent. That said, because the field experiment does not allow us to control for additional differences between the products, we will rely on lab experiments to test the proposed theory directly.

To compare the two selling formats in each of these product categories, a randomized controlled experiment was implemented on HP's website using the Optimizely platform, which facilitates implementation of A/B tests. This platform randomly assigned visitors to a selling format, with an automated assignment-correction mechanism geared toward balancing the conditions if they became unbalanced. The test launched on Wednesday, March 6, 2019, and ran for a preplanned period of 2.5 weeks, ending on Saturday, March 23, 2019. The test encompassed every visitor to HP's U.S. website in this period (including those who visited the U.S. version of the site from other countries). When users arrived on the site, they were randomly assigned to one of the two conditions (i.e., selling formats) for the duration of the

experiment.[2] Thus, customers who visited the site multiple times were assigned to the same format for all web sessions as long as they could be tracked (e.g., with browser cookies).

The dataset is at the level of single website sessions (i.e., single customer visits). For each session, we observe the visit date, selling format, customer ID, visit number, and geographic location. For visits that resulted in purchases, we observe items ordered, number of units of each item, and revenue from each item. Therefore, for our key metric of purchase likelihood, we follow the company's guidelines and compute conversion rates by comparing the sessions that resulted in purchases in a given product category to the sessions that did not. The data comprise all visits to HP's website, including customers who never visited the Supplies Finder and who were accordingly not exposed to the manipulation. This represents an intention-to-treat design (i.e., our analysis is based on assignment to treatment rather than whether a given respondent was actually exposed to the treatment), as we do not have comprehensive data on customers' searches. This is a conservative test, likely to underestimate the average treatment effect.

3.1.2. Randomization Checks

As mentioned, some customers visited the website multiple times during the test period, and randomization was performed at the customer level. To test for successful randomization, we compare observable customer characteristics (geolocation and history of website visits) in the two formats. Due to a confidentiality agreement with the company, we are required to omit absolute figures such as the total number of visitors, and we instead report relative figures. As shown in Table 2, these variables did not differ meaningfully across formats, suggesting that randomization was executed successfully.

Table 2. Randomization Checks, Field Experiment

	Integrated	Sequential	Difference
% of customers	50.19%	49.81%	$\chi^2(1) = 1.96$, $p = .16$
Geolocation: Distribution of countries	N/A	N/A	$\chi^2(75) = 76.98$, $p = .42$
Geolocation: Distribution of U.S. states	N/A	N/A	$\chi^2(52) = 55.87$, $p = .33$
% of customers who have visited before*	21.98%	22.09%	$\chi^2(1) = 0.24$, $p = .63$

Note. We include the first-observed geographic location for each customer. Some country-format cells had low expected counts (< 5); removing those countries reveals a similar result ($\chi^2(51) = 42.25$, $p = .804$). The state category includes "non-U.S.," "District of Columbia," and "unknown" in addition to the 50 U.S. states. Removing

[2] Because of implementation glitches, 0.03% of visitors were exposed to both test formats during the experiment. For clarity, we exclude these visitors from analyses, although including them has no effect on the results.

states with low counts reveals a similar result ($\chi^2(51) = 54.56$, $p = .341$). *This value indicates the percentage of customers who had visited HP's website prior to the start of this experimental period.

3.1.3. Results

Purchase Rates. We examine the results separately within each category. For robustness, we examine multiple treatments of this data, which all yield consistent results. First, within the focal product category (Category A), the integrated format yielded substantially higher purchasing. We examined conversion rates: the percentage of website visits that resulted in Category A purchases. The raw conversion rate in the integrated format was 11.68% higher than in the sequential format ($\chi^2(1) = 7.06$, $p = .008$).[3] Regression results including controls for observables (past visits when first observed, geolocation, date of the visit) are presented in Table 3. Appendix B presents linear probability models revealing convergent results. By contrast, selling format did not meaningfully affect Category B purchasing. The difference in the raw conversion rates for Category B was not significant (−1.99%, $\chi^2(1) = 1.61$, $p = .20$; see Table 3 for regression results with controls).

Table 3. Logistic Regression Models Predicting Purchase, Field Experiment

	Focal Product Category (A)			Boundary Condition Category (B)		
	(1)	(2)	(3)	(1)	(2)	(3)
Sequential (vs. Integrated) Format	-.11** (.04)	-.11** (.04)	-.12** (.04)	.02 (.02)	.03 (.02)	.03 (.02)
First-Observed Past Visits		-.003 (.002)	-.004* (.002)		-.007*** (.001)	-.008*** (.001)
Constant	-4.21*** (.03)	-4.20*** (.03)	-5.16*** (.75)	-2.49 (.01)	-2.48*** (.01)	-2.88*** (.28)
Geolocation Fixed Effects			Yes			Yes
Date Fixed Effects			Yes			Yes
Pseudo-R^2	.0003	.0004	.052	.00002	.0007	.064
Akaike Inf. Crit.	24090	24089	23124	89510	89452	84040

Note. *N*s are omitted at the request of the company. Standard errors are shown in parentheses. Selling Format = 1 for sequential and 0 for integrated. Geolocation fixed effects include country and U.S. state. Geolocation was

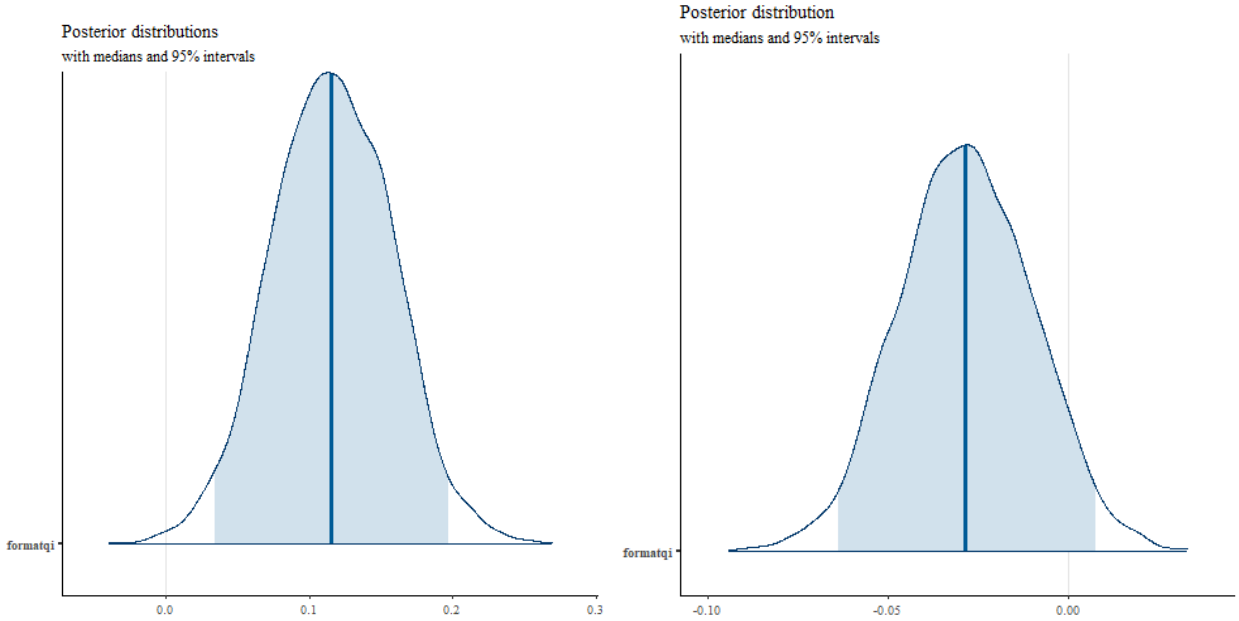
[3] We omit the reporting of the actual Ns and conversion rates at the request of the company. Instead, we report relative differences in conversion between the formats. Reported percentages are relative differences (i.e., difference between the integrated and sequential formats, divided by the base sequential format performance).

unobserved for 10% of the observations; these are treated as a separate "unobserved" category. Pseudo R^2 is calculated with the McFadden method (McFadden 1973). * $p < .05$; ** $p < .01$; *** $p < .001$.

To contend with potential individual effects, we also conducted a Bayesian generalized linear model analysis via MCMC (using default settings in the rstanarm R package, which uses normally distributed and weakly informative priors; Goodrich, Gabry, Ali, and Brilleman 2020). The specified model estimated the posterior distribution of the selling format parameter, with fixed effect controls for number of past visits when first observed, geolocation, and date of the visit and random intercepts for customer ID. For the focal product category (Category A), the average estimated coefficient on selling format (1 = integrated, 0 = sequential) was 0.12, with 0 lying outside the 95% credibility interval and with 99.74% of the posterior values being negative. This precisely estimated coefficient reveals a substantial quantity integration effect. On the other hand, the same analysis for Category B revealed a null effect, estimating an average coefficient on selling format of −.03, with 0 lying inside the 95% credibility interval (Figure 6, right panel).

Figure 6. Posterior Distribution of Selling Format Parameter, Field Experiment

Focal Product Category (A) *Boundary Condition Category (B)*



Note. The 95% credibility intervals are displayed in light blue, with medians represented by the thick blue lines.

As another treatment of the data, we also examine the proportion of customers who made any purchases in the category during the duration of the experiment, across all of their visits. Examining the raw data as a relative difference, we find that customers assigned to the integrated format were 11.57% more likely to make any Category A purchases than were customers assigned to the sequential format ($\chi^2(1) = 6.81$, $p = .01$). In Category B, the integrated format yielded a nonsignificant decrease of 2.60% compared to the sequential format ($\chi^2(1) = 2.36$, $p = .12$).

Purchase Quantity and Revenue. The proposed mechanism does not offer a prediction about purchase quantities. The average Category A quantity purchased—among the purchasers—did not meaningfully differ between formats, though average quantities were directionally higher in the integrated format ($M = 1.93$, $SD = 1.28$) than in the sequential format ($M = 1.88$, $SD = 1.22$; $b = -.05$, $SE = .05$, $t = 1.01$, $p = .31$). Similarly, the average Category B quantity purchased—among the purchasers—did not meaningfully differ (integrated: $M = 1.87$, $SD = 1.18$; sequential: $M = 1.85$, $SD = 1.17$; $b = -.01$, $SE = .02$, $t = -.57$, $p = .57$).

More importantly, we can examine the average units sold per visit, including non-purchases, which would have a quantity of zero. Using this metric, the integrated format sold 14.83% more units of Category A per visit, compared to the sequential format ($b = -.004$, $SE = .001$, $p = .006$). This difference was primarily driven by the substantial increase in purchase likelihood for Category A. This corresponded to a 15.47% relative difference in revenue per visit between the formats. In Category B, the integrated format yielded a non-significant 1.53% fewer units sold per visit, relative to the sequential format ($b = .002$, $SE = .003$, $p = .45$), corresponding to 1.02% lower revenue per visit in the integrated format.

3.1.4. Discussion

Quantity integration substantially increased sales in the field. In response to this result and the company's own follow-up testing, HP changed its interface for Category A from its existing sequential format to the new integrated format. The company estimated that this change will yield over a $1 million annual increase in revenue. At the same time, quantity integration did not meaningfully affect Category B, and HP continues to employ its sequential selling format for this category (as of February 2022). These results demonstrate the existence of the effect and motivate further investigation of the underlying process in more controlled laboratory settings.

This field experiment has some limitations. The integrated (vs. sequential) format increased conversion rates and overall sales, but some of this boost may be attributable to purchase acceleration. Even if this is the case, however, securing earlier sales still benefits the company in this product category, in which customers could respond to a shortage of their supplies by simply reducing consumption rather than replacing their supply or, as mentioned above, by buying from a competitor or a counterfeit product. It is therefore considered a strategic advantage here even if customers stockpile. We discuss purchase acceleration further in the General Discussion.

We are also limited in the depth of the data. We are unable to observe customer search, so the reported average treatment effect may underestimate the true magnitude of the effect, as the denominator likely included customers who did not search for either product category and accordingly were not exposed to the treatment. Further, these two categories were included in accordance with managers' requests, based on their internal knowledge about the different use cases for these supplies. Yet, the categories may differ in other ways beyond just customers' purchase urgency. Finally, the field experiment tests one specific way of implementing the two formats, but they can be implemented in various ways, so it is important to understand whether the quantity integration effect persists under other conditions. To address these limitations, we next present controlled lab experiments that vary key features that could influence the effect: the number of choice options, the product type and price, the call to action, the information provided about the available quantities, and beyond.

3.2. Lab Experiment 1, Basic Demonstration: Dominos

Marketers often present a purchase opportunity and ask customers a pointed question of if they wish to purchase. Experiment 1 tests whether the quantity integration effect persists in this different, ecologically valid context, using stimuli adapted from Domino's Pizza's website. Domino's is the world's highest-revenue pizza chain, with $12.25 billion in gross annual sales, and over three-quarters of its orders are placed online through its digital channels (Clifford 2021). When ordering pizza on the Domino's website, customers who click "Checkout" see a pop-up message asking whether they would like to add featured items to their order. (This

checkout process is in place as of October 5, 2021; see Appendix A for screenshots.) We modified the presentation of the "add" buttons in this pop-up message in a shopping simulation.

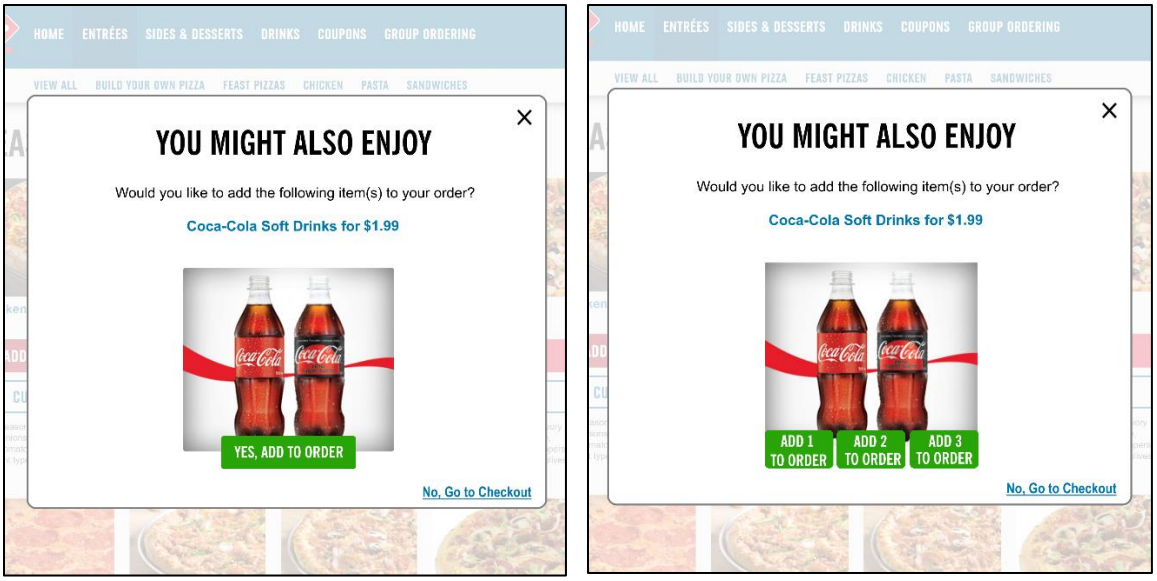
3.2.1. Method

This study was preregistered (https://aspredicted.org/dz4jx.pdf). We recruited 397 Amazon Mechanical Turk (MTurk) workers (after preregistered exclusions; 47.9% male, M_{age} = 41.9 years) using CloudResearch's approved participants filter (Litman, Robinson, and Abberbock 2017) and randomly assigned them to one of two conditions (selling format: sequential vs. integrated) in a between-subjects design. All participants were instructed to imagine that they were online, ordering pizza for delivery when a pop-up appeared. They saw a screen adapted directly from Domino's Pizza's current pop-up on its site and were asked to click on what they would click in this situation.

In both conditions, the pop-up showed a bottle of Coca-Cola and asked, "Would you like to add the following item(s) to your order?" To decline, participants could click "No, Go to Checkout" (to leave the pop-up and move to the cart page) or the X button at the top of the pop-up (to exit the pop-up and remain on the page). What differed was the display of the purchasing options in the two formats. Sequential condition participants saw the pop-up displayed in the left panel of Figure 7, with an option to click "Yes, add to order," which added one unit to the shopping cart on Dominos' site. Participants in the integrated condition saw a similar screen, but had different purchasing options: "Add 1 to order," "Add 2 to order," and "Add 3 to order" (Figure 7, right panel). In this way, these participants could specify both their purchase intent and their intended quantity in a single click.

Figure 7. Purchase Choice Screen For Each Selling Format, Experiment 1

Sequential Screen **Integrated Screen**



Note. On this screen, participants could click an "Add" button, the X button (to exit the pop-up), or the "No, Go to Checkout" button, just as on Domino's Pizza's actual website (see Appendix A for a screenshot).

On the next page, following Dominos' current practice on its website, all participants who had elected to purchase could adjust the desired quantity using a drop-down menu of quantities. For sequential purchasers, this drop-down was defaulted to a quantity of 1 (as it is on Dominos' site), with other options of 2 and 3. For integrated purchasers, the drop-down was defaulted to the quantity they had selected on the initial purchase choice screen (e.g., if they had clicked "Add 2 to order," it would be defaulted to 2).

Thereafter, all participants answered, "Do you sometimes buy Coca-Cola?" ("Yes," "No, I never buy it"). We preregistered to include all participants in our main analyses but also, as an exploratory analysis, to examine only the participants who answered yes to this question. These results are consistent with this subset of respondents (if anything, revealing a larger effect) and are reported in Appendix C. Finally, participants provided demographic information and answered an attention check question.

3.2.2. Results

Table 4 presents customers' clicking decisions in each condition[4]. As shown, integrated participants were twice as likely to add Coca Cola to their cart than were sequential participants.

[4] One participant chose to "add 1" in the integrated format but then selected a blank option in the drop-down menu. We treat this observation as not purchasing, but excluding it from analyses does not impact the results. This participant is not included in Table 4.

Table 4. Click Rates, Experiment 1

Action	Integrated	Sequential	Difference
Purchase Coca-Cola	**23.35%**	**11.56%**	**$\chi^2(1, N = 396) = 9.57, p = .002$**
"No, Go to Checkout"	60.41%	71.86%	$\chi^2(1, N = 396) = 5.80, p = .016$
"X" button	16.24%	16.58%	$\chi^2(1, N = 396) = .01, p = .927$

Conditional on choosing to purchase, participants in the two formats selected similar quantities (sequential: $M = 1.61$, $SD = .66$ vs. integrated: $M = 1.59$, $SD = .54$; $t(67) = -.15$, $p = .88$). When including non-purchases (i.e., quantity of 0) and thus comparing the average quantity per respondent, the integrated format "sold" double the number of bottles. On average, integrated participants "bought" 0.37 bottles ($SD = .72$), whereas sequential participants "bought" 0.19 bottles ($SD = .56$, $t(395) = 2.82$, $p = .005$).

3.2.3. Discussion

The quantity integration effect replicated in a controlled lab setting, doubling the effective purchase rate compared to the sequential condition and consequently, also doubling the total quantity sold. One limitation is that participants did not have the same information about available quantities in both conditions: when integrated participants were making their purchase decisions, the buttons signified that they could add up to three bottles of Coca-Cola to their order. By contrast, when sequential participants were making their purchase decisions, they did not have this information about potential quantities. This is an ecologically valid difference, as it mimics the real-world context. Yet it also introduces a potential confound, as participants may have drawn inferences from the quantity information. Perhaps integrated participants interpreted the highest quantity button as an implied quantity limit—indicating that they could buy up to three bottles only. Or perhaps they inferred that because there is an option to buy three bottles, it is common for customers to buy multiple bottles. Either inference could influence purchase decisions. To address such concerns, the next experiment includes an explicit statement about the maximum available quantity in both conditions, and Appendix F further tests for such inferences directly. Experiment 2 also supports our mechanism.

3.3. Experiment 2: Testing the Mechanism

Experiment 2 tests our proposed explanation: the selling formats anchor customers in different stages of the buying process. In this experiment, participants encountered an incentive-compatible purchasing opportunity with either a sequential or integrated selling format. To address possible inferences about quantities, both formats stated an explicit maximum purchase quantity on the purchase decision page. After making their purchase decision, participants explained the thought process that had guided their decision. These explanations were later coded to determine whether respondents reported considerations from earlier versus later stages of the buying process (e.g., need recognition/information search vs. close evaluation of the current choice alternatives). Our theory suggests that the sequential format, compared with the integrated format, should prompt earlier-stage considerations. Moreover, based on the theory, early-stage considerations should predict, and mediate, lower purchase likelihood.

3.3.1. Method

Main choice experiment. The choice phase of the experiment was preregistered (https://aspredicted.org/xd4xi.pdf). Three hundred seventy-four MTurk workers (after preregistered exclusions; 46.3% male, M_{age} = 36.2 years) were randomly assigned to one of two conditions (selling format: sequential vs. integrated) in a between-subjects design.[5] All participants read that they would make a purchase decision and that one person would be selected to receive a monetary bonus along with any products purchased. In both conditions, participants read, "If you are selected, you will receive a $10 bonus. If you'd like, you can use this money to purchase bags (6 oz. each) of Lindt milk chocolate truffles for $2.50 per bag." Then, they read an explicit purchasing quantity limit in both conditions: "You can buy up to 4 bags." Finally, they read that any money not spent on truffles would be given to them as a monetary bonus. Participants in both formats then answered the question, "What would you like to do?" What differed was the choice options presented. In the sequential format, participants could choose "Not buy any truffles" or "Buy truffles." In the integrated format, participants could choose "Not buy any truffles," "Buy 1 bag of truffles," "Buy 2 bags of truffles," "Buy 3 bags of truffles," or "Buy 4 bags of truffles."

[5] The preregistration erroneously did not note that we would also analyze purchase quantity (in addition to purchase rates), which is not our primary result but is relevant. Accordingly, we report it for consistency with other experiments in the paper. The preregistration also did not mention exploratory measures that were incidentally included at the end of the survey; accordingly, we do not report them further.

Next, all participants explained the thought process underlying the decision they had made, answering, "In a few sentences, please explain why you chose what you chose. Try to consider anything you thought or felt that guided your decision. How did you make this decision (please be as detailed as possible)?"[6] Then, sequential condition purchasers specified their desired purchase quantity, answering, "You indicated that you would like to purchase truffles ($2.50 each) with the potential bonus. What would you like to do?" with choice options: "Buy 1 bag of truffles," "Buy 2 bags of truffles," "Buy 3 bags of truffles," and "Buy 4 bags of truffles." Finally, participants answered an attention check and provided demographic information.

Scoring of thought process explanations. Five hundred seventy participants from the same population pool later scored these explanations.[7] These condition- and hypothesis-blind scorers were guided through an overview of the buying decision process and its stages, including the distinction between considerations that arise early versus later in the funnel (see full text in Appendix C). They next viewed the chocolate truffles purchasing situation that participants from the main experiment had seen. Then, they scored 20 randomly selected explanations. For each explanation, they answered, "Is this participant more likely expressing considerations that arise early or late in the decision-making process?" with three choice options: "Early in the process (focusing on concerns such as whether there is a need, or whether there is enough info or if more searching is needed)," which we scored as 0; "Later in the process (focusing on evaluating the specific choice options and comparing them to each other, including the non-purchase option)," which we scored as 1; and "It's too hard to tell." After coding, participants answered three questions assessing their English fluency and reported demographics.[8] For more accurate

[6] The choice experiment was run without CloudResearch's data quality improvement filters (Litman 2021; Simmons and Nelson 2020), and hence resulted in a small group of hard-to-parse or irrelevant answers (e.g., "Because better one in the recently add list for the some time"; "This very expedites very good and nice."). To avoid drawing conclusions from low-quality responses, we had four hypothesis- and condition-blind research assistants examine the responses and mark "answers that are total nonsense (something totally unrelated to the question prompt, or really bad English that you can't understand, or not really an answer to the question)." Any explanation that two or more research assistants marked as total nonsense was not included for scoring, with 342 explanations remaining. Additionally excluding the 17 responses that one research assistant marked as nonsense further strengthens the effect size and statistical significance of the reported results.

[7] We sought to have an average of 30 scores per explanation after any exclusions, and hence posted the study for 550 respondents (with the CloudResearch Approved data filter); 570 ended up completing it. Of these 570 coders, 19 had inadvertently also participated in the initial choice phase of the experiment. If we exclude these 19 coders, as requested by a reviewer, the results are consistent: participants received a lower average score in the sequential (M = .396, SD = .18) than in the integrated condition (M = .451, SD = .21, $t(340) = 2.589$, p = .010).

[8] These questions were (correct answers bolded): "I _ born in 1980." (**was**, am, were, is); "Would you like _ to drink, sir?" (**something**, anywhere, nothing, drink); "Would you mind _ the door, please?" (**closing,** to close, close, closed).

conclusions, we exclude raters who failed any of the fluency checks (n = 22; remaining N = 548), but the results are equivalent when including all raters (presented in Appendix C).

3.3.2. Results

Main Choice Experiment. We examine choice results in two ways: first, including only the 342 participants whose explanations were eventually scored; second, including all 374 participants who passed the attention check. The results are consistent. Among the 342 participants whose explanations were scored, those in the integrated condition were more than twice as likely to make a purchase (40.11%) as were those in the sequential condition (18.79%; $\chi^2(1, N = 342) = 18.56$, $p < .001$, $\varphi = .23$). Among all 374 participants, results were similar: 44.79% purchased in the integrated condition versus 24.73% in the sequential condition ($\chi^2(1, N = 374) = 16.53$, $p < .001$, $\varphi = .21$). Thus, the effect persisted even when explicit quantity information was provided in both conditions.

Conditional on buying, sequential purchasers bought directionally more bags of truffles (M = 1.90, SD = .94) than did integrated purchasers (M = 1.61, SD = .96; $t(100) = -1.44$, p = .15; among all 374 participants, sequential: M = 2.13, SD = .94 vs. integrated: M = 1.83, SD = 1.05; $t(129) = -1.64$, p = .10). This pattern is consistent with the integrated format influencing participants who are on the knife-edge of buying versus not buying to make a purchase. These marginal customers may purchase fewer units than the enthusiasts who would purchase regardless of the selling format, and accordingly they may drag down the average quantity. When including non-purchases (i.e., quantity of 0) and thus comparing average quantities sold per respondent, the integrated format sold nearly double the amount of truffle bags. Specifically, on average, integrated participants bought 0.64 bags (SD = 1.00) and sequential participants bought 0.36 bags (SD = .85, $t(340) = 2.85$, p = .005; among all 374 participants, integrated: M = .82, SD = 1.15 vs. sequential: M = .53, SD = 1.03; $t(372) = 2.56$, p = .01).

Scoring of Thought Process Explanations. Each explanation was scored by between 28 and 35 scorers. Each explanation could receive a 0 (early in the buying process), 1 (later in the buying process), or "It's too hard to tell." In the main text, we treat these "too hard to tell" explanations as partway between the other two responses (0.5) and then compute an overall average score for each explanation. As robustness checks, Appendix C presents alternative treatments of the data: relaxing the assumption that these responses should exist at exactly the

halfway point and instead endogenously determining cutoffs, and treating each score as an observation in mixed-effects models. All methods yield consistent results.

To illustrate the coding strategy, Table 5 presents a few examples of explanations and the corresponding average score they received across scorers. As intended, lower-scoring explanations generally entailed concerns that would arise earlier in the buying process (e.g., considering the existence of a need), whereas higher-scoring explanations generally entailed evaluating the specific alternatives.

Table 5. Example Choice Explanations and Corresponding Decision Stage Scores, Experiment 2

Explanation	*Purchased?*	*Condition*	*Score*
I personally don't like chocolate that much so there is no point to me buying the lindts.	No	Sequential	.030
I do not need to eat chocolates	No	Integrated	.047
I really love chocolate so a bag or two of truffles would be good.	Yes	Sequential	.118
I want some chocolate but I also want some cash	Yes	Integrated	.191
While I really love truffles, at this point I could use the $10 for more important things than the truffles. I was tempted to buy 1 bag because I would still have the $7.50 left, but decided that I would be more responsible to just have the $10 that can be used towards groceries or bills.	No	Integrated	.806
I chose to buy the chocolates because I really enjoy this brand of chocolates (lindt). While having an extra 10 dollars would be great, i think its nice to treat yourself to something nice like chocolate every once in a while.	Yes	Sequential	.848

Note. We chose these examples for ease of presentation. Although it may seem, based on these exemplars, that score and length are confounded, analyses show that differences in length do not drive the effect, as we report.

Consistent with the proposed mechanism, we found that participants received a lower average score in the sequential (M = .394, SD = .18) than in the integrated condition (M = .450, SD = .21, t(340) = 2.61, p = .010).[9] That is, participants who encountered the sequential format expressed considerations from earlier stages of the buying process than did participants who encountered the integrated format. We also expected and found that participants who purchased received a higher average score (M = .582, SD = .18) than those who did not purchase (M = .356, SD = .17); a logistic regression predicting purchasing from average-score yielded a positive main effect (b = 7.19, SE = .86, z = 8.38, p < .001). This correlation suggests that individuals who

[9] Results persist when also controlling for the length of the explanation: b = -.04, SE = .02, t(339) = -2.27, p = .024. When treating the "too hard to tell" scores as N/A, the results are: $M_{\text{Sequential}}$ = .391 vs. $M_{\text{Integrated}}$ = .447, t(340) = 2.48, p = .014; controlling for explanation length: b = -.04, SE = .02, t(339) = -2.13, p = .034; and the mediation results are b = .06, 95% CI [.01, .10].

focused on later stages were more likely to purchase. At the same time, this is just a relative difference. Many individuals who focused on later-stage considerations still chose not to buy (e.g., 42% of respondents scoring above 0.5 did not purchase), which is consistent with the buying-process model: a customer evaluating the alternatives could reach the conclusion that no option is worth buying, and even a customer who reaches the purchase decision stage may decide not to buy the preferred alternative right now. Still, to examine whether participants' buying process considerations could explain the effect of format on purchasing, we conducted a mediation analysis treating score as a mediator, selling format as the independent variable, and purchasing as the dependent variable. This analysis revealed a significant indirect pathway (b = .06, 95% CI [.02, .11]).[10] The effect of selling format on purchasing was at least partly explained by whether participants' thought processes reflected considerations from earlier versus later stages.

3.3.3. Discussion

This study implicates considerations from different stages of the buying process in the quantity integration effect. Participants who encountered the sequential format, compared to the integrated format, were more likely to express earlier-stage considerations, such as questioning the existence of a need. In turn, these individuals were less likely to purchase.

One critique of this study is that participants provided their explanations after having made a choice. It is possible that because the integrated format made participants more likely to purchase, and because purchasers are more likely to report later-stage considerations, the apparent correlation between the integrated format and stages of the process may be inaccurate. To address this problem, we conducted a preregistered replication study with the same scoring process, exclusion criteria, and analyses as in Experiment 2 (reported fully in Appendix C). Respondents were presented with the same choice as participants in this experiment and saw one of the two selling formats; however, they were asked to report their considerations when first encountering the selling format, without making any choice. Specifically, they reported, "What is the first question you would ask yourself when thinking over this choice?" The results are consistent: the first thoughts that came to participants' minds belonged to later stages of the buying decision process among those exposed to the integrated format compared to the

[10] We used an implementation of Hayes's method (2013) of path analysis for statistical mediation with 5,000 bootstrapped samples, using the mediation package in R (Tingley et al. 2019).

sequential format. Together, these results support stages of the buying decision process as one factor contributing to the quantity integration effect. Yet, across all our experiments thus far, a key difference remains between the two formats: the number of choice options they present. We address this asymmetry next.

3.4. Experiment 3: Addressing the Number of Choice Options

Quantity integration naturally changes the number of available options (e.g., the number of buttons one can click). To equate the number of options between formats, one must either artificially increase the number of alternatives in the sequential format or artificially contract all the quantity options into a single alternative in the integrated format. Although both strategies move away from ecological validity, to test this theoretical question, Experiment 3 uses the first approach, and Experiment AE, also reported in Appendix F, conceptually replicates it. Experiment AF, in Appendix F, provides convergent evidence using the latter approach.

To generate additional choice options for the sequential format, Experiment 3 uses a common situation encountered on Amazon.com, where customers can choose between different but functionally equivalent sellers of the same product. In this way, we integrate brand/seller choice into the initial decision for all participants. However, we additionally integrate quantity into that choice for only one condition. This creates the usual quantity-sequential versus -integrated distinction, but with the same number of choice alternatives in both.

3.4.1. Method

This study was preregistered (https://aspredicted.org/qd2p9.pdf). We recruited 399 MTurk workers using CloudResearch (50.6% male, M_{age} = 38.7 years) and randomly assigned them to one of two conditions (selling format: sequential vs. integrated) in a between-subjects design. All participants read, “Imagine you are shopping on Amazon's website when you see that one of the body washes you like is on sale. You already have a few different body washes at home, but you take a look. Amazon allows you to purchase the same products from multiple sellers. There are 2 sellers who sell this body wash: *Beauty Care* and *For Your Beauty*. Both have 100% positive lifetime customer ratings. This body wash normally retails for $5.00 a bottle,

but is currently offered at a discounted price of $3.99. You can buy up to 2 bottles. What would you do?" (The order of the two sellers was counterbalanced.)

What differed between conditions were the choice options presented. In the sequential format, the choice options were: "Not make a purchase," "Make a purchase from Beauty Care," and "Make a purchase from For Your Beauty" (seller order counterbalanced). Hence, participants saw one non-purchase option and two purchase options. In the integrated format, the choice options also comprised one non-purchase option and two purchase options: "Not make a purchase," "Buy 1 bottle from Beauty Care," and "Buy 2 bottles from For Your Beauty" (counterbalanced; half of the participants saw "Buy 1 bottle from For Your Beauty" and "Buy 2 bottles from Beauty Care"). (Note that this implementation likely weakens the effect because it adds an additional tradeoff between seller and quantity only in the integrated condition.) Sequential condition purchasers then specified their desired quantity by answering, "How many bottles of this body wash would you buy?" (1 bottle, 2 bottles). Finally, participants answered an attention check question and reported demographics.

3.4.2. Results

To test whether the order of sellers (i.e., counterbalancing) impacted choice, we regressed purchasing onto seller order (coded 1 = Beauty Care was first and -1 if For Your Beauty was), format (coded 1 = integrated and -1 = sequential), and their interaction. There was no main effect of seller order (b = .10, SE = .11, z = .88, p = .378) and no interaction between factors (b = −.05, SE = .11, z = −.47, p = .638). Therefore, as preregistered, we collapse across seller order for the primary analyses.

Participants in the integrated condition were more likely to indicate they would make a purchase (74.13%) than were sequential condition participants (64.65%; $\chi^2(1, N = 399) = 4.23$, p = .040). Thus, the quantity integration effect replicated even when the number of choice options was artificially equated in the two formats.

Conditional on buying, sequential purchasers indicated they would buy more bottles of body wash (M = 1.73, SD = .44) than did integrated purchasers (M = 1.58, SD = .50; $t(275)$ = −2.76, p = .006). When including non-purchases (i.e., quantity of 0) and thus comparing average quantities per respondent, we find that on average, integrated participants "bought" 1.17 bottles of body wash (SD = .81), while sequential participants "bought" 1.12 bottles (SD = .90, $t(397)$ = .56, p = .578). We do not draw strong conclusions from these null quantity results because the

quantity options differed in the two formats: in the sequential condition, quantity and brand were independent, so customers who favored one brand name over another could fully satisfy their preferences. In the integrated condition, quantity and brand covaried; so, those participants were stuck with the brand that offered the quantity they desired, or alternatively, were stuck with the quantity offered by the brand they desired. The presence of this tradeoff in the integrated format also likely reduced purchasing likelihood too (Dhar 1997), making this a more conservative test.

3.4.3. Discussion

Participants were significantly more likely to purchase in the integrated (vs. sequential) format, even with the number of choice options held constant across formats. This was done by integrating brand choice into the initial decision for both formats. One may wonder if this brand-integration increased purchasing relative to a purely sequential format, in which the initial choice would only be between purchasing versus not. We address this in the General Discussion; briefly, it is possible, but it is also possible to find the opposite (Dhar and Nowlis 2004). Either way, brand integration was held constant across formats and cannot explain the results.

In Appendix F, Experiment AE replicates this result with a different way of artificially creating additional sequential choice options—having options to buy or buy "with excitement" —while Experiment AF replicates this result by contracting all of the integrated purchasing options into a singular alternative ("Buy 1, 2, or 3"). Together, these experiments establish that the number of choice alternatives (e.g., buttons to click) cannot solely drive the quantity integration effect.

In the next section, we analyze additional lab experiments we conducted using different products, price points, and purchasing situations to investigate the robustness of the quantity integration effect. We pool these experiments to estimate the average effect size and examine its heterogeneity. We then exploit variation in the design of these experiments to explore the role of other potential contributing mechanisms.

3.5. Pooled Analysis

We conducted 36 in-person and online lab experiments (including Experiments 1–3), amassing a total of 21,004 participant observations. All experiments tested the quantity integration effect by presenting participants with a purchase situation and randomly assigning

them to either a quantity-sequential or a quantity-integrated selling format, then observing their purchase decisions. As shown in Table 6, studies included a variety of products, at different price points, each associated with different typical purchasing habits (e.g., raffle tickets, candles, chocolates, bank CDs). They also varied implemental features of the formats, such as the phrasing of the call to action and the maximum quantity available for purchase, as well as other aspects of the choice context that are not necessarily tied to the selling format, such as whether the respondent was choosing for themselves versus someone else, whether or not the respondent was under time pressure, and whether various goal-directed mindsets were primed before the choice. We point interested readers to Appendix D for greater detail on these additional experiments. We first present aggregate analyses of the full dataset, which reveal a robust effect persisting across settings, over and above any influence of the abovementioned factors. Subsequently, we explore the heterogeneity of the effect with respect to some of these factors.

Table 6. Brief Overview of Lab Experiments, Pooled Analysis

Experiment	*N*	Product	Price	Quantity Limit (Explicit?)	CTA: Same vs. Different	Other Factor Manipulated
1	397	Coca-Cola	$1.99	3 (No)	same	
2	342	Lindt milk chocolate truffles	$2.50	4 (Yes)	same	
3	399	Body wash	$3.99	2 (Yes)	same	
AA	801	Lindt milk chocolate truffles	$2.50	1 (Yes)	different	
AB	403	Small notebooks	$6.00	3 (Yes)	same	
AC	800	Lindt milk chocolate truffles	$2.50	4 (Yes)	same	
AD	655	Extra spearmint gum	$0.50	2 (No)	same	Priming closure
AE	582	Small notebooks	$6.00	3 (Yes)	same	
AF	401	Extra spearmint gum	$0.88	2 (Yes)	same	
AG	433	Avocados	$0.99	3 (No)	same (no CTA)	
A	593	Raffle tickets	$0.05	10 (No)	different	
B	790	2-liter bottles of Coca-Cola or “soda”	$2.49	5 (No)	different	Product uncertainty
C	773	2-liter bottles of Coca-Cola or a randomly chosen soda (Coke, Pepsi, Sprite, Dr. Pepper, or Mountain Dew)	$1.99	5 (No)	different	Product uncertainty
D	1175	Scented candles	$6.99	5 (No/Yes)	different	Level of commitment
E	394	Scented candles	$6.99	5 (Yes)	different	Level of commitment
F	261	Raffle tickets	$0.25	8 (No)	same	
G	402	4-pack of refill razor blades	$9.99	5 (Yes)	different	Recipient: self vs. other
H	394	Bar soap	$2.99	5 (Yes)	different	Recipient: self vs. other
I	399	Bar soap	$2.99	5 (Yes)	different	Explicit deferral option
J	396	2-liter Coca-Cola bottles	$2.49	5 (Yes)	different	Level of commitment

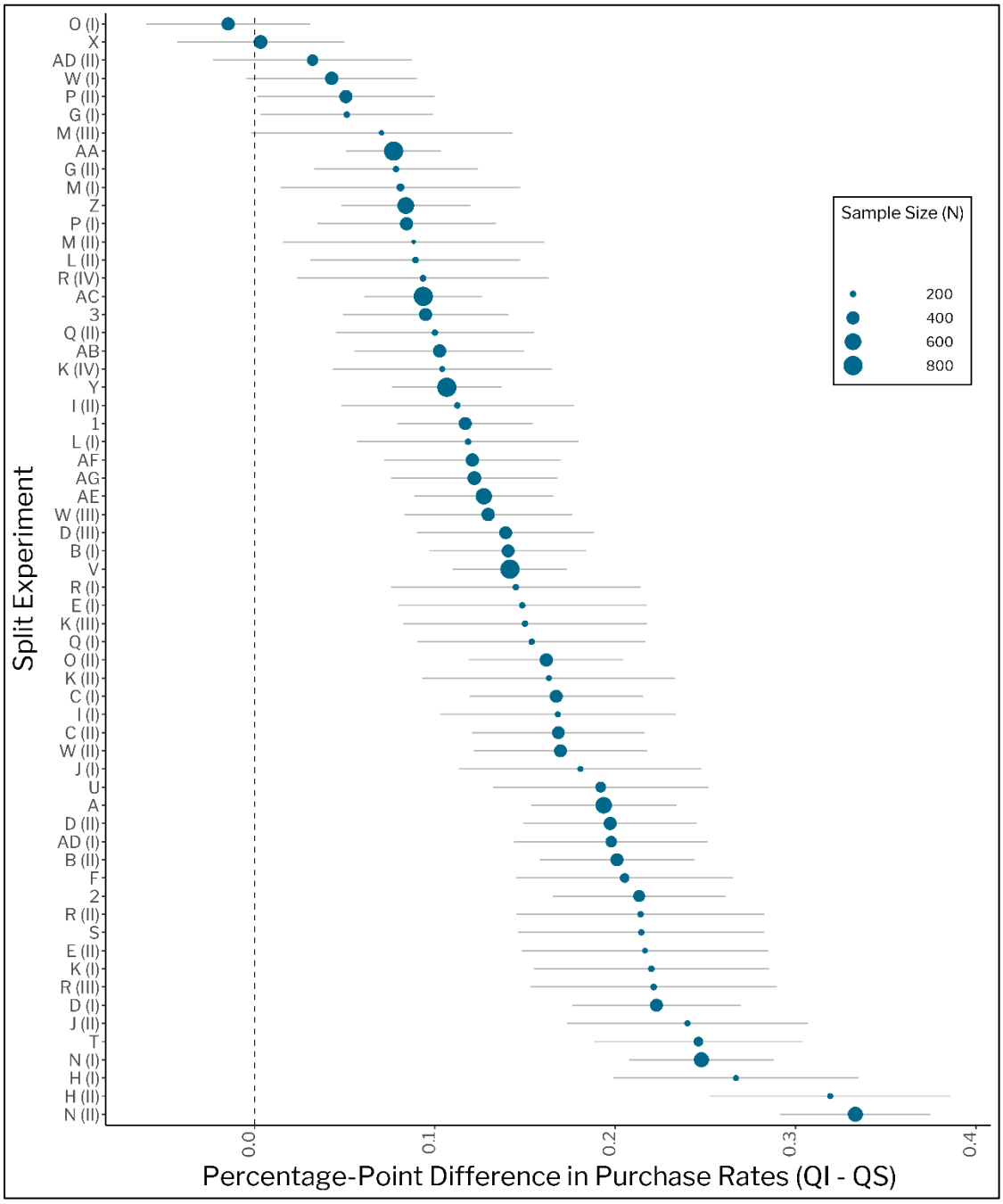
K	395	Hand soaps and ballpoint pens (participants made two decisions, doubling participant observations; see Appendix D)	$.99 / $3.99	3 (Yes)	different	Presence of other products
L	401	Ferrero Rochers	$0.25	5 (Yes)	different	Choice option color differentiation
M	605	Extra spearmint gum	$0.99	5 (Yes)	same	Sense of commitment
N	1003	1-month or 25-year CD (2.88% APY)	$200	5 (Yes)	different	Purchase timeframe
O	811	Ferrero Rochers	$0.25	5 (Yes)	same	Time pressure
P	806	2-liter Coca-Cola bottles	$1.49	5 (Yes)	same	Time pressure
Q	399	2-liter Coca-Cola bottles	$2.49	3 (Yes)	same	Concreteness
R	808	2-liter Coca-Cola bottles	$1.49	1, 3, 5, or 10 (Yes)	different	Maximum quantity
S	201	Extra spearmint gum	$0.99	5 (Yes)	same	
T	266	Scented candles	$6.99	3 (Yes)	different	
U	300	Scented candles	$6.99	3 (Yes)	same	QS on same vs. different pages
V	793	2-liter Coca-Cola bottles	$2.49	5 (No)	different	Slider vs. drop-down
W	1210	Scented candles	$6.99	3 (Yes)	same	Implemental vs. deliberative mindsets
X	424	Starbucks gift cards (value: $5.00)	$3.00	3 (Yes)	same	
Y	798	2-liter Coca-Cola bottles	$2.49	3 (Yes)	same	
Z	603	2-liter Coca-Cola bottles	$2.49	3 (Yes)	same	

Note. N indicates the number of participants in the study. Quantity limit indicates the maximum quantity available for purchase, and the text in parentheses indicates whether a quantity limit was explicitly mentioned. The call-to-action (CTA) column indicates whether participants answered the same question in both formats or the questions differed across formats (conversationally adapted to best match each format).

3.5.1. Aggregate Effect Size and Heterogeneity Across Studies

As shown in the rightmost column of Table 6, we often varied an additional factor within an experiment (e.g., whether participants were choosing for themselves vs. for another individual). Because each factor is orthogonal to the selling format manipulation, we split each experiment that used a two-by-two design, treating it as two separate studies (McShane and Böckenholt 2017), so that in the pooled analysis, each split experiment represents a simple two-condition design (selling format: sequential vs. integrated). The resultant data include 61 split experiments testing the effect. Figure 8 presents the average difference in purchasing in each split experiment. As shown, in most experiments, the integrated format yielded substantially greater purchasing, with an average 14 percentage-point difference. We present a complementary single-paper meta-analysis (McShane and Böckenholt 2017) in Appendix E that yields equivalent results.

Figure 8. Difference in Purchase Rate Between Selling Formats Across All Split Experiments, Pooled Analysis



Note. Error bars represent ± 1 *SE* of the difference between formats.

Table 7 presents logistic mixed-effects models predicting purchase. We include random intercepts for split-experiment, full-experiment, and experimental condition to account for

variation attributable to unique experiment and/or product characteristics (e.g., time of day, product category).[11] We include individual random intercepts to account for repeated measures on certain participants. (Many of our experiments were conducted on the MTurk platform. In cases where the purchase scenarios/opportunities were considerably different from prior experiments, we allowed previous participants to complete additional studies. As a result, some individuals participated in multiple experiments, with different products and situations, although each individual could participate only once in a given study.). Finally, we include fixed effects for implementation factors that could influence the effect: whether there was an explicit quantity limit (and what that maximum was), whether the two formats used the same or different calls to action, whether or not the decision was framed as an add-on to an existing purchase (e.g., buying soda in Experiment 1's Domino's Pizza scenario), and the product's price. Appendix E presents convergent results with Bayesian techniques. Together, these analyses corroborate that the integrated format resulted in substantially higher purchasing than the sequential format.

Table 7. Generalized Linear Mixed-Effects Models Predicting Purchase, Pooled Analysis

	(1)	(2)	(3)
Sequential (vs. Integrated) Format	-.76***	-.76***	-.79***
	(.04)	(.04)	(.14)
Mentioned Quantity Limit		.79*	.75*
		(.32)	(.32)
Max. Quantity		.03	.05
		(.05)	(.05)
Same CTA		-.33	-.47
		(.28)	(.28)
Add-On Purchase		-.38	-.40
		(.28)	(.28)
Price		-.30**	-.26*
		(.11)	(-.11)
Sequential Format x Mentioned Limit			.09
			(.08)
Sequential Format x Max Quantity			-.03
			(.02)
Sequential Format x Same CTA			.28**
			(.08)
Sequential Format x Add-On			.04
			(.07)

[11] We thank anonymous reviewers and our associate editor for suggestions on conducting these analyses.

Sequential Format x Price			-.08** (.03)
Constant	.03 (.14)	-.13 (.41)	-.11 (.41)
Individual Random Effects	.80 (.007)	.80 (.007)	.81 (.007)
Expt.-Condition Random Effects	.15 (.01)	.15 (.01)	.00 (.00)
Split-Experiment Random Effects	.33 (.04)	.28 (.04)	.30 (.04)
Full-Experiment Random Effects	.79 (.13)	.73 (.13)	.73 (.13)
R_GLMM²	.27	.29	.29
Observations	21004	21004	21004
Akaike Inf. Crit	25,713	25,711	25,688

Note. Standard errors are shown in parentheses. Binary variables (all variables except for price) are dummy-coded. Selling Format = 1 for sequential and 0 for integrated. Mentioned Quantity Limit indicates whether the maximum purchase quantity was explicitly mentioned in both selling formats (=1) or not (=0). Max. Quantity indicates the highest number of units that participants could purchase. Same CTA indicates whether the question/call to action was identical in both selling formats (=1) or if the questions differed (=0). Add-On Purchase indicates whether the purchase opportunity was framed as part of an existing purchase (e.g., adding a bottle of soda to an existing pizza order, as in Experiment 1, = 1) or a standalone purchase (as in Experiment 2, =0). Price was log-transformed to contend with skew. R_GLMM² indicates the conditional coefficient of determination for the generalized mixed-effects model computed with the delta method (analogous to Pseudo R^2, as computed with the MuMIn package, Barton 2020). * $p < .05$; ** $p < .01$; *** $p < .001$.

Heterogeneity. Beyond these overall differences, there is substantial heterogeneity in the size of the effect. Model (3) of Table 7 includes interaction terms between selling format and implemental characteristics as exploratory analyses. Three of these characteristics shed light on potential psychological mechanisms, so we discuss them individually in the following subsections: whether a quantity maximum was explicitly mentioned, what that maximum was, and whether or not the same call-to-action question was used in both formats.

As mentioned, another characteristic we explored was whether the purchase opportunity was framed as a standalone purchase opportunity (as in Experiment 2) versus as an opportunity to add a product to an existing order (as in Experiment 1). We did not find a notable difference between the two; the effect was similar in both settings (no statistically significant moderation). Further, a logistic mixed-effects model predicting purchase from selling format with the same random intercepts as the primary results, among only standalone experiments revealed consistent results (b = −.76, *SE* = .06, *z* = −12.63, $p < .001$; among only add-on experiments: b = −.68, *SE* = .06, *z* = −11.59, $p < .001$).

A final characteristic we examined was price. We found that the quantity integration effect was larger for more expensive products. We can only speculate, but perhaps the effect is amplified when customers have greater uncertainty, which may accompany more-expensive

purchases. Alternatively, when customers consider buying multiple units (as in the integrated format), this may attenuate the perceived expense of higher-cost products (we thank an anonymous editor for this suggested explanation).

Within-Person Effects. In total, we had 13,154 unique individuals participate in our experiments.[12] Of these, 3,864 individuals participated in more than one experiment, allowing for an exploratory examination of within-person effects: does the effect wear off after multiple exposures to selling formats? A logistic regression predicting purchase from the selling format, among only the participants who took part in two or more experiments (total observations = 10,924)—with random intercepts for split-experiment, full-experiment, experimental condition, and individual—revealed a negative effect of the sequential format ($\beta = -.87$, $z = -15.72$, $p < .001$). A similar large negative effect arises when examining only the individuals who participated in three or more experiments, four or more experiments, and so on, even up to the 19 individuals who supplied 10 or more observations each (for a total of 198 observations).

One may wonder whether the people who participate in multiple experiments are more susceptible to the effect. Importantly, a large effect also appears when instead examining only the 9,290 individuals who participated in just a single experiment ($\beta = -.58$, $z = -12.75$, $p < .001$). Appendix E presents models including all participants and exploring potential interaction effects between a participant's number of appearances and the selling format. These analyses uncover no notable relationships. In summary, the same person was substantially more likely to buy in the integrated versus sequential format, an effect that arose repeatedly. Note that these analyses are necessarily exploratory. Nevertheless, this lack of "wearing off" across repeated encounters with these selling formats speaks to the robustness of the effect. Next, we discuss other differences between the formats and their associated psychological mechanisms.

3.5.2. Differences Between the Formats

The Call to Action: Difference I in Table 1. Some experiments employed the same call to action in both formats (e.g., Experiments 1–3). Others used different calls to action that were adapted to be conversationally appropriate for each format. For example, it may be more natural

[12] One experiment required participants to make choices for multiple products (Studies K1-K4). For simplicity, these observations were excluded from this analysis, although including them does not change the results. Additionally, 0.18% of sequential observations involved participants choosing to purchase in the first stage, but then adjusting the quantity to zero on the second. To be conservative in testing the impact of selling format on purchasing, we treat these observations as purchases; treating this small fraction as non-purchases only increases the effect.

to ask, “Would you like to buy any notebooks?” in the first step of a sequential format, whereas “How many notebooks would you like to buy, if any?” may be easier to process in the integrated format. An exploratory analysis presented in Table 7 shows that the quantity integration effect was larger in experiments using different conversation-adapted questions in the two formats. At the same time, the effect was still substantial among only experiments that used the same format-neutral call to action in both formats (among these experiments, regressing purchase on selling format with the same random intercepts as the primary results reveals: b = −.53, *SE* = .05, *z* = −10.37, $p < .001$). Thus, conversationally adapted questions can enhance the effect, but are not required to observe it.

Information About Quantities: *Difference II in Table 1*. In some experiments (e.g., E2), we explicitly stated a maximum purchase quantity in both formats so this potential anchor would be readily apparent in both formats. As a main effect, stating an explicit limit was correlated with increased purchasing in both formats (Table 7, Model (2)), in line with prior research showing that quantity limits can increase buying (Lessne and Notarantonio 1988; Inman, Peter, and Raghubir 1997; Wansink, Kent, and Hoch 1998). But importantly, this did not interact statistically significantly with the format; that is, providing a quantity limit did not reduce the gap between the formats. This suggests that any quantity information leaked by the integrated format is not likely to be a primary driver of the effect.

Number of Choice Options: Difference III (Table 1). Across experiments, we varied the maximum quantity—and, accordingly, the size of the difference in the number of choice options between formats.[13] If this asymmetry contributes to the effect, then as the maximum quantity rises, the magnitude of the quantity integration effect should also rise. However, the maximum quantity did not meaningfully interact with the effect (Table 7, Model (3)).

3.5.3. Secondary Result: Quantity Purchased

In addition to whether customers purchase, it is relevant to know how much they buy. Examining the aggregate data, the integrated (vs. sequential) format yielded a higher average purchase quantity (when including non-purchasers who bought zero units; see Appendix E for

[13] To elaborate, consider a scenario where the maximum purchase quantity is two. Here, the options in the integrated format would be not purchasing, buying one, and buying two. Compare this to a case where the maximum is seven. There, the integrated format would offer eight options: not purchasing, buying one, buying two, buying three, …, buying seven. In both scenarios, the sequential format would offer only two options (buy vs. do not buy). Hence, the asymmetry in the number of choice options between formats is larger when the maximum quantity is higher.

analyses). In terms of total sales volume, changing from a sequential to an integrated format yielded a 28% average increase in total units sold per customer (from 0.79 to 1.01 average units). Conditional on buying, purchasers in the sequential format bought a higher average quantity than did purchasers in the integrated format. This makes sense: if the integrated format reduces barriers to purchasing, it should be most likely to nudge the marginal customers who are closest to indifference (and who would likely buy a lower quantity). Adding in a few more customers who may otherwise not buy should, in turn, lower the average quantity among buyers. That said, the substantial lift in volume sold underscores the power of quantity integration.

4. General Discussion

All purchase interactions have some design. In purchase settings where customers can choose their desired quantity, these designs can lay out the "whether to buy" and "how much to buy" decisions sequentially or simultaneously. We find that the latter approach, of integrating the quantity decision with the initial purchase decision, can substantially increase purchase likelihood. This large and robust "quantity integration effect" arose in the lab and in the field, across various implementations, and through repeated exposures to the selling formats. In what follows, we discuss boundary conditions and limitations of the present experiments, discuss alternative psychological mechanisms, detail the practical and theoretical implications of these findings, and outline directions for future research.

4.1. Boundary Conditions and Limitations

In this paper, we implicate one key mechanism in the effect: the formats cue considerations from different stages of the buying decision process. Specifically, the integrated format is more likely than the sequential format to cue evaluation-of-alternatives, and accordingly is less likely to focus customers on earlier-stage considerations such as whether or not one has a broad general need in the category. As a result, these customers face fewer points at which they could exit the purchase funnel, and thus are more likely to buy. This mechanism also implies boundaries. If customers naturally start from alternative evaluation, or skip the initial stages of the buying process altogether, they are not likely to be impacted by quantity integration. Indeed, the field experiment found no significant impact of quantity integration in a product category for which there was high urgency prior to encountering the selling format. Yet

we also note that given the constraints of a field setting, there may be other factors differentiating Category A and Category B that contributed to the divergent patterns in each, and this boundary condition evidence should be explored further in future studies.

Relatedly, we suspect quantity integration should be most applicable to unplanned purchases, which make up approximately half of what shoppers buy (Kollat and Willett 1967; Stilley, Inman, and Wakefield 2010). In these cases, the integrated format has room to affect behavior by inducing alternative evaluation, reducing the likelihood that customers will get mired in earlier-stage considerations and exit from the purchasing process. It is also possible that in some special cases, quantity integration could backfire for customers who already have strong purchase intent prior to reaching the selling format. Being presented with multiple different quantity options at once may cause them to question their choice and produce deferral. We did not observe evidence of this in our experiments, although the Category B field results point slightly in this direction. Future research should test this.

Exploratory findings in the pooled analysis also point to two additional potential boundary conditions to test in future research. First, in our lab studies, the effect was larger among more (vs. less) expensive products. Future research should explore whether this result obtains experimentally. Second, the effect was larger when customers responded to different, conversation-adapted calls to action in the two formats than when they responded to the same generic question. Marketers should recognize that using a question like "How many chocolates, if any, would you like to buy?" may further enhance the power of quantity integration, although this is not required to observe the benefits of quantity integration.

The current experiments tested products that customers could plausibly purchase in multiple units (e.g., bottles of soda, packs of gum). However, we posit that attempts to encourage purchase via quantity integration may backfire, eliciting reactance, if they are perceived as attempts at persuasion (Clee and Wicklund 1980; Fitzsimons and Lehmann 2004). For products that customers would not reasonably purchase in multiple quantities (e.g., cars or smartphones), consumers may perceive quantity-integrated appeals as strange or suspicious. Accordingly, we caution that the quantity integration effect is likely limited to situations where a customer could reasonably expect to buy more than one unit. That said, we still found a strong quantity integration effect in situations where, *in practice*, nearly all shoppers do end up purchasing only one unit (e.g., one bottle of Coke to accompany a pizza order). Thus, we propose it is the mere

reasonableness of asking about multiple quantities, rather than whether a customer actually intends to buy multiple units, that may qualify the applicability of this effect.

We also suspect that quantity integration could backfire when the quantities themselves complicate the choice. In choices with a large number of quantity options (e.g., when customers can purchase between 1 and 20 packs of toilet paper), or those with continuous quantities, as when buying gasoline by the gallon or spices by the ounce, the complexity of specifying just the right quantity may undermine the benefits of quantity integration. Quantity integration may also complicate choice in settings where customers have limited knowledge about the appropriate amounts. For example, a customer purchasing pounds of meat to cook may know only that she needs enough to feed several people, but not the exact quantity that would correspond to this need. Here, tackling the decision problem one step at a time—as in the sequential format—may reduce complexity and encourage purchase. Relatedly, most of our studies focus on cases where customers see one focal product and make decisions about it (although this was not true for the field experiment, in which the interface typically presented multiple SKUs at once). In cases where customers contend with a large number of alternative SKUs at once, quantity integration may complicate choice and produce deferral.

Finally, one additional limitation of these experiments is that we observe only one-time purchasing. It is possible that some of the benefits of quantity integration may be attributed to purchase acceleration. With this in mind, we suggest that quantity integration is most easily applied to one-off, discretionary purchase opportunities as opposed to repeated, habitual purchasing.

4.2. Psychological Mechanisms

Overall, our results share conceptual features with those of Dhar and Nowlis (2004)'s. They compared response modes in which customers first decided whether or not to purchase (e.g., deciding whether they will buy a computer) and then selected the desired product variant (e.g., choosing which brand/model), with modes in which customers simultaneously decided whether and which variant to buy. Dhar and Nowlis (2004) suggested that these selling formats activate different comparison processes (attribute- vs. alternative-based evaluations), which influence the relative weight assigned to shared versus unique attributes, which can either increase or decrease purchasing (Dhar and Nowlis 2004; Parker and Schrift 2011). In this way,

our results complement and dovetail with, but are fundamentally distinct from, those of Dhar and Nowlis (2004).

We also considered additional mechanisms that may arise from other features of the selling formats, including the call to action, the information presented about quantity, the number of choice options, and the effort required. Together, our experiments found that the quantity integration effect persisted beyond any potential influence of such factors, which should be explored further in future work. For the interested reader, Appendix F also discusses additional potential mechanisms we tested. These explanations include goal-oriented mindsets (e.g., deliberative vs. implemental mindsets; Gollwitzer 1990; Chandran and Morwitz 2005; Dhar, Huber, and Khan 2007; or whether-to-buy vs. which-to-buy mindsets; Xu and Wyer 2007), social norm or experimenter inferences (e.g., Kamenica 2008; Lieberman, Duke, and Amir 2019), and construal level/concreteness (e.g., Trope and Lieberman 2010). Although we could not find supportive evidence for these explanations, future research may wish to assess them in other ways.

4.3. Implications and Future Directions

Most simply, our results suggest that marketers should pay careful attention to how they invite customers to buy. Online, retailers have tools at their disposal to easily encourage simultaneous purchase and quantity considerations. Merchants can change their purchase appeals to provide quantity-integrated choice options (e.g., “Add 1 cookie,” “Add 2 cookies”) rather than quantity-sequential ones (e.g., “Add to cart”). Our field experiment demonstrates that changing to an integrated format, even from a sequential format that already had the purchase and quantity decisions presented right beside one another, can have a substantial impact on sales.

Other marketer interactions may similarly shape how customers approach purchasing considerations. For example, the calls to action that marketers pose to customers—in emails, in in-person interactions, in advertisements, and more—may subtly encourage an integrated or sequential thought process. Consider the difference between an ad appeal such as “Get it while it’s hot!” and one framed to encourage quantity consideration: “Grab a few—one or two?” We suspect that appeals encouraging quantity consideration, even without an explicit choice opportunity, could potentially also increase purchase rates, an interesting question for future research.

A key theoretical contribution of this work is in shedding light on how the structure of the purchase decision can affect how customers perceive their stage in the buying process. In particular, we implicate the provision of a complete choice set, from which any decision would finalize the entire purchasing process, as evoking evaluation and suppressing concerns from earlier stages. We suspect this mechanism may also contribute to other factors that have been shown to encourage purchase. As an example, one of Amazon's major steps in increasing its growth was eliminating the shipping fees for Prime customers (Wei 2018). Part of that success may have been driven by the choice finality that this provided: by eliminating any need to consider shipping costs, Amazon propelled customers closer to a "one click seals the deal" experience. Amazon also recently instituted a "Buy Now" button that may confer similar benefits.

One may wonder whether integrating other attribute decisions into a single choice could similarly reduce early-stage considerations and encourage purchase. Although it is possible, we speculate that this effect may be specific to quantity (vs. other attribute) integration. Quantity is special in that (a) the choice options exist on an orderable and meaningful continuum, (b) the choice options do not greatly conflict with one another, and (c) the integration does not greatly increase complexity. That is, a customer who decides to purchase "3" T-shirts does not need to give up the alternatives of "2" or "1" T-shirt, nor does he need to keep a great deal of information in working memory when comparing across options; each quantity alternative is inclusive of the values that precede it (Nowlis, Dhar, and Simonson 2010; Moon and VanEpps 2021). Consider how this would differ for another attribute. Imagine a "color-integrated" choice, in which a customer shopping for a T-shirt is presented with choice options of "red shirt," "blue shirt," "yellow shirt," "purple shirt," and "no shirt." In this case, the different options may introduce added tradeoffs between options and amplify the complexity of the choice, yielding deferral (Tversky and Shafir 1992). Further research is needed to examine the potential consequences of integrating other types of attribute decisions into the purchase decision.

Finally, the power of quantity integration may apply not only to purchase decisions but also to other situations in which there is both a decision to act and a choice of quantity. Consider the decisions of whether and how much to volunteer, whether and how much to donate (Moon and VanEpps 2021), whether and how much to invest in the stock market, whether and how much to exercise, whether and how much to diet, and so on. In each case, simultaneously

considering the behavior and its quantity may increase individuals' likelihood of choosing to act. We hope our findings open the door to exploring not only whether, but how many, such contexts reveal the power of quantity integration.

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The Importance of Selling Formats: When Integrating Purchase and Quantity Decisions Increases Sales

ONLINE APPENDICES

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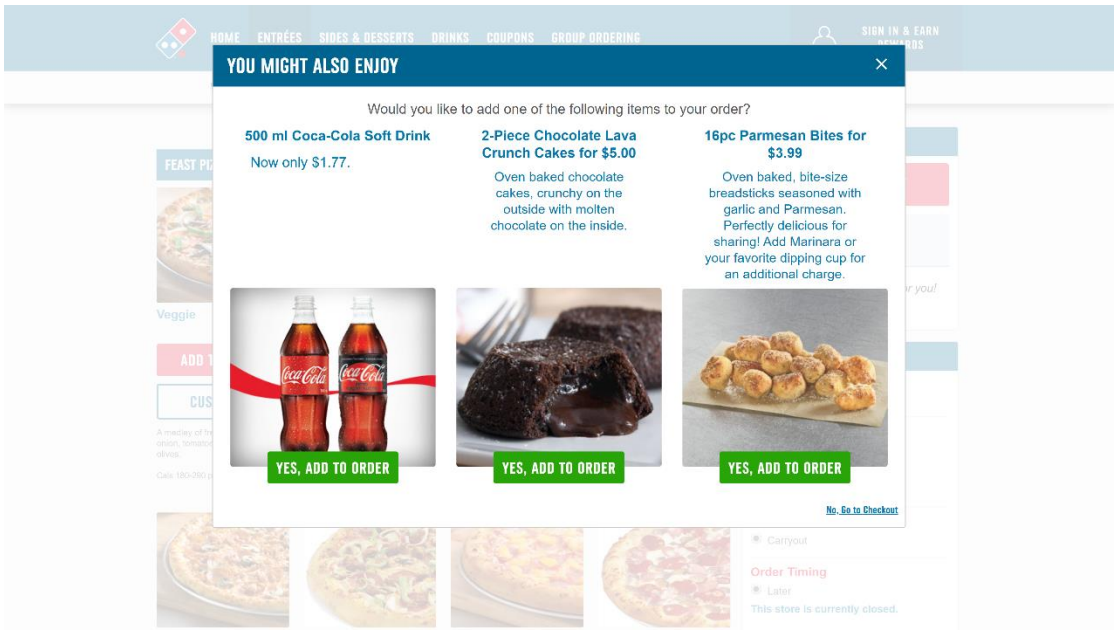
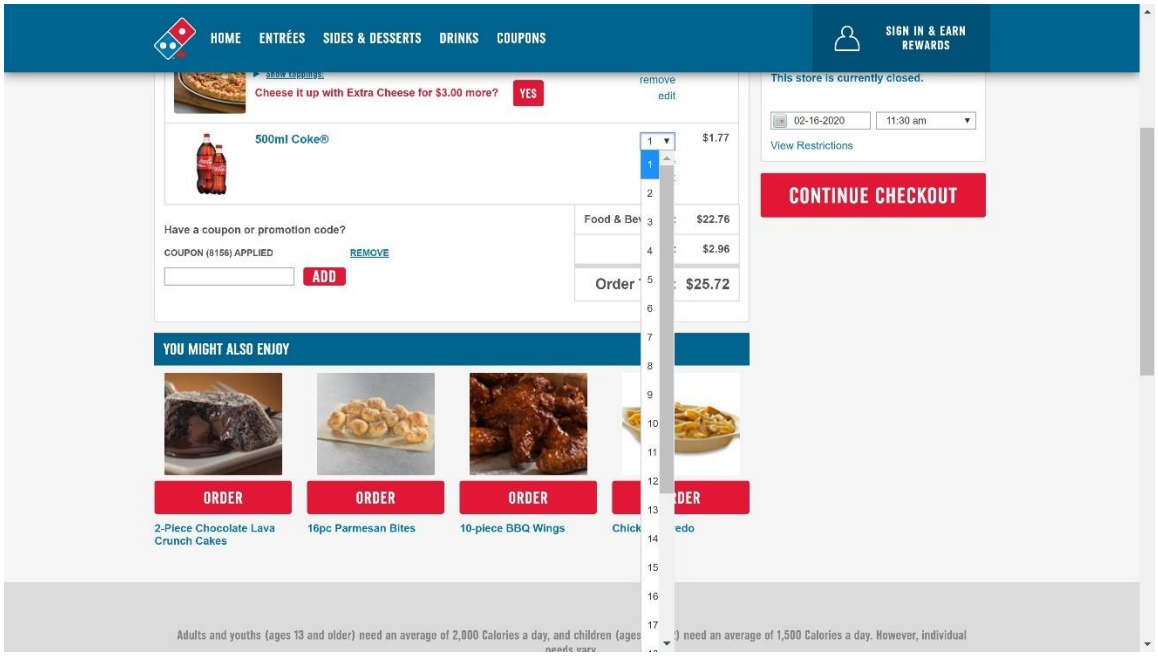
APPENDIX A: EXAMPLES OF RETAILERS USING THE QUANTITY-SEQUENTIAL SELLING FORMAT

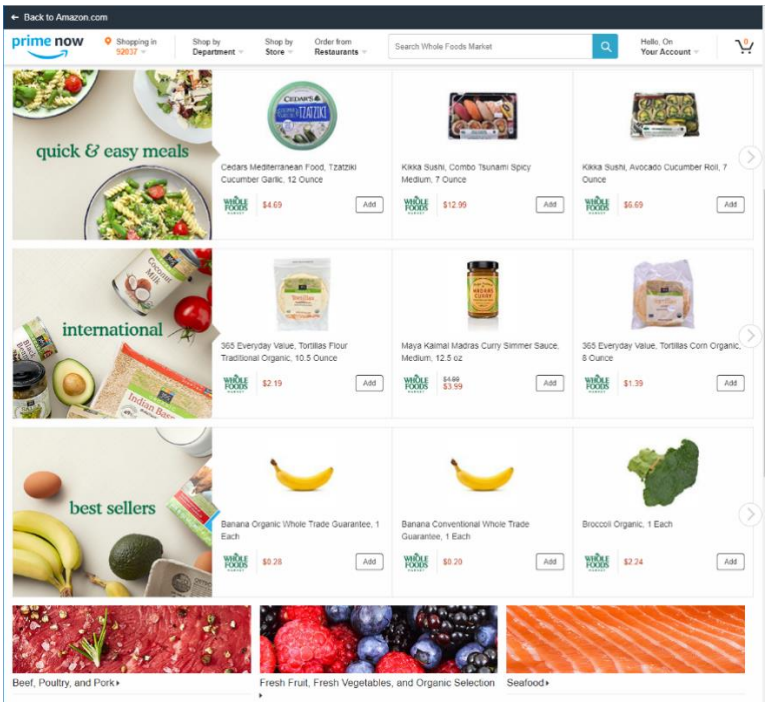
Domino's Pizza's Checkout Process. Customers who click the "Checkout" button are confronted with a pop-up message along the lines of the following, which asks if they would like to add featured items to their order. Customers wishing to add items can do so by clicking an "add" button. Those wishing not to must either X out of the pop-up (top right) or click "No, Go to Checkout" (bottom right).



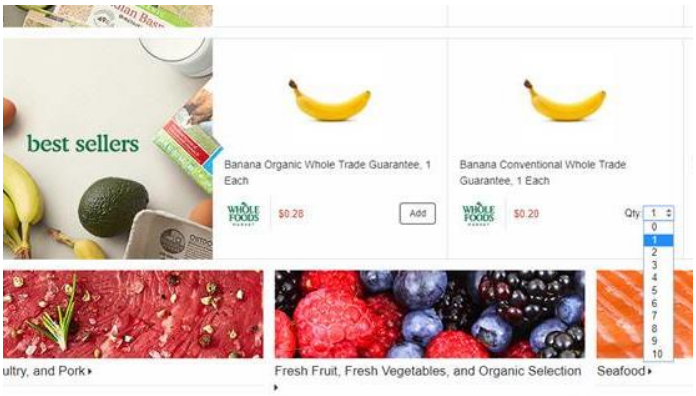
If featured items are added to the order, customers can adjust the desired quantity on the cart page:



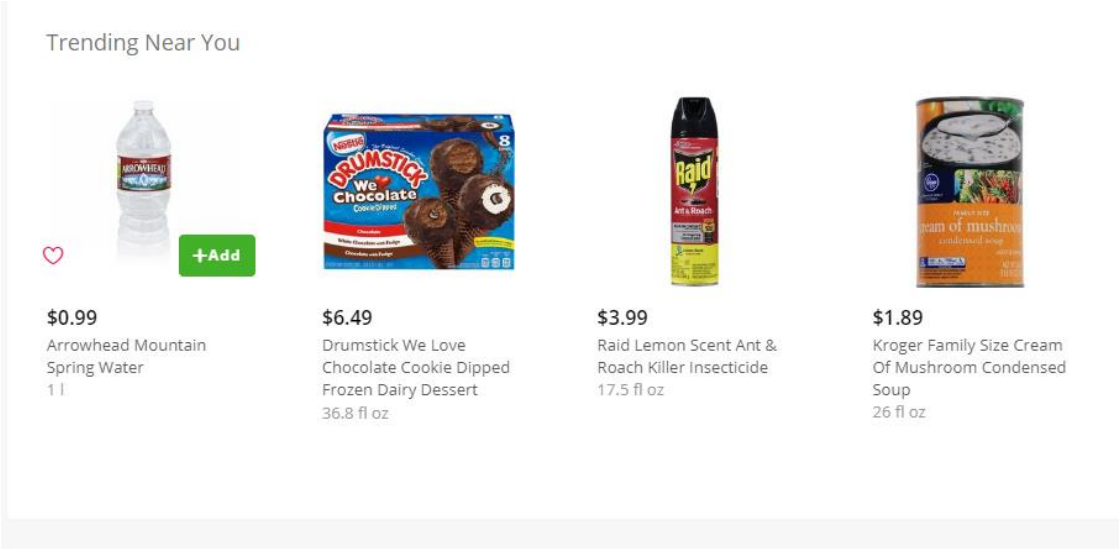
Amazon's display of grocery items available on "PrimeNow". Customers are given opportunities to "add" an item to the cart, without simultaneously specifying quantity:



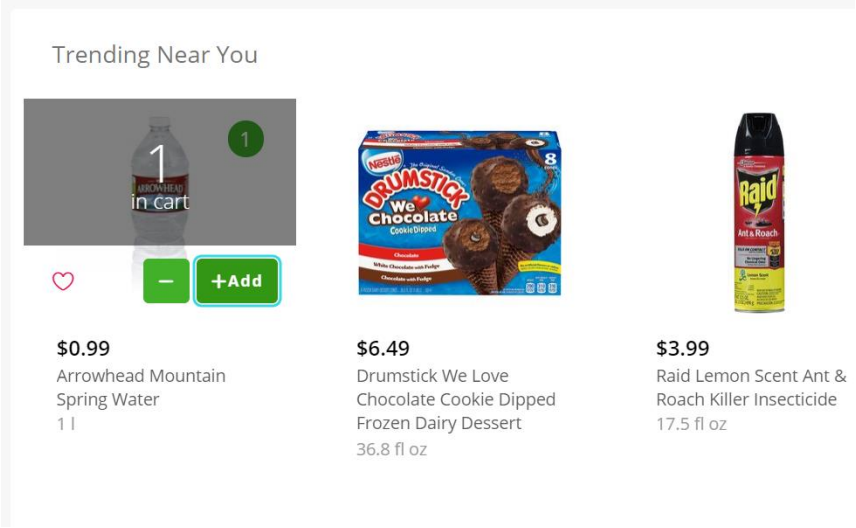
After a user clicks the "Add" button next to a product offer, he/she is given an opportunity to specify/modify the quantity using a drop-down menu:



Instacart's interface options appear upon hovering over a focal product. As with PrimeNow, customers here are only given opportunities to "+Add" an item to the cart, without simultaneously specifying the purchase quantity:



After a user clicks the "+Add" button, he/she is given an opportunity to specify/modify the particular quantity by clicking the add button again (or clicking the minus button to adjust downward):



APPENDIX B: LINEAR PROBABILITY MODELS FOR FIELD EXPERIMENT

Linear Probability Models

	Focal Product Category (A)			*Boundary Condition Category (B)*		
	(1)	(2)	(3)	(1)	(2)	(3)
Sequential (vs. Integrated) Format	.002**	.002**	.002**	-.002	-.002	-.002
	(.0006)	(.0006)	(.0006)	(.001)	(.001)	(.001)
First-Observed Past Visits		-0.00002	-0.00002*		-0.0001***	-0.0001***
		(.00001)	(.00001)		(.00003)	(.00003)
Constant	.01***	.01***	.007	.08***	.08***	.07***
	(.0004)	(.0004)	(.006)	(.0009)	(.0009)	(.01)
Geolocation Fixed Effects			Yes			Yes
Date Fixed Effects			Yes			Yes
Adjusted R^2	.00004	.00004	.005	3.9e-6	.0002	.02

Note: Ns are omitted at the request of the company. Standard errors in parentheses. Selling Format = 1 for quantity-sequential and 0 for quantity-integrated. Geolocation fixed effects include country and US state. 10% of observations have unobserved geolocation; models 3 include these observations as a separate "unobserved" category.

APPENDIX C: LAB EXPERIMENT MATERIALS, SUPPLEMENTAL DETAILS, AND ADDITIONAL ANALYSES

Experiment 1

Exploratory Analysis: Only Coke Buyers

As mentioned in our preregistration, we also examine only the participants who answered yes to "Do you sometimes buy Coca-Cola?" (70.53% of participants; difference between conditions: $\chi^2(1, N = 397) = 1.39$, p = .24). These results are consistent with the primary results:

Customers' Clicking Decisions in Each Condition, Among Participants Who Sometimes Buy Coke

Action	*Integrated*	*Sequential*	*Difference*
Add Coca Cola to order	**31.94%**	**16.30%**	**$\chi^2(1, N = 279) = 9.26$, $p = .002$**
"No, Go to Checkout"	54.86%	68.15%	$\chi^2(1, N = 279) = 5.18$, $p = .022$
"X" button	13.19%	15.56%	$\chi^2(1, N = 279) = .32$, $p = .574$

Among these individuals: Conditional on choosing to purchase, participants in the two formats selected similar quantities (sequential: $M = 1.64$, $SD = .66$ vs. integrated: $M = 1.59$, $SD = .54$; $t(66) = -.33$, p = .744). When including non-purchases (i.e., those purchasing a quantity of 0) and thus comparing average quantities sold per respondent, the integrated format "sold" about double the number of bottles. The average integrated participant "bought" 0.50 bottles ($SD = .80$), while the average sequential participant "bought" 0.27 bottles ($SD = .66$, $t(278) = 2.69$, $p = .008$).

Experiment 2

Materials: Main Choice Experiment

Participants saw the following information prior to making a choice:

Materials: Scoring Phase

Prior to beginning the study, these to-be coding participants completed a bot check to weed out any bot-like responses attempting to access the study. Participants answered, "Thank you for participating in this survey. We appreciate your attention. To get started, in the space below, please write the current month we are in. (Just type the one word.)" Individuals who answered incorrectly were exited out of the study. Those who answered correctly were invited to begin the study.

Participants saw this brief explanation of the buying decision process:

> Marketing research suggests that people often make purchase decisions in stages. For example, imagine someone who is deciding whether to purchase chocolates.
>
> In the early stages of the decision process, this person would tend to focus on general concerns, asking herself questions such as:
>
> - Do I have a need in this category? (e.g., *Do I need/ want chocolates?*)
> - Do I have enough information to make a final decision? Or, should I keep doing research, finding out what other options might exist?
>
> After these matters are settled, she will turn to later stages of the process. This typically involves evaluating the different choice alternatives, weighing their pros and cons and comparing them to each other. In this later evaluation stage, she might:
>
> - compare different chocolate brands based on their relative appeal,
> - compare different unit sizes to get,
> - or compare different flavors,
> - all while also considering the option not to buy anything at all.
>
> Your task today will be to read through other people's explanations of their thought processes, then determine if they are expressing considerations that would arise:
>
> 1. **early in the process** (focusing on concerns such as *whether there is a need,* or *whether there is enough information or if more searching is needed*), or
> 2. **later in the process** (focusing on *evaluating the specific choice options and comparing them* to each other).

They answered a few questions to ensure their comprehension before beginning the scoring.

Just to make sure the instructions are clear, please take a look at the participants' explanations below.
Then, indicate if the participant seems to be listing considerations in ***early*** or ***late*** stages of the decision-making process.

If it is helpful, the definitions of early versus late stages are printed again below.

In the early stages of the decision process, one tends to focus on general concerns, asking questions such as:

- Do I have a need in this category? (e.g., *Do I need/ want chocolates?*)
- Do I have enough information to make a final decision? Or, should I keep doing research, finding out what other options might exist?

After these matters are settled, one will turn to later stages of the process. This typically involves evaluating the different choice alternatives, weighing their pros and cons and comparing them to each other. In this later evaluation stage, one might:

- compare different chocolate brands based on their relative appeal,
- compare different unit sizes to get,
- or compare different flavors,
- all while also considering the option not to buy anything at all.

Participant Explanation: *"I don't really like chocolates."*

Is this participant more likely expressing considerations that arise **early** or **late** in the decision-making process?

Early in the process (focusing on concerns such as whether there is a need, or whether there is enough info or if more searching is needed)	**Later in the process** (focusing on evaluating the specific choice options and comparing them to each other, including the non-purchase option)	It's too hard to tell

---

Participant Explanation: *"This product is fairly expensive, but seems to be a good value for the price. Although it is not the brand I usually buy, I still think it is a good deal to buy some of these chocolates rather than just taking the money. I need the money but would really enjoy some chocolate."*

Is this participant more likely expressing considerations that arise **early** or **late** in the decision-making process?

Early in the process (focusing on concerns such as whether there is a need, or whether there is enough info or if more searching is needed)	**Later in the process** (focusing on evaluating the specific choice options and comparing them to each other, including the non-purchase option)	It's too hard to tell

The explanation: "I don't really like chocolates" is likely to be **EARLY** in the process.

This is because the response seems to focus on whether there is a **general desire** or need in the product category, rather than focusing on weighing pros and cons of specific choice options.

The explanation: "This product is fairly expensive, but seems to be a good value for the price. Although it is not the brand I usually buy, I still think it is a good deal to buy some of these chocolates rather than just taking the money. I need the money but would really enjoy some chocolate" is likely to be **LATER** in the process.

This is because the response seems to weigh the pros and cons and compare their options (including the option not to purchase), and appears to be evaluating the tradeoffs.

Your task will be to review participants' responses to a purchasing situation, and code whether the response reflects considerations from *early* vs. *late* in the decision process.

On the next page, we'll show you the purchasing situation.

RA Coding for Nonsense

RAs were given these instructions: "Mark answers that are total nonsense (something totally unrelated to the question prompt, or really bad English that you can't understand, or not really an answer to the question)." As mentioned, we excluded responses that at least 2 RAs marked as nonsense from scoring:

# RAs that marked this response as nonsense	0	1	2	3	4
# of responses meeting this criterion	325	17	5	7	20

Robustness Checks

Results with Different Exclusion Rules

Dropping responses that any RA deemed nonsense (remaining $N = 325$)

Difference in average scores between formats:

When treating "too hard to tell" as midpoint: QI = .453 vs. QS = .387, $t(323) = 2.97$, $p = .003$

When excluding "too hard to tell": QI = .451 vs. QS = .383, $t(323) = 2.99$, $p = .003$

Difference in average scores between purchasers and non-purchasers:

When treating "too hard to tell" as midpoint: Non-purchasers = .353 vs. purchasers = .591, $t(323) = -11.39$, $p < .001$

When excluding "too hard to tell": Non-purchasers = .349 vs. purchasers = .594, $t(323) = -11.22$, $p < .001$

Mediation analysis:

When treating "too hard to tell" as midpoint: $b = .07$, 95% CI [.02, .12]

When excluding "too hard to tell": $b = .07$, 95% CI [.0, .12]

Including non-fluent scorers (so that scoring $N = 570$)

Difference in average scores between formats:

When treating "too hard to tell" as midpoint: QI = .452 vs. QS = .397, $t(340) = 2.62$, $p = .009$

When excluding "too hard to tell": QI = .449 vs. QS = .393, $t(340) = 2.50$, $p = .013$

Difference in average scores between purchasers and non-purchasers:

When treating "too hard to tell" as midpoint: Non-purchasers = .359 vs. purchasers = .582, $t(340) = -11.23$, $p < .001$

When excluding "too hard to tell": Non-purchasers = .353 vs. purchasers = .584, $t(340) = -10.87$, $p < .001$

Mediation analysis:

When treating "too hard to tell" as midpoint: $b = .06$, 95% CI [.01, .11]

When excluding "too hard to tell": $b = .05$, 95% CI [.01, .10]

Other Ways of Analyzing Scores

Treating each score as an observation in mixed-effect models

Recall that each of the original explanations was rated by 28-35 individuals, who, in turn, each provided 20 such ratings. To ensure robustness, we report an additional treatment of the data where each explanation-score is its own observation (for a total of 10,960 observations). We conducted a linear mixed-effects model predicting these individual scores from the selling format, with random intercepts for the explanation and for the scorer. P-values and degrees of freedom are approximated using the Satterthwaite method as implemented in the lmerTest R package (Kuznetsova and Christensen 2017). This analysis yielded consistent results, such that participants in the sequential condition gave explanations coded as earlier in the buying process than participants in the integrated condition ($b_{Sequential} = -.05$, $t(339.68) = -2.47$, $p = .014$). A model excluding the random intercepts for explanation yields convergent results ($b_{QS} = -.05$, $t(10685.30) = -6.10$, $p < .001$). For robustness, we also repeated the analyses when treating the "too hard to tell" scores as N/A and excluding them from analysis. That method yields consistent results, both in the model with random intercepts for explanation and rater ($b_{QS} = -.05$, $t(338.58) = -2.37$, $p = .019$) and in the model with only random intercept for rater ($b_{QS} = -.06$, $t(10066.02) = -5.95$, $p < .001$).

Relaxing the assumption that these responses should exist at exactly the halfway point and instead endogenously determining cutoffs

To further ensure robustness, we also conducted an ordered logistic regression (cumulative link mixed model, implemented with the ordinal R package; Christensen 2019) to relax the assumption that the "too hard to tell" responses should exist at the midpoint (0.5 on a scale from 0 to 1). This method instead endogenously determines cutoffs between the three levels of scores ("early," "too hard to tell," and "late"). This analysis yielded consistent results, finding that the sequential format responses were again scored as expressing considerations from earlier stages more so than the integrated format (b = -.28, $SE = .11$, $z = -2.50$, $p = .013$).

Replication of Experiment 2, Without Participants Making a Choice

Both parts of this replication were preregistered: first is the explanation collection (https://aspredicted.org/Z4T_QXV), and second is the coding of these explanations (https://aspredicted.org/VHP_52F). This experiment is not included in the pooled analysis because it does not include any purchasing decisions.

Explanation Collection Phase

We posted the survey to Prolific Academic for 400 participants and excluded individuals who incorrectly answered our attention check (after exclusions, N = 345, 40.3% male, $M_{age} = 31.0$ years). Participants were assigned to one of two conditions (selling format: sequential vs. integrated) in a between-subjects design. All participants were asked to imagine being presented with a purchase opportunity. They viewed a screenshot of the Lindt chocolate choice participants made in Experiment 2. Then, they read, "Imagine you are asked to make the following choice:" and saw a screenshot of the choice question ("What would you like to do?") with choice options corresponding to their condition. In

the sequential format, the options were: "Not buy any truffles" or "Buy truffles." In the integrated format, the options were, "Not buy any truffles," "Buy 1 bag of truffles," "Buy 2 bags of truffles," "Buy 3 bags of truffles," and "Buy 4 bags of truffles." Importantly, participants could not click on any options, and were not making an actual choice.

Instead, all participants answered, "Imagine you have been presented with this choice, and are thinking about what to do. What is the first question you would ask yourself when thinking over this choice?" Finally, participants answered an attention check (about which product they had seen) and provided demographic information.

Removing Nonsense Responding

As in Experiment 2, to avoid drawing conclusions from low-quality responses, we had independent hypothesis- and condition-blind research assistants (RAs) examine the responses and mark "answers that are total nonsense (something totally unrelated to the question prompt, or really bad English that you can't understand, or not really an answer to the question)." Two RAs marked these responses, and any explanation that both RAs marked as total nonsense was excluded, as preregistered (1 response was excluded).

Consideration Scoring Phase

We posted the scoring survey to Prolific for 550 participants (after preregistered fluency exclusions, N = 522, 31.6% male, M_{age} = 32.0 years). Prior to beginning the study, participants completed a bot check to weed out any bot-like responses attempting to access the study. Participants answered, "Thank you for participating in this survey. We appreciate your attention. To get started, in the space below, please write the current month we are in. (Just type the one word.)" Individuals who answered incorrectly were exited out of the study. Those who answered correctly were invited to begin the study.

These condition- and hypothesis-blind scorers were guided through the same information and explanation as the coders in Experiment 2 (they read an overview of the buying decision process and its different stages, including the distinction between concerns that arise early versus later in the funnel). They then viewed the chocolate truffles purchasing situation that participants from the consideration collection phase had seen. They read, "Participants were asked, 'What is the first question you would ask yourself when thinking over this choice?'" Next, they scored 20 randomly selected consideration responses. For each one, they answered, "Is this participant more likely expressing considerations that arise early or late in the decision-making process?" with three choice options: "Early in the process (focusing on concerns such as whether there is a need, or whether there is enough info or if more searching is needed)", which we scored as 0; "Later in the process (focusing on evaluating the specific choice options and comparing them to each other, including the non-purchase option)", which we scored as 1; and "It's too hard to tell", which we scored as 0.5 (as preregistered, and just as in Experiment 2). After coding, these participants answered three questions assessing their English fluency (the same as in Experiment 2) and reported demographic information.

Results and Robustness Checks

Each explanation was scored by between 26 and 32 scorers. We predicted and found that participants would receive a lower average score in the sequential (M = .354, SD =.22) than in the integrated condition (M = .407, SD =.22, $t(342) = 2.23$, p = .026). That is, the first question participants asked themselves when facing the sequential format was earlier in the buying decision process than the first question participants asked themselves when facing the integrated format. This conceptually replicates Experiment 2.

We also consider other treatments of the data, as in Experiment 2 (and as mentioned as exploratory analyses in our preregistration), for robustness:

- This result holds when treating the "too hard to tell" responses as N/A and hence excluding them from analyses (integrated: M = .403 vs. sequential: M = .348, $t(342) = 2.22$, p = .027).

- This result holds when controlling for the length of the explanation (b = -.05, $t(341)$ = -2.23, p = .027).
- This result holds when analyzing the data including all scorers, including those who fail the fluency checks (integrated: M = .409, SD = .22, vs. sequential: M = .355, SD = .21, $t(342)$ = 2.31, p = .021).
- This result holds when treating each individual explanation-score as an observation in mixed-effect models, predicting these individual scores from the initial condition, with random intercepts for the explanation and for the scorer ($b_{Sequential}$ = -.05, $t(341.64) = -2.20$, p = .028). The result is similar without the intercept for explanation ($b_{Sequential}$ = -.05, $t(10238.56) = -5.85$, $p < .001$) or when excluding the "too hard to tell" responses ($b_{Sequential}$ = -.06, $t(342.30) = -2.21$, p = .028).
- This result holds when conducting an ordered logistic regression (cumulative link mixed model, Christensen 2019) to relax the assumption that the "too hard to tell" responses should exist at the midpoint ($b_{Sequential}$ = -.29, z = 2.17, p = .030).

Experiment 3

Prior to beginning the study, participants completed a bot check to weed out any bot-like responses attempting to access the study. Participants answered, "Thank you for accepting this HIT. Just to get started, please type the current year as a 4 digit number." Individuals who answered incorrectly were exited out of the study. Those who answered correctly were invited to begin the study.

APPENDIX D: DETAILS ON ALL POOLED ANALYSIS EXPERIMENTS

Methods

All of our lab experiments designed to test the purchasing difference between formats follow a similar structure. Details of all experiments are in the table on the following page. Column 2 lists the number of participants; unless mentioned otherwise, participants were Mechanical Turk workers. Participants were assigned to condition in a between-subjects design; Column 3 outlines the factorial design of each experiment. All participants either imagined being in a shopping scenario or entered an actual incentive-compatible purchase situation. Column 4 presents the scenario or purchase opportunity description. Then, to provide greater context, all participants viewed an image of a pop-up advertisement, a sign advertising a sale, or an image of the product available for purchase. The product and its price are in Columns 5 and 6. Column 7 presents the quantity limit (i.e., the maximum number of units that participants they could purchase), and notes whether or not this limit was described explicitly (e.g., a statement specifying "The maximum purchase quantity is X" or "you can buy up to X"). All participants then made a purchase decision by selecting a choice option, according to their selling format. Columns 8 and 9 present these questions and choice options.

Several experiments were designed with a secondary goal beyond simply demonstrating the effect in a new setting. Accordingly, we often orthogonally layered an additional manipulation on the design. In some cases, the results of this additional manipulation yielded meaningful insights about potential psychological mechanisms; for these experiments, we provide a concise description of the methods and results in Appendix F.

Methods Details for Lab Experiments

(1) Study	(2) N	(3) Design	(4) Choice Description	(5) Product	(6) Price	(7) Quantity Limit (Explicit?)	(8) Question(s)	(9) Choice Options (for QS, this represents the first stage)
1	397	2 (selling format: QS vs. QI)	"Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up. What would you click? Please select what you would click next in this situation. Whenever you click an area of the screen, it will highlight in green. You can click it again to un-highlight that area."	Coca-Cola	$1.99	3 (No)	"Would you like to add the following item(s) to your order?"	QS: "Yes, add to order," "No, go to checkout," X button. QI: "Add 1 to order," "Add 2 to order," "Add 3 to order," "No, go to checkout," X button.
2	342 (only ps who were scored)	2 (selling format: QS vs. QI)	"If you are selected, you will receive a $10 bonus. If you'd like, you can use this money to purchase bags (6 oz. each) of Lindt milk chocolate truffles for $2.50 per bag. You can buy up to 4 bags. Any money you do not spend on truffles will be given to you as a bonus."	Lindt milk chocolate truffles	$2.50	4 (Yes)	"What would you like to do?"	QS: "Not buy any truffles" and "Buy truffles" QI: "Not buy any truffles," "Buy 1 bag of truffles," "Buy 2 bags of truffles," "Buy 3 bags of truffles," and "Buy 4 bags of truffles"
3	399	2 (selling format: QS vs. QI)	"Imagine you are shopping on Amazon's website when you see that one of the body washes you like is on sale. You already have a few different body washes at home, but you take a look. Amazon allows you to purchase the same products from multiple sellers. There are 2 sellers who sell this body wash: Beauty Care and For Your Beauty. Both have 100% positive lifetime customer ratings. This body wash normally retails for $5.00 a bottle, but is currently offered at a discounted price of $3.99. You can buy up to 2 bottles."	Body wash	$3.99	2 (Yes)	"What would you do?"	QS: "Not make a purchase," "Make a purchase from Beauty Care," "Make a purchase from For Your Beauty" (counterbalanced). QI: "Not make a purchase," "Buy 1 bottle from Beauty Care," "Buy 2 bottles from For Your Beauty" (counterbalanced)
AA	801	2 (selling format: QS vs. QI)	"If you are selected, you will receive a $4 bonus. If you'd like, you can use this some of this money to purchase 6 oz. of Lindt milk chocolate truffles for $2.50 per bag. You can buy up to 1 bag. Any money you do not spend on truffles will be given to you as a bonus."	Lindt milk chocolate truffles	$2.50	1 (Yes)	QS: "Would you like to buy truffles with your bonus money?" QI: "How many truffles would you like to buy with your bonus money?"	QS: "No" and "Yes" QI: "None" and "1 bag"
AB	403	2 (selling format: QS vs. QI)	"If you are selected, you will receive a $20 bonus. If you'd like, you can use this money to purchase Lemome notebooks (pictured below) for $6 per notebook (current price on Amazon: $9). You can buy up to 3 notebooks. Any money you do not spend on notebooks will be given to you as a bonus."	Small notebooks	$6	3 (Yes)	"What would you like to do?"	QS: "Not buy any notebooks" and "Buy" QI: "Not buy any notebooks," "Buy 1 notebook," … "Buy 3 notebooks"
AC	800	2 (selling format: QS vs. QI)	"If you are selected, you will receive a $10 bonus. If you'd like, you can use this money to purchase bags (6 oz. each) of Lindt milk chocolate truffles	Lindt milk chocolate truffles	$2.50	4 (Yes)	"What would you like to do?"	QS: "Not buy any truffles" and "Buy truffles"

(1) Study	(2) N	(3) Design	(4) Choice Description	(5) Product	(6) Price	(7) Quantity Limit (Explicit?)	(8) Question(s)	(9) Choice Options (for QS, this represents the first stage)
			for $2.50 per bag. You can buy up to 4 bags. Any money you do not spend on truffles will be given to you as a bonus."					QI: "Not buy any truffles," "Buy 1 bag of truffles," … "Buy 4 bags of truffles"
AD	655 (lab under-grads)	2 (selling format: QS vs. QI) X 2 (prime: lack of closure vs. high sense of closure)	"At the end of the lab session today, you'll receive $1 in quarters. This money is yours to keep. Or, if you'd like, you can use this money to purchase packs of Extra Spearmint gum (15 sticks) for 50 cents per pack."	Extra spearmint gum	$0.50	2 (No)	"What would you like to do?"	QS: "Make a purchase" and "Not make a purchase" QI: "Purchase 1 pack," "Purchase 2 packs," and "Not make a purchase"
AE	867 in 3 conditions; 582 in main 2	3 (selling format: QS, QI, articulated binary)	"If you are selected, you will receive a $20 bonus. If you'd like, you can use this money to purchase Lemome notebooks (pictured below) for $6 per notebook (current price on Amazon: $9). You can buy up to 3 notebooks. Any money you do not spend on notebooks will be given to you as a bonus."	Small notebooks	$6	3 (Yes)	"What would you like to do?"	QS: "Not buy any notebooks" and "Buy" QI: "Not buy any notebooks," "Buy 1 notebook," … "Buy 3 notebooks". Articulated: "Not buy any notebooks," "Buy 1, 2, or 3 notebooks"
AF	400	2 (selling format: QS vs. QI)	"Imagine you are waiting in line to check out at a store. As you're waiting, you see the following sign."	Extra spearmint gum	$0.88	2 (Yes)	"Please indicate what you would do in this situation."	QS condition, there were 3 choice options: "Not buy gum," "Buy gum," "Buy gum with excitement!" QI: "Not buy gum," "Buy 1 pack of gum," "Buy 2 packs of gum with excitement!"
AG	433 (lab under-grads)	2 (selling format: QS vs. QI)	"Please imagine you are actively navigating this website, and click the next thing that you would click in this situation."	Avocados	$0.99	3 (No)	N/A	QS: "+Add", Arrow button, heart icon, Product category. QI: "+ Add 1," "+ Add 2," "+ Add 3," arrow button, heart icon, Product category.
A	593	2 (selling format: QS vs. QI)	"As part of your participation today, you will receive a 50 cent bonus. You can use any amount of this money to purchase raffle entry tickets toward winning $200…"	Raffle tickets	$.05	10 (No)	QS: "Please select your preference below." QI: "How many raffle entry tickets would you like to purchase toward winning the $200?"	QS: "Yes: I would like to purchase some tickets" and "No: I would not like to purchase any tickets" QI: 0… 10 (sliding scale)
B	790	2 (selling format: QS vs. QI) X 2 (product:	"Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up."	2-Liter bottles of Coca-Cola or "soda" (label only included the word SODA)	$2.49	5 (No)	QS: "Would you like to add any 2 Liter bottles of Coke (soda) to your order?" QI: "How many 2 Liter bottles of Coke (soda) would you like to add to your order?"	QS: "Yes" and "No" QI; 0, 1, …5 (sliding scale)

(1) Study	(2) N	(3) Design	(4) Choice Description	(5) Product	(6) Price	(7) Quantity Limit (Explicit?)	(8) Question(s)	(9) Choice Options (for QS, this represents the first stage)
		Coke vs. "soda")[14]						
C	773	2 (selling format: QS vs. QI) X 2 (product: Coke vs. randomly chosen soda)[1]	"Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up."	2-Liter bottles of Coca-Cola or a randomly chosen soda (Coke, Pepsi, Sprite, Dr. Pepper, or Mtn. Dew)	$1.99	5 (No)	QS: "Would you like to add any 2 Liter bottles of Coke (soda) to your order?" QI: "How many 2 Liter bottles of Coke (soda) would you like to add to your order?"	QS: "Yes" and "No" QI; 0, 1, …5 (sliding scale)
D	1175	2 (selling format: QS vs. QI) X 2 (commitment: normal vs. low vs. normal + maximum quantity info)[15]	"Imagine you are online shopping at home. After some browsing, the following box pops up."	Scented candles	$6.99	5 (No [Yes in "normal + maximum quantity info" condition])	QS: "Would you like to purchase any candles?" QI: 'How many candles would you like to purchase?" Low commitment: above + "You can always change your mind later before purchasing."	QS: "Yes" and "No" QI; 0, 1, …5 (sliding scale)
E	394	2 (selling format: QS vs. QI) X 2 (commitment: normal vs. low)[2]	"Imagine you are online shopping at home. After some browsing, the following box pops up."	Scented candles	$6.99	5 (Yes)	QS-normal: "Would you like to purchase any candles?" QI-normal: "How many candles would you like to purchase?" QS-low: above, plus "You can always change your mind later before purchasing." QI-low: above, plus "You can always change your mind later before purchasing."	QS: "Yes" and "No" QI: 0, 1, … 5 (sliding scale)
F	261 (lab under-grads)	2 (selling format: QS vs. QI)	Participants learned they would receive $2 in quarters and could use any amount of this money to purchase raffle tickets toward winning a $200 Amazon gift card.	Raffle tickets	$.25	8 (No)	"Place a check mark on the line next to your choice."	QS: "Yes: I would like to purchase some tickets" and "No: I would not like to purchase any tickets" QI: "0 tickets," "1 ticket," … "8 tickets"
G	402	2 (selling format: QS vs. QI)[*G] X 2 (recipient:	Self: "Imagine you are online shopping for a razor, and have chosen one that comes with two blades." Other: "Imagine a wealthy gentleman has decided to never shop online again, but to outsource his	4-pack of refill razor blades	$9.99	5 (Yes)	QS: "Do you want to buy any 4-packs of blades?"	QS: "no" and "yes" QI: 0, 1, … 5 (sliding scale)

[14] These designs were used to determine whether the clarity with which the product is described would moderate the effect; in general, it did not.

[15] These designs were used to determine whether the extent to which the purchase feels like a commitment would moderate the effect. In general, the effect was usually directionally but not significantly smaller when the purchase was designed to seem "low commitment" rather than "high commitment."

(1) Study	(2) N	(3) Design	(4) Choice Description	(5) Product	(6) Price	(7) Quantity Limit (Explicit?)	(8) Question(s)	(9) Choice Options (for QS, this represents the first stage)
		self vs. other)[16]	shopping to others. Imagine you were asked to shop online for a razor for him, and have chosen one that comes with two blades." Both: "After adding the item to your shopping cart, a screen pops up advertising additional "blades for purchase."				QI: "How many 4-packs of blades do you want to buy?"	
H	394	2 (selling format: QS vs. QI) *H X 2 (recipient: self vs. other)[3]	Self: "Imagine you are online shopping for some new bath towels." Other: "Imagine a wealthy woman has decided to never shop online again, but to outsource her shopping to others. Imagine you were asked to shop online for bath towels for her." Both: "After choosing towels, the following box pops up."	Bar soap	$2.99	5 (Yes)	QS: "Do you want to buy [her] any bars of soap?" QI: "How many bars of soap do you want to buy [her]?"	QS: "no" and "yes" QI: 0, 1, … 5 (sliding scale)
I	399	2 (selling format: QS vs. QI) X 2 (deferral: not mentioned vs. available)	"Imagine you are online shopping for some new bath towels. After choosing towels, the following box pops up."	Bar soap	$2.99	5 (Yes)	QS: "Do you want to buy any bars of soap?" QI: "How many bars of soap do you want to buy?"	QS: "no" and "yes" [and "I want to decide later" in deferral available condition] QI: "0," "1," … "5" [and "I want to decide later" in deferral available condition]
J	396	2 (selling format: QS vs. QI) X 2 (commitment: normal vs. no commitment) [2]	Both: "Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up." No commitment: "…No Commitment Ordering. If you'd like, our door-to-door delivery specialist can bring up to 5 bottles of Coke along with your order. You can always change your mind and choose not to purchase any bottles."	2-Liter Coca-Cola bottles	$2.49	5 (Yes)	QS normal: "Would you like to add any 2 Liter bottles of Coke to your order?" QI normal: "How many 2 Liter bottles of Coke would you like to add to your order?" QS no commitment: "How many 2 Liter bottles of Coke would you like the delivery specialist to bring?" QI no commitment: "Would you like the delivery specialist to bring any 2 Liter bottles of Coke?"	QS: "Yes" and "No" QI: 0, 1… 5 (sliding scale)
K	395 *K	2 (selling format: QS vs. QI) X 2 (context: normal vs.	Normal: "Imagine you came across this item." Next to Other Products: "Imagine you came across this set of items."	Hand soaps and ballpoint pens (participants made 2 decisions)	Soap: $.99 Pen: $3.99	3 (Yes)	QS: "Would you like to add any bottles of the soap [pens] outlined in yellow to your order?" QI: "How many bottles of the soap [pens] outlined in	QS: "Yes" and "No" QI: 0, 1,…3 (sliding scale)

[16] These designs were used to determine whether participants would be differently affected by the selling format when choosing for themselves versus others. In general, they were not.

(1) Study	(2) N	(3) Design	(4) Choice Description	(5) Product	(6) Price	(7) Quantity Limit (Explicit?)	(8) Question(s)	(9) Choice Options (for QS, this represents the first stage)
		next to other products)[17]					yellow would you like to add to your order?"	
L	401	2 (selling format: QS vs. QI)*L X 2 (color: normal vs. G&R)[18]	"Imagine you are waiting in line to check out at a store. As you're waiting, you see the following sign."	Ferrero Rochers	$.25	5 (Yes)	QS: "Do you want to buy any Ferrero Rocher chocolates?" QI: "How many Ferrero Rocher chocolates do you want to buy?"	QS: "No" (printed in red in G&R condition) and "Yes" (printed in green in G&R condition) QI: "0" (printed in red in G&R condition), "1," … "5" (all printed in red in G&R condition)
M	605	2 (selling format: QS vs. QI) X 3 (commitment prime: none vs. high vs. low)[2]	High, before scenario: "Please recall a time where you have shown great commitment, follow-through, and strength of character." Low, before scenario: "Please recall a time where you have shown a lack of commitment and follow-through: a time when you wiggled back and forth on a decision." All, scenario: "Imagine you are waiting in line to check out at a store. As you're waiting, you see the following sign."	Extra spearmint gum	$.99	5 (Yes)	"Please indicate what you would do in this situation."	QS: "Not buy any" and "Buy" QI: "Buy 0 packs," "Buy 1 pack," … "Buy 5 packs"
N	1003	2 (selling format: QS vs. QI) X 2 (timeframe: short vs. long)[2]	"Imagine you are visiting a bank to make a deposit. You walk in and wait in the lobby area to meet a teller. You look around and read a few of the posters. You notice one poster with the following offer."	Short: 1-month CD (2.88% APY) Long: 25-year CD (2.88% APY)	$200	5 (Yes)	QS: "Would you open $200 one-month [25-year] CDs?" QI: "How many $200 one-month [25-year] CDs would you open?"	QS: "No" and "Yes" QI: "0," "1," … "5"
O	811	2 (selling format: QS vs. QI) X 2 (time pressure: normal vs. pressure)[19]	Time Pressure: "We would like you to work as quickly as you can. The top 10 fastest responders on the next page will each earn a 50-cent bonus. Therefore, on the next page, please work as quickly as you can, while still reading the scenario instructions." Both, scenario: "Imagine you are waiting in line to check out at a store. As you're waiting, you see the following sign."	Ferrero Rochers	$.25	5 (Yes)	"Please indicate what you would do in this situation."	QS: "Not buy any" and "Buy" QI: "Not buy any," "Buy 1," … "Buy 5"
P	806	2 (selling format: QS vs. QI) X 2 (time pressure:	Time Pressure: "We would like you to work as quickly as you can. The top 10 fastest responders on the next page will each earn a 50-cent bonus. Therefore, on the next page, please work as	2-Liter Coca-Cola bottles	$1.49	5 (Yes)	"Please indicate what you would do in this situation."	QS: "Not buy any" and "Buy" QI: "Not buy any," "Buy 1 bottle," … "Buy 5 bottles"

[17] This design was used to determine whether presenting a focal item in isolation vs. in a set of options would moderate the effect.; it did not.

[18] This design was used to determine if presenting the non-purchase option in red and the purchase option(s) in green (thus, highlighting the difference between them) would influence the effect; it did not.

[19] This design was used to determine whether time pressure would moderate the effect. In Experiment O, time pressure amplified the effect, but this pattern did not replicate in a second experiment (Experiment P).

(1) Study	(2) N	(3) Design	(4) Choice Description	(5) Product	(6) Price	(7) Quantity Limit (Explicit?)	(8) Question(s)	(9) Choice Options (for QS, this represents the first stage)
		normal vs. pressure)[6]	quickly as you can, while still reading the scenario instructions." Both, scenario: "Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up."					
Q	399	2 (selling format: QS vs. QI) X 2 (concreteness: normal vs. with image)[20]	"Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up."	2-Liter Coca-Cola bottles	$2.49	3 (Yes)	"Please indicate what you would do in this situation."	QS: "Not buy any" and "Buy" (in With Image Condition, included image of coke bottle) QI: "Not buy any," "Buy 1 bottle," … "Buy 5 bottles" (in With Image Condition, included image of coke bottle with each purchase option)
R	808	2 (selling format: QS vs. QI) X 4 (maximum purchase quantity: 1, 3, 5, or 10)	"Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up."	2-Liter Coca-Cola bottles	$1.49	1, 3, 5, or 10 according to condition (Yes)	QS: "Would you like to add any 2 Liter bottles of Coke to your order?" QI: "How many 2 Liter bottles of Coke would you like to add to your order?"	QS: "Yes" and "No" QI: "0" and "1" (when max = 1); "0," "1," "2," and "3" (when max = 3); etc.
S	201 (301 *S)	3 (selling format: QS vs. QI "buy 0" vs. QI "not buy any")[21]	"Imagine you are waiting in line to check out at a store. As you're waiting, you see the following sign."	Extra spearmint gum	$.99	5 (Yes)	"Please indicate what you would do in this situation."	QS: "Not buy any" and "Buy" QI: "Buy 0" (or "Not buy any"), "buy 1 pack," … "Buy 5 packs"
T	266 (lab under-grads)	2 (selling format: QS vs. QI)	"Imagine you are online shopping at home. After some browsing, the following box pops up."	Scented candles	$6.99	3 (Yes)	QS: "Would you like to buy any candles?" QI: "How many candles would you like to buy?"	QS: "Yes" and "No" QI: 0, 1, 2, 3 (sliding scale)
U	300	3 (selling format: QS vs. QS-same-page vs. QI)[22]	"Imagine you are online shopping at home. After some browsing, the following box pops up."	Scented candles	$6.99	3 (Yes)	"What would you like to do?" QS, second stage: "Please specify the quantity."	QS: "Not buy any" and "Buy" QI: "Not buy any", "Buy 1 candle", … "Buy 3 candles"
V	793	3 (selling format: QS vs. QI slider vs. QI drop-down) *V	"Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up."	2-Liter Coca-Cola bottles	$2.49	5 (No)	QS: "Would you like to add any 2 Liter bottles of Coke to your order?"	QS: "Yes" and "No" QI: "0," "1", …"5"

[20] This design was used to determine if making the product purchase seem more concrete (by including an image of the product in the choice option buttons) would moderate the effect; it did not.

[21] This design was used to assess whether the phrasing of the non-purchase option (as including vs. excluding the number "0") in QI would influence the effect; it did not.

[22] This design was used to assess whether the effect would still arise when the two QS decisions are presented on the same page; it did.

(1) Study	(2) N	(3) Design	(4) Choice Description	(5) Product	(6) Price	(7) Quantity Limit (Explicit?)	(8) Question(s)	(9) Choice Options (for QS, this represents the first stage)
							QI: "How many 2 Liter bottles of Coke would you like to add to your order?"	
W	1210	2 (selling format: QS vs. QI) X 3 (prime: implemental, deliberative, control)	"Imagine you are online shopping at home. After some browsing, the following box pops up."	Scented candles	$6.99	3 (Yes)	"What would you like to do?"	QS: "Not buy any" and "Buy" QI: "Not buy any," "Buy 1 candle," Buy 2 candles," "Buy 3 candles"
X	424	2 (selling format: QS vs. QI)	"If you are selected, you will receive a $10 bonus. If you'd like, you can use this money to purchase discounted $5 Starbucks gift cards, at a price of $3 each. The gift card(s) will be emailed to you. Any money you do not spend will be given to you as a bonus."	Starbucks gift cards ($5.00)	$3.00	3 (Yes)	"What would you like to do?"	QS: "Not buy any gift cards" and "Make a purchase" QI: "Not buy any gift cards," "Purchase 1 gift card," … "Purchase 3 gift cards"
Y	798	2 (selling format: QS vs. QI)	"Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up."	2-Liter Coca-Cola bottles	$2.49	3 (Yes)	"Please indicate what you would do in this situation."	QS: "Not buy any" and "Buy" QI: "Not buy any," "Buy 1 bottle," … "Buy 3 bottles"
Z	603	2 (selling format: QS vs. QI)	"Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up."	2-Liter Coca-Cola bottles	$2.49	3 (Yes)	"Please indicate what you would do in this situation."	QS: "Not buy any" and "Buy" QI: "Not buy any," "Buy 1 bottle," … "Buy 3 bottles"

Notes

QS = Quantity-Sequential; QI = Quantity-Integrated.

Although we targeted round numbers of participants (e.g., N = 600), at times, participants completed the survey without submitting for payment, resulting in additional responses (e.g., N = 603). Additionally, only participants who responded to the purchase solicitation question (the DV) were retained in each experiment. These two features explain why some sample sizes are not round numbers.

*K Note that all participants made choices about both products (soaps and pens), and therefore each participant appears twice in the pooled analysis.

*S Because this design was unbalanced in terms of selling format (there were twice the number of QI than QS participants), we chose to drop one of the QI conditions, retaining the ever-so-slightly more conservative condition (with slightly lower purchase; retaining "buy 0" and dropping "not buy any") for the pooled analysis.

*V The QI slider and QI drop-down conditions were combined into a single QI selling format for comparison in the pooled analysis.

Results for All Experiments

As mentioned previously, the prior table includes several experiments that had an additional, orthogonal manipulation beyond the manipulation of selling format. Accordingly, as described in the main text, we split each such experiment into separate smaller experiments, each with only two conditions: the sequential format or the integrated format. The following table presents the percentage of participants purchasing in each selling format, within each such split experiment. For each experiment that was split, each orthogonal cell is represented with a Roman numeral in parentheses (e.g., Experiment 2 (I)) that is described in Column 2. Columns 3 and 4 present the Ns in each selling format, and 5 and 6 present the percentage of participants purchasing in each selling format. Column 7 presents the χ^2 statistic analyzing the difference between the two selling formats and indicates the level of significance.

Percentage of Participants Purchasing in Each Experiment

Experiment	Experimental Condition	QS *N*	QI *N*	QS % Purchasing	QI % Purchasing	X^2 and Significance
1		199	198	11.56	23.23	9.42**
2		165	177	18.79	40.11	18.56***
3		198	201	64.65	74.13	4.23*
A		300	293	39.00	58.36	22.25***
AA		400	401	13.00	20.70	8.47**
AB		201	202	29.35	39.60	4.69*
AC		399	401	26.57	35.91	8.13**
AD (I)	Lack of closure	157	170	33.76	53.53	12.95***
AD (II)	High sense of closure	171	157	50.29	53.50	0.34
AE		294	288	26.53	39.24	10.65**
AF		201	199	51.24	63.32	5.96*
AG		217	216	30.88	43.06	6.89**
B (I)	Product = Coke	201	191	18.41	32.46	10.25**
B (II)	Product = soda	199	199	16.08	36.18	20.83***
C (I)	Product = Coke	201	186	27.36	44.09	11.81***
C (II)	Product = randomly chosen soda	198	188	26.77	43.62	12.04***
D (I)	Normal	195	194	23.08	45.36	21.46***
D (II)	Low commitment	200	195	29.00	48.72	16.18***
D (III)	Normal + maximum quantity	197	194	33.50	47.42	7.87**
E (I)	Normal	101	99	34.65	49.49	4.52*
E (II)	Low commitment	97	97	28.87	50.52	9.50**
F		133	128	45.11	65.62	11.10***
G (I)	Recipient: self	100	101	84.00	89.11	1.13
G (II)	Recipient: other	101	100	84.16	92.00	2.94^
H (I)	Recipient: self	97	99	28.87	55.56	14.30***
H (II)	Recipient: other	102	96	27.45	59.38	20.57***
I (I)	Deferral not mentioned	100	98	24.00	40.82	6.40*

I (II)	Deferral available	101	100	24.75	36.00	3.01^
J (I)	Normal	101	96	26.73	44.79	7.01**
J (II)	No commitment	100	98	26.00	50.00	12.12***
K (I)	Normal: pens	100	100	23.00	45.00	10.78**
K (II)	Next to other products: pens	93	102	48.39	64.71	5.28*
K (III)	Normal: soaps	100	100	55.00	70.00	4.80*
K (IV)	Next to other products: soaps	93	102	70.97	81.37	2.92^
L (I)	Normal	98	101	68.37	80.20	3.65^
L (II)	G&R	101	101	73.27	82.18	2.32
M (I)	No prime	114	110	47.37	55.45	1.47
M (II)	Prime high commitment	97	92	42.27	51.09	1.48
M (III)	Prime low commitment	86	105	45.35	52.38	0.94
N (I)	Short timeframe	251	252	55.38	80.16	35.37***
N (II)	Long timeframe	248	252	25.81	59.13	56.75***
O (I)	Normal	203	203	70.44	68.97	0.1
O (II)	Time pressure	203	202	66.01	82.18	13.78***
P (I)	Normal	202	202	45.05	53.47	2.86^
P (II)	Time pressure	202	200	55.94	61.00	1.06
Q (I)	Normal	100	99	21.00	36.36	5.75*
Q (II)	With image	100	100	14.00	24.00	3.25^
R (I)	Maximum quantity = 1	100	101	37.00	51.49	4.27*
R (II)	Maximum quantity = 3	100	101	38.00	59.41	9.22**
R (III)	Maximum quantity = 5	101	102	42.57	64.71	10.00**
R (IV)	Maximum quantity = 10	102	101	42.16	51.49	1.77
S		101	100	44.55	66.00	9.35**
T		132	133	26.52	51.13	16.89***
U		199	101	41.21	60.40	9.89**
V		395	398	21.77	35.93	19.35***
W (I)	Control	197	212	32.99	37.26	0.82
W (II)	Implemental	210	182	28.10	45.05	12.18***
W (III)	Deliberative	198	211	28.28	41.23	7.53**
X		213	211	34.74	35.07	0.01
Y		398	400	19.60	30.25	12.09***
Z		302	301	22.19	30.56	5.45*

Note: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Experiment U's N combines the two QS conditions (same page and different page).

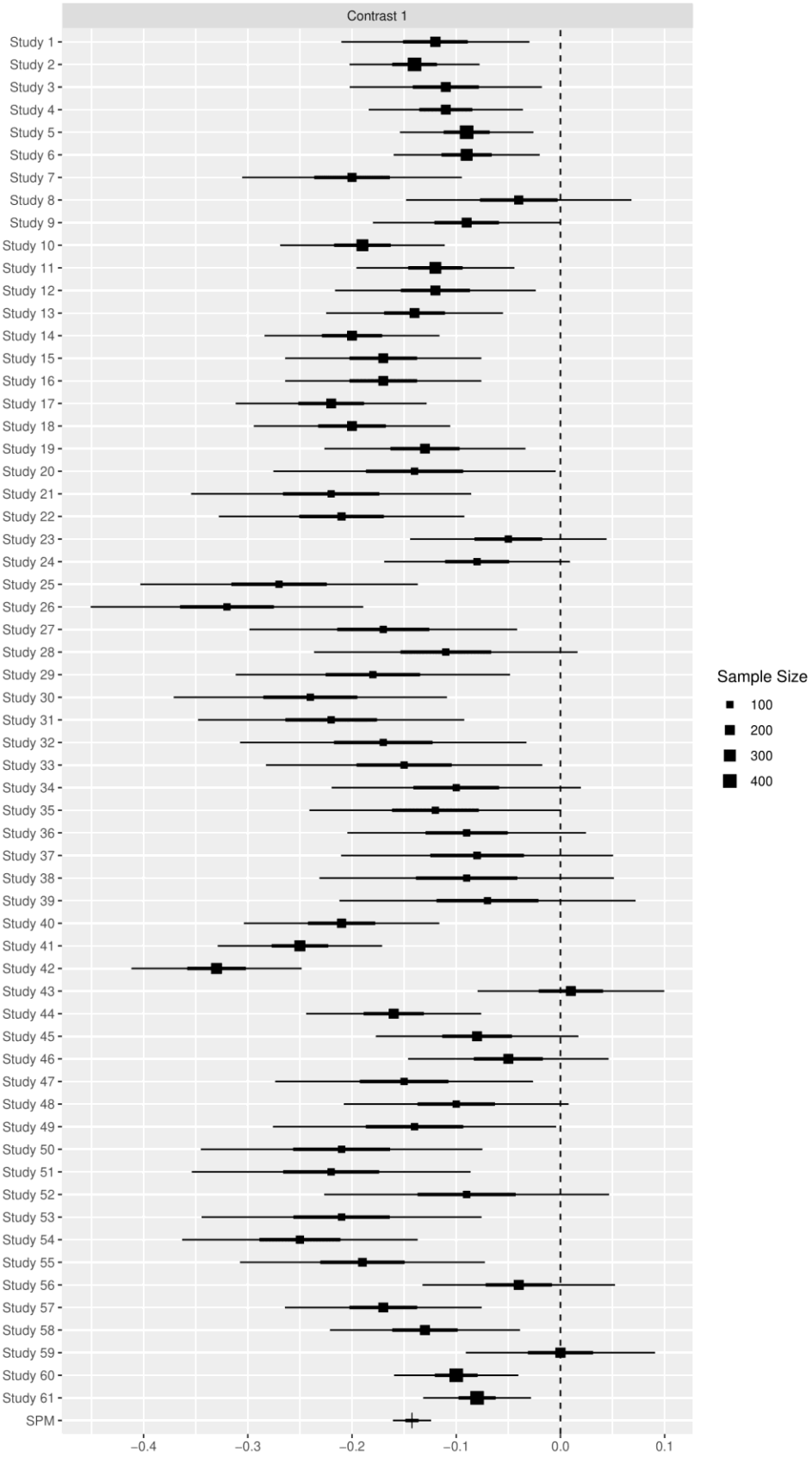
APPENDIX E: SUPPLEMENTAL ANALYSES, POOLED ANALYSIS OF EXPERIMENTS

Single-Paper Meta-Analysis, Purchasing

Following the procedures outlined by McShane and Böckenholt (2017), we conducted a single-paper meta-analysis via https://blakemcshane.shinyapps.io/spmeta/. It revealed a significant effect of selling format on participants' likelihood of purchasing across all (split) experiments. According to this analysis, quantity integration led to a 14.25 percentage-point increase in likelihood of purchase as compared to quantity-sequential processes (SE = .009 (.93 percentage-points), z = 15.83, p < .001).

The point estimates were a 37.60% average purchase rate in the QS condition (SE = 2.19%) in our studies and a 51.85% average purchase rate in the QI condition (SE = 2.19%). Thus, this tool estimates that quantity integration produced an average 38% relative increase in purchasing. This analysis corroborates a robust effect of selling format. The figure below shows the magnitude of the effects of selling format in each split experiment.

Difference In Purchase Rates (Integrated- Sequential), Lab Experiments SPM.


Contrast 1
Study 1
Study 2
Study 3
Study 4
Study 5
Study 6
Study 7
Study 8
Study 9
Study 10
Study 11
Study 12
Study 13
Study 14
Study 15
Study 16
Study 17
Study 18
Study 19
Study 20
Study 21
Study 22
Study 23
Study 24
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Study 26
Study 27
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Study 42
Study 43
Study 44
Study 45
Study 46
Study 47
Study 48
Study 49
Study 50
Study 51
Study 52
Study 53
Study 54
Study 55
Study 56
Study 57
Study 58
Study 59
Study 60
Study 61
SPM
−0.4
−0.3
−0.2
−0.1
0.0
0.1
Sample Size
100
200
300
400

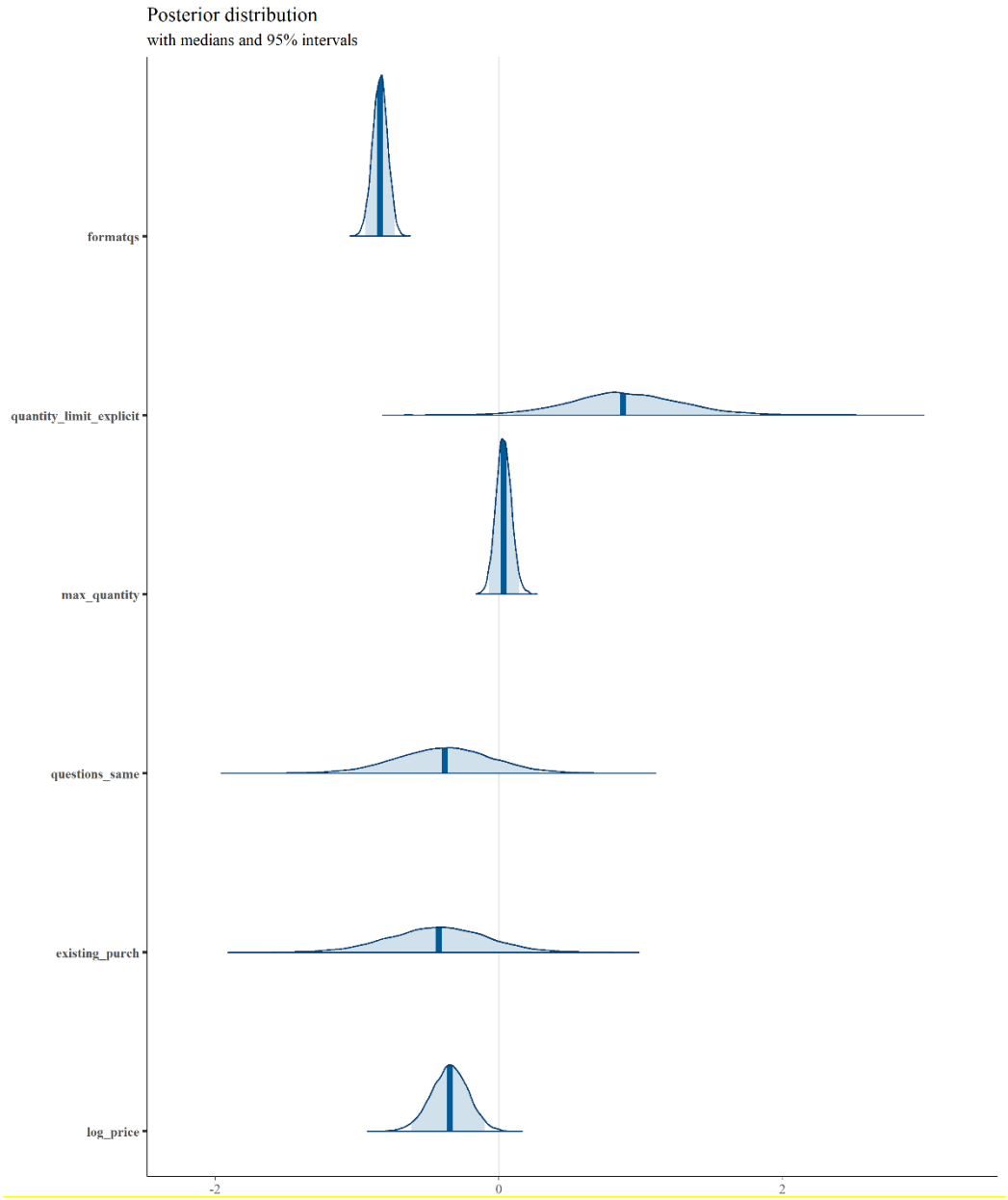
Note: This figure was generated using the tool provided at https://blakemcshane.shinyapps.io/spmeta/. The point estimated size of the quantity integration effect (i.e., difference in proportion of participants who purchase between the QI format and the QS format) are presented in squares, and this difference is represented on the x-axis. 50% and 95% confidence intervals of the magnitude of the effect are presented with the thick and thin lines, respectively. 95% confidence intervals that overlap the dashed vertical line at zero represent effects that are not significant at $\alpha = .05$.

This meta-analytic tool also revealed that I^2 was estimated at 96.49% (95% CI [96.13%, 96.81%]), suggesting a substantial level of heterogeneity. Thus, method factors (e.g., the operationalization of the experimental manipulation, or unaccounted-for substantial moderators in this analysis such as what the product is) contribute to a high percentage of the variation in observations.

Bayesian GLM Models Predicting Purchase

The specified model estimated the posterior distribution of the selling format parameter, with random effect controls for individual, split-experiment, full-experiment, and experimental condition, as well as fixed effects for: whether an explicit maximum was provided, the maximum purchase quantity, whether the call to action was the same across formats, whether the context was part of an existing purchase, and the product's price (log-transformed). The average estimated coefficient on selling format (where 1 = QS and 0 = QI) was -0.84, with 0 lying outside the 95% credibility interval and with >99.99% of the posterior values being negative. The posterior distribution for each predictor is depicted in the figure below. These results converge with those reported in the main paper.

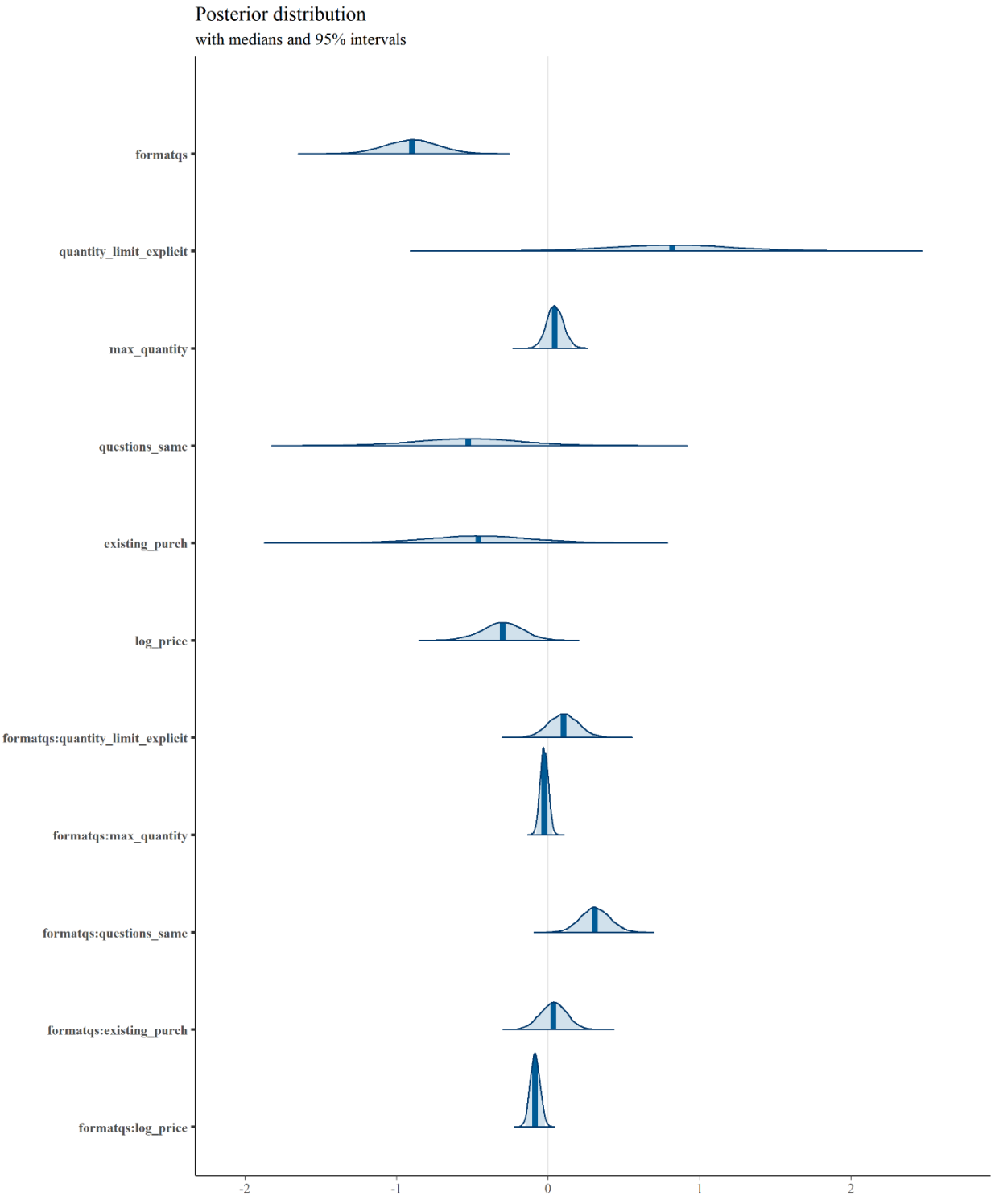
Posterior Distribution of Selling Format Parameter, Pooled Analysis with Main Effects



Note. The 95% credibility intervals are displayed in light blue, with the medians represented by thick blue lines.

Further, we conducted a supplementary analyses with the same parameters in addition to interactions between format and: whether an explicit maximum was provided, the maximum purchase quantity, whether the call to action was the same across formats, whether the context was part of an existing purchase, and the product's price (log-transformed). The posterior distribution for each predictor is depicted in the figure below. These results converge with those reported in the main paper.

Posterior Distribution of Selling Format Parameter, Pooled Analysis with Interaction Terms



Within-Person Models, Purchasing

An alternative way to examine within-person effects in the pooled analysis is to include an indicator denoting whether it is the participant's first time participating in an experiment, or the second time, or third, and so on. We test whether this "observation number" interacted with the selling format in

a few ways. First, in the generalized linear mixed-effects model (1), we test whether participants behaved differently when it was their first time appearing in an experiment versus when they were repeating. Next, in model (2), we treat observation number as a continuous variable. In both, we find no statistically significant interaction with the selling format.

	(1)	(2)
Sequential (vs. Integrated) Format	$-.81^{***}$	$-.72^{***}$
	(.07)	(.07)
First Partic Obs.	$-.04$	
	(.05)	
Sequential x First Obs.	.10	
	(.07)	
Observation Num (Cont.)		$-.01$
		(.02)
Sequential x Obs. Num		$-.02$
		(.03)
Constant	.03	.02
	(.15)	(.15)
Split-Experiment Random Effects	✓	✓
Full-Experiment Random Effects	✓	✓
Experimental-Condition Random Effects	✓	✓
Individual Random Effects	✓	✓
Observations	20,214	20,214
Akaike Inf. Crit.	24,737.12	24,737.15
Bayesian Inf. Crit.	24,800.43	24,800.46
Note:	*p<0.05; **p<0.01; ***p<0.001	

Note for this table and the following tables: Standard errors in parentheses.

Finally, in model (3) below, we treat observation number as a categorical variable, rather than assuming linearity, and again uncover no significant interactions:

Sequential (vs. Integrated) Format	−.72*** (.05)
Obs 2	.05 (.06)
Obs 3	.10 (.10)
Obs 4	.02 (.13)
Obs 5	.01 (.17)
Obs 6	−.33 (.23)
Obs 7	−.07 (.33)
Obs 8	−.39 (.46)
Obs 9	.21 (.61)
Obs 10	−.02 (.71)
Obs 11	−.90 (.98)
SF x Obs 2	−.07 (.09)
SF x Obs 3	−.22 (.13)
SF x Obs 4	−.14 (.18)
SF x Obs 5	−.03 (.24)
SF x Obs 6	.39 (.32)
SF x Obs 7	−.14 (.44)
SF x Obs 8	−.11 (.59)
SF x Obs 9	−.24 (.78)
SF x Obs 10	−.49 (1.04)
SF x Obs 11	1.29 (1.54)
Constant	−.01 (.15)
Split-Experiment Random Effects	✓
Full-Experiment Random Effects	✓
Experimental-Condition Random Effects	✓
Individual Random Effects	✓
Observations	20,214
Akaike Inf. Crit.	24,764.89
Bayesian Inf. Crit.	24,970.66
Note:	*p<0.05; **p<0.01; ***p<0.001

These results are consistent with a null effect.

Regressions Examining Quantity Purchased

Quantity Purchased, Conditional on Purchase

	(1)	(2)	(3)
Sequential (vs. Integrated) Format	.17***	.17***	.03
	(.03)	(.03)	(.12)
Mentioned Quantity Limit		−.14	−.17
		(.33)	(.33)
Max Quantity		.15***	.14***
		(.03)	(.03)
Same CTA		.06	.06
		(.27)	(.27)
Add-on Purchase		−.82**	−.75**
		(.27)	(.27)
Price		−.37***	−.35***
		(.09)	(.09)
SF x. Ment. Limit			.10
			(.07)
SF x Max Quantity			.04*
			(.02)
SF x Same CTA			.003
			(.06)
SF x Add-On			−.17**
			(.06)
SF x Price			−.05*
			(.02)
Constant	1.97***	2.04***	2.09***
	(.18)	(.36)	(.36)
Split-Experiment Random Effects	✓	✓	✓
Full-Experiment Random Effects	✓	✓	✓
Experimental-Condition Random Effects	✓	✓	✓
Individual Random Effects	✓	✓	✓
Observations	8,639	8,639	8,639
Akaike Inf. Crit.	28,318.13	28,296.57	28,316.54
Bayesian Inf. Crit.	28,367.58	28,381.34	28,436.63
Note:		*p<0.05; **p<0.01; ***p<0.001	

Note: Standard errors in parentheses. All binary variables (all variables except for price) are dummy-coded. Selling Format = 1 for quantity-sequential and 0 for quantity-integrated. Mentioned Quantity Limit indicates whether or not the maximum purchase quantity was explicitly mentioned in both selling formats. Max Quantity indicates the highest number of units that participants could purchase. Same CTA indicates whether the question/call to action was identical in both selling formats (format-neutral) or if the questions differed. Add-On Purchase indicates whether the purchase opportunity was framed as part of an existing purchase (e.g., adding a bottle of soda to an existing pizza order) or a standalone purchase. Price was log-transformed to contend with skew.

Results reveal that on average, sequential purchasers generally purchased a higher quantity than integrated purchasers. This makes sense, because sequential purchasers should have a priori higher purchase intent. Furthermore, the average purchase quantity was lower for add-on purchases than for standalone purchases, and also lower for higher-priced goods. Additionally, the quantity maximum exerted a greater impact on quantity purchased in the integrated than the sequential format, as did whether or not the purchase was an add-on setup. Finally, price exerted a greater impact on purchase quantity in the integrated (vs. sequential) format.

Quantity Purchased, Including Non-Purchase

Below are the results in terms of aggregate quantity. Across the board, the integrated format yielded substantially higher purchase quantities (including zero-quantity non-purchases).

	(1)	(2)	(3)
Sequential (vs. Integrated) Format	$-.22^{***}$	$-.22^{***}$	$-.03$
	(.03)	(.03)	(.10)
Mentioned Quantity Limit		.24	.21
		(.26)	(.26)
Max Quantity		$.09^{**}$	$.13^{***}$
		(.03)	(.03)
Same CTA		$-.10$	$-.12$
		(.21)	(.21)
Add-on Purchase		$-.46^{*}$	$-.51^{*}$
		(.21)	(.21)
Price		$-.32^{***}$	$-.30^{***}$
		(.07)	(.07)
SF x. Ment. Limit			.07
			(.06)
SF x Max Quantity			$-.07^{***}$
			(.02)
SF x Same CTA			.02
			(.05)
SF x Add-On			$.12^{*}$
			(.05)
SF x Price			$-.03$
			(.02)
Constant	1.07^{***}	$.99^{**}$	$.89^{**}$
	(.13)	(.30)	(.31)
Split-Experiment Random Effects	✓	✓	✓
Full-Experiment Random Effects	✓	✓	✓
Experimental-Condition Random Effects	✓	✓	✓
Individual Random Effects	✓	✓	✓
Observations	20,571	20,571	20,571
Akaike Inf. Crit.	69,294.14	69,288.11	69,296.08
Bayesian Inf. Crit.	69,349.66	69,383.28	69,430.92
Note:		*p<0.05; **p<0.01; ***p<0.001	

APPENDIX F: ALTERNATIVE PSYCHOLOGICAL MECHANISMS AND RELEVANT EXPERIMENTS

Below, we present a more detailed table elaborating on the points made in Table 1 in the main text:

Difference	How This Could Influence Purchasing	Our Empirical Evidence
I. Call to action	Sometimes, the CTA is implicit. At other times, marketers ask direct questions (e.g., "Do you want to buy [product]?"). In practice, marketers may conversationally adapt these questions to the format, as conversational norms dictate using the clearest and most relevant wording (Grice 1975). For example, "How many slices of pizza do you want, if any?" may better fit with the integrated format, while "Do you want any slices of pizza?" may fit the sequential format better. However, asking different questions could cue different types of considerations (Schwarz 1999), activate conversational norms of appropriate responding (Grice 1975), or leak information about what other customers tend to do (Tannenbaum et al. 2021), impacting purchase.	Some experiments do not present any question at all (e.g., field experiment), and others hold constant the CTA in both formats (E1-E3). Thus, the CTA is not integral to the effect. However, when considering deploying quantity integration in practice, marketers may wish to know if it makes a difference to ask more conversationally natural questions tailored to match the answer options. Appendix D presents some experiments that do so, and the pooled analysis compares the effect size between same-CTA and different-CTA experiments. It finds that conversationally adapted CTAs can further amplify the quantity integration effect.
II. Information about quantities	When a choice presents multiple potential quantities (as in the integrated format), there is naturally one highest value, which respondents may interpret as a purchasing quantity limit. The first choice in the sequential format does not necessarily provide any quantity information. Quantity limits may increase purchase (e.g., due to anchoring; Lessne and Notarantonio 1988; Inman, Peter, and Raghubir 1997; Wansink, Kent, and Hoch 1998). More generally, including information about quantities in a choice set, as the integrated format naturally does, may leak information about other buyers or about the retailer/experimenter (e.g., that it's normal to purchase 3 ink cartridges; Tannenbaum et al. 2021; Prelec et al. 1997).	E2 show the effect persists even when explicitly stating a maximum purchase quantity in both formats (hence providing this same quantity anchor for both). Further, the pooled analysis shows no meaningful differences in the size of the effect between studies with and without an explicit maximum quantity. Finally, Experiments A1 and A2 in Appendix F directly test for information leakage/inferences.
III. Number of choice options	The sequential format typically presents only one purchasing option in the initial purchase phase, whereas the integrated format typically presents multiple (e.g., "Buy 1," "Buy 2," and "Buy 3"). Purchasing a small quantity in the integrated format may been seen as a compromise option between not purchasing and purchasing a large quantity (Simonson 1989), while no such compromise exists in the sequential format's binary choice set. Having multiple purchase options could also draw proportionally more visual attention toward purchasing (Armel et al. 2008; see also Brenner, Rottenstreich, and Sood 1999) or increase the odds that someone choosing randomly will end up purchasing (Krosnick 1991). Appendix F further explains how these mechanisms could influence choice.	E3 finds the effect even when equating the number of choice options in the two formats, and Appendix F presents Experiments AE and AF that conceptually replicate it. The pooled analysis also shows that increasing the maximum quantity (thus increasing the # of purchase options in the integrated format, and enlarging the difference between formats) does not have a measurable influence on the effect.
IV. Process costs/ Effort required	The integrated format typically involves just one action, while purchasing in the sequential format involves two separate actions (choosing to buy and choosing an amount). Sequential customers may choose to minimize consideration effort, reduce time spent, or avoid the "cost of clicking" by opting not to buy (Shugan 1980), avoiding a subsequent quantity decision. On the other hand, an effort minimization account could also make the opposite prediction: the "buy" decision in the sequential format is technically easier (it requires fewer alternatives, it does not require giving a final answer, etc.) than the more complex choice in the integrated format, which requires simultaneously answering two questions. Hence, this mechanism could also predict that the sequential format would yield more purchasing.	Experiment AE in Appendix F shows that equating the search/clicking costs by requiring integrated purchasers to make two clicks still shows the effect. Further, Experiment AB in Appendix F shows that the effect persists even when tightly controlling the amount of time spent in each format, and Experiment U shows that whether the two QS choices are on the same or different pages does not influence the effect.

The following subsections discuss supplemental psychological explanations for the quantity integration effect. Where we have relevant evidence that can speak to the listed mechanism, we include it.

More Details on Theories Tied to Information Leakage (Table 1, Difference II)

Past literature (e.g., Prelec, Wernerfelt, and Zettelmeyer 1997; Tannenbaum, Fox, and Goldstein 2013) shows that choice option information can signal information to individuals about what is "normal" or "typical." For example, Prelec et al. (1997) suggest that people infer that the "middle" option in a product line should correspond to middling preferences (e.g., if a sweatshirt comes in 3 sizes, then the middle option should fit an average person). Tannenbaum et al. (2013) show that the arrangement of choice options can signal the descriptive norms in the context (what other people tend to do).

It is possible that because QI shows multiple ways of purchasing (i.e., multiple different quantities available for purchase all at once), the QI format could be signaling information—perhaps, that customers typically do tend to buy this product, which could increase purchasing. Customers may infer that purchasing this product is *so* appealing that some customers buy even two or three units! To some extent, including explicit quantity information in both formats should mitigate this difference between them, because providing a maximum quantity also implicitly provides information about the full set of choice options. Nevertheless, it's possible that some difference may still remain. We conducted two experiments to assess various forms of social norm/experimenter inferences.

Experiment A1: Measuring Descriptive Social Norms and Experimenter Expectations

Here, participants report (a) what they infer to be the normative behavior and (b) their perceptions of the experimenter's expectations. Note also that a null effect on perceived norms would imply that consumers do not intuit the differential effectiveness of the two selling formats. This experiment is excluded from the pooled analysis because it does not include purchase decisions. We predicted a null effect on perceived norms and expectations. However, a null effect could arise if participants simply do not attend to or understand the question or situation. To demonstrate that participants are indeed responding to the stimuli in a meaningful way, we include a third condition in which participants view the quantity-sequential selling format, but the product they see is on a promotional sale price. If they are attending to the stimuli and responding appropriately, their responses in this condition should reflect higher norms and expectations of purchase.

Method. One hundred fifty Mechanical Turk workers (49.0% female; M_{age} = 32.8 years, SD_{age} = 10.2 years) participated. Participants were randomly assigned to one of three conditions (selling format: quantity-sequential, quantity-sequential sale, or quantity-integrated) in a between-subjects design. All participants read, "Imagine you are online, ordering some pizza to be delivered. After choosing your food items and adding them to your cart, the following box pops up." An image displayed a pop-up with the words, "You might also enjoy:" above a photo of a Coca-Cola bottle, with the words, "2 Liter: $2.49" and "Customers can purchase up to 3 bottles" beneath. For participants in the quantity-sequential sale condition, this image also contained a slash thorough the price, with the words "Special Price: $0.99" written in red. Participants read, "Imagine you see the following question," above a screenshot of a question and answer options. All participants saw the question, "Please indicate what you would do in this situation." For quantity-sequential and quantity-sequential sale participants, the answer options were, "Not buy any" and "Buy." For quantity-integrated participants, the answer options were, "Not buy any," "Buy 1 bottle," "Buy 2 bottles," and "Buy 3 bottles." In this way, participants imagined themselves in the shoes of a participant in our other experiments, without actually making a choice.

While imagining this experience, participants reported their perceptions of the descriptive norm. Specifically, they answered, "Out of every 100 participants who see this question, how many do you think choose to buy?" on a sliding scale from 0 to 100. On the next page, participants reported what they

believed the experimenters expected. Specifically, participants read, "Now, we would like you to think about the people who designed the Coke purchasing survey. Think about what these survey designers expect participants will do in the situation you saw. How many people, out of every 100 participants, do the survey designers think will choose to buy?" on a sliding scale from 0 to 100. Finally, they provided demographic information.

Results: Descriptive social norm perceptions. Participants believed that a similar proportion of participants would buy in the quantity-sequential (M = 46.84%, SD = 24.94%) and quantity-integrated conditions (M = 44.12%, SD = 24.73%; t(98) = .55, p = .59). However, this result does not reflect participants' lack of attention or understanding: they proved to be sensitive to the scenario's details. Specifically, participants in the quantity-sequential sale condition expected that significantly more participants would buy (M = 70.86%, SD = 19.36%) than did both the quantity-sequential (t(99) = 5.40, p < .001) and quantity-integrated (t(97) = 6.00, p < .001) participants. Thus, participants do not seem to perceive different descriptive social norms under the two selling formats, and accordingly do not hold a lay theory that the two selling formats differ in their ability to solicit purchase. However, they do intuit that cheaper products entice more purchasing.

Results: Perceived experimenter expectations. Participants did not anticipate any differences in experimenter demand/expectancies in the two selling formats (quantity-sequential: M = 54.80%, SD = 22.54%; quantity-integrated: M = 51.43%, SD = 21.96%; t(98) = .76, p = .45). As with social norm perceptions, participants in the quantity-sequential sale condition reported significantly higher experimenter expectations (M = 70.84%, SD = 16.54%) than both the quantity-sequential (t(99) = 4.06, p < .001) and quantity-integrated (t(97) = 4.97, p < .001) participants, suggesting they indeed adjusted to the details of the scenario.

Discussion. Participants perceived similar descriptive social norms and experimenter expectations in the two selling formats. If anything, these measures were directionally higher in the quantity-sequential (vs. quantity-integrated) format, in the opposite direction of the quantity integration effect. These findings do not simply reflect inattention or lack of understanding, as participants appropriately adjusted their norm perceptions and perceived experimenter expectations in response to a change in the product's price. Instead, they suggest that consumers do not seem to draw meaningfully different norm inferences from the two formats, and also do not seem to intuit the quantity integration effect.

Experiment A2: Measuring "Normalcy" of (a) Purchasing and (b) Purchasing Multiples

A slightly different inference is whether customers perceive (a) purchasing and (b) purchasing multiple units to be "normal" or "typical." To test these two specific inferences, we conducted an additional experiment (excluded from the pooled analysis because it does not include purchase decisions). This experiment varies two features: (a) the selling format (QI vs. QS), and (b) whether or not a quantity maximum is explicitly mentioned. We additional included a fifth QI condition that included both an explicit quantity maximum *and* explicit information about the behavior of others. We made the following predictions, as preregistered (https://aspredicted.org/V63_Z8F):

- When the quantity maximum is mentioned, there should be no difference between selling formats in either normalcy DV. In other words, we expected that equating quantity maximum information would eliminate any possible differences in norm perceptions between the two, reducing any concerns about this alternative explanation.
- Providing explicit information about the behavior of others would enhance (at least multiple-item purchasing) normalcy compared to both these conditions. This would suggest that neither condition on its own is leaking full information about normalcy, further reducing concerns about this alternative explanation. More pragmatically, this condition was also included to ensure that our normalcy measures were sensitive to "normalcy" information, as one would hope.
- We made additional predictions that are not relevant for this alternative-explanation test. (When no maximum quantity is mentioned, we reported competing predictions. Either the two conditions

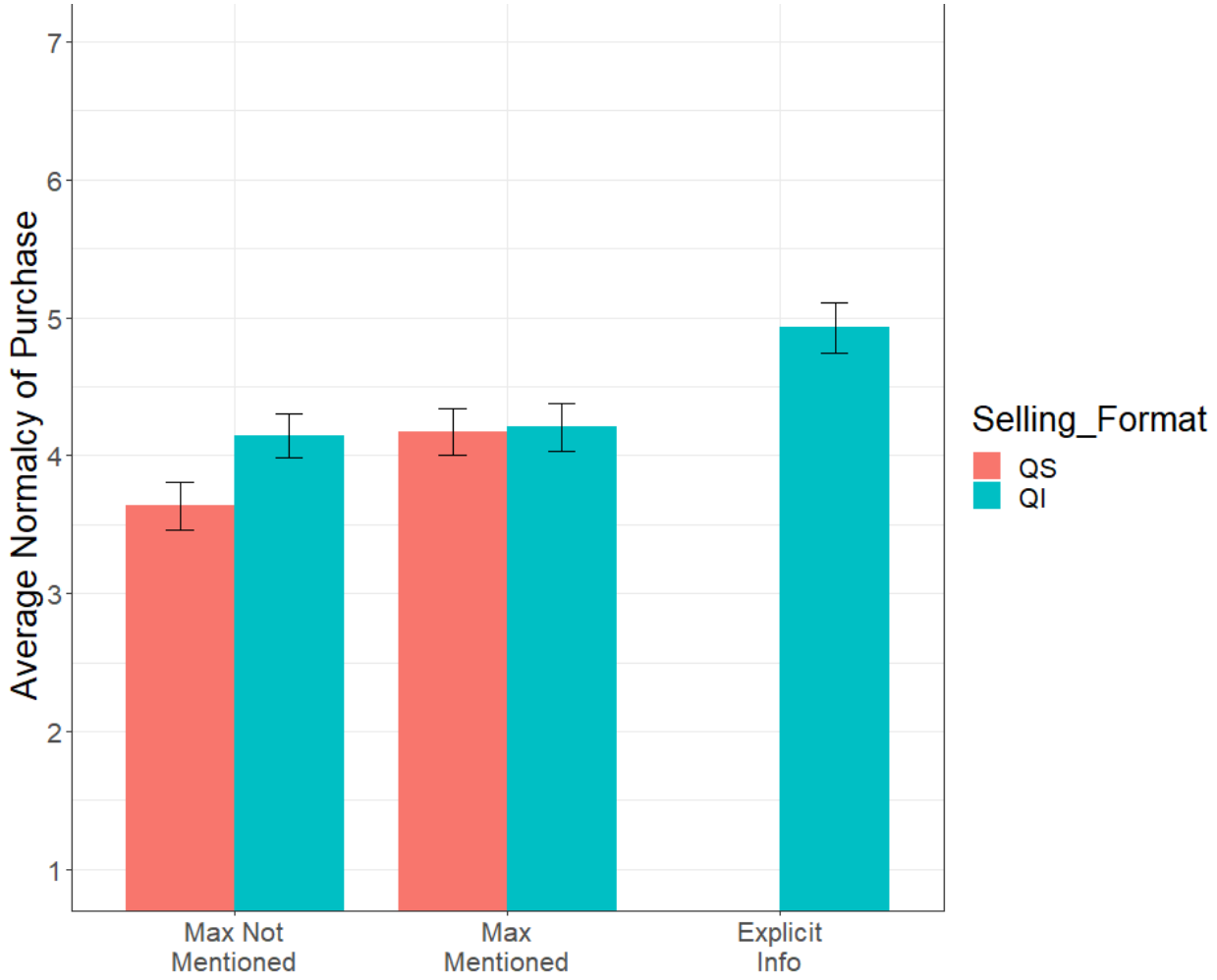
would be flat, or the QI condition would have higher normalcy perceptions. This is not important for our theorizing because the majority of our studies provide explicit quantity information. Within the QS condition, mentioning a quantity maximum would increase multiple-purchasing normalcy. This question is unrelated to the impact of QI vs. QS.)

Method

600 Prolific participants (35.0% male, M_{age} = 28.8 years) were randomly assigned to condition in a 2 (selling format: QI vs. QS) x 2 (quantity maximum: not mentioned, mentioned) + 1 ("explicit norm information" [QI + maximum + explicit statement]) between-subjects design. Participants were presented with the truffles purchasing situation participants saw in Experiment 3, along with a screenshot of the selling format corresponding to their condition. Participants in the quantity maximum mentioned conditions additionally saw, "You can buy up to 4 bags of chocolate truffles with this monetary bonus." Finally, participants in the explicit-norm-information condition additionally saw, "Most participants buy all 4 bags." They then answered two questions: *normalcy of purchasing*, "How normal/typical is it to purchase any chocolate truffles in this situation?" (1: extremely abnormal/unusual, 4: Neutral, 7: Extremely normal), and *normalcy of purchasing multiple units*, "How normal/typical is it to purchase multiple bags of chocolate truffles in this situation?" (1: extremely abnormal/unusual, 4: Neutral, 7: Extremely normal). They then answered an attention check and provided demographic information.

Results

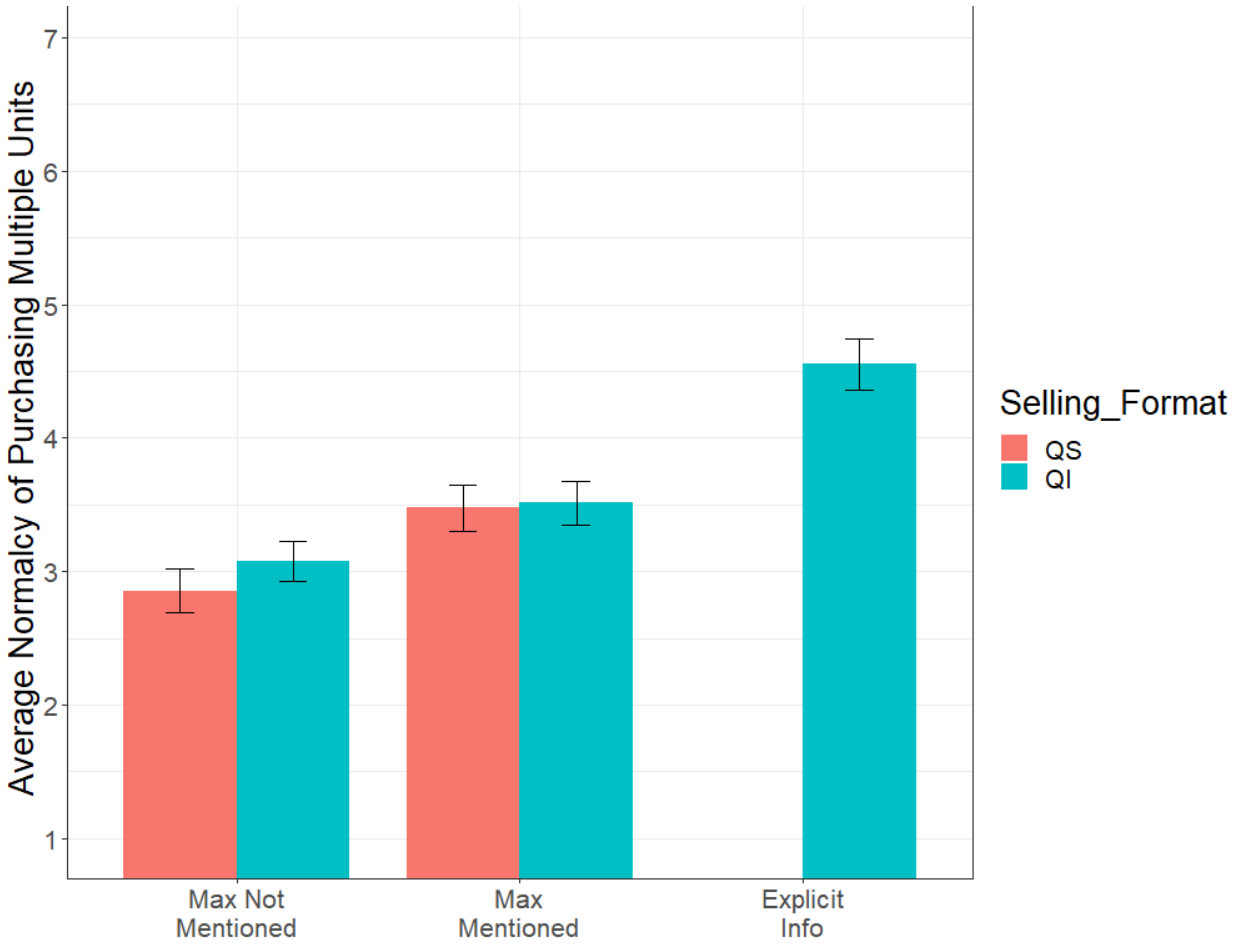
Normalcy of purchasing. An ANOVA revealed that there was a significant effect of condition on perceived normalcy ($F(4, 595) = 7.25$, $p < .001$). We present the means graphically:



Planned contrasts revealed the following results that are relevant for our theory:

- When the quantity maximum is *not mentioned*, people perceive purchasing to be more normal in QI than in QS ($F(1, 595) = 4.26$, $p = .039$). That is, the natural presence of quantity information in QI may cue some inferences about the normalcy of purchasing.
- When the quantity maximum is *mentioned*, there is no significant difference between selling formats ($F(1, 595) = .02$, $p = .897$). Equating quantity maximum information seems to eliminate any such differences in norm perceptions between the two formats.
- Providing explicit information about the behavior of others increases normalcy compared to both QI-maximum ($F(1, 595) = 8.93$, $p = .003$) and QS-maximum ($F(1, 595) = 9.77$, $p = .002$). Hence, neither format on its own is leaking full information about the normalcy of buying.

Normalcy of purchasing multiple units. An ANOVA also revealed that there was a significant effect of condition on perceived normalcy of buying multiple bags of truffles ($F(4, 595) = 14.93$, $p < .001$). We present the means graphically:



Planned contrasts revealed the following results that are relevant for our theory:

- When the quantity maximum is *not mentioned*, there was no significant difference between formats ($F(1, 595) = .77$, $p = .382$).
- When the quantity maximum is *mentioned*, we see the same ($F(1, 595) = .02$, $p = .876$).
- Providing explicit information about the behavior of others increases normalcy of purchasing multiple units compared to both QI-maximum ($F(1, 595) = 19.11$, $p < .001$) and QS-maximum ($F(1, 595) = 20.58$, $p < .001$). Hence, neither format on its own is leaking full information about the normalcy of buying multiple units.

Discussion

First, providing explicit information about others' behavior greatly increased perceived normalcy of (a) buying and (b) buying multiple units. This suggests that neither selling format sufficiently leaks this information on its own. Further, it also suggests that our normalcy measures are appropriately sensitive to norm information. Second, when the quantity maximum was mentioned, there was no difference between selling formats in either normalcy DV. In other words, equating quantity maximum information would eliminate any possible differences in norm perceptions between the two, reducing any concerns about this alternative explanation.

More Details on Theories Tied to the Number of Choice Options (Table 1, Difference III)

As mentioned in the text, the integrated format (QI) tends to offer more purchasing options than the sequential format (QS) does, which could possibly increase purchase likelihood. Multiple psychological mechanisms would make this prediction. These include:

- Random choosing (Krosnick 1991): In QI, there are more options involving purchase than non-purchase. So if a participant were to choose randomly, they would have greater odds of striking an option that involves purchasing. By contrast, the QS format tends to offer equal # of purchasing and non-purchasing options (i.e., 1 each), which does not confer this random-choice advantage.
- Biased visual attention (Armel, Beaumel, and Rangel 2008): this research shows that people have a higher likelihood of choosing options that they focus on visually. If the presence of more purchasing options in QI leads customers to visually attend more to these options, this could increase purchasing.
- Compromise effect or extremeness aversion (Simonson 1989; Simonson and Tversky 1992): this literature suggests that customers have a bias toward choosing middling compromise options and avoiding choosing endpoints on scales. For example, customers will be more apt to choose a middle-cost/middle-quality choice option in a trinary set that also includes a high-cost/high-quality option and a low-cost/low-quality option than a binary set with either of the latter options. Because QI offers multiple purchasing options (along with the non-purchase option), perhaps customers could be more apt to consider "buying a little"—purchasing a small quantity—in QI, an idea that does not come to mind as readily in QS (which at first, only presents "buying" or "not buying" and no middle compromise option).

As described, these mechanisms rely upon there being more purchasing options in QI than in QS so as to create an asymmetry between the two. If the two formats presented equal numbers of choice options, then there would be no possibility for differences in random choice (because participants would have similar chances in both formats of randomly landing upon a purchase option), no obvious possibility for differences in attracting visual attention (because again there would be equal options to draw their gaze), and no differences in customers' ability to choose a compromise option/ avoid endpoints (because again, the choice options would be equivalent in both formats). There are 2 ways we can equate the number of choice options in the two formats:

- One is to artificially reduce the number of choice options in the integrated format, offering only one purchase option (to match the sequential format). Experiment AE below tests this setting, and shows that even here, we still observe a significant quantity integration effect.
- The second way is to artificially increase the number of choice options in the sequential format, offering multiple purchase options (to match the integrated format). This is what we did in Experiment 4 in the main text. We also present an additional experiment here, Experiment AF, that tests this in an alternative setting.

These findings, coupled with the null result of the quantity-maximum in the pooled analysis as presented in the main text, suggest that mechanisms rooted in different numbers of choice options between the two formats are unlikely to be primary drivers of the quantity integration effect.

Experiment AE: Reducing the number of choice options in the integrated format

Method

Participants (N = 867) were assigned to one of three conditions. In all conditions, participants learned about an opportunity to purchase notebooks in an incentive-compatible choice. They read that if they are randomly selected, they would win a $20 bonus, and that they could use part of this money to buy notebooks for $6 each. They could buy up to 3 notebooks. All participants answered, "What would you like to do?" What differed across conditions was the choice options presented to participants. Participants in the sequential condition chose between "Not buy any notebooks" and "Buy," while participants in the integrated condition chose among "Not buy any notebooks," "Buy 1 notebook," "Buy 2 notebooks," or "Buy 3 notebooks." In a third condition, participants chose between two options, like the sequential format. However, like the integrated format, this condition explicitly articulated the full choice set—in other words, it listed out the different quantity alternatives. Specifically, participants in this articulated-binary-integrated condition chose between "Not buy any notebooks" and "Buy 1, 2, or 3 notebooks." After making a choice, sequential purchasers specified their desired quantity by answering "You indicated you will make a purchase. What would you like to do?" with choice options "Buy 1 notebook," "Buy 2 notebooks," or "Buy 3 notebooks." Thereafter, participants answered an attention check and provided demographic information.

Results and Discussion

If the quantity integration effect is caused by the different number of choice options in the two formats, then the articulated-binary-integrated condition should approximate the sequential format, as it included the same number of choice options (2). But instead, it yielded higher purchasing (36.93%) than did the sequential format (26.47%; $\chi^2(1, N = 579) = 6.66$, $p = .01$), at a rate similar to the integrated format (40.07%; $\chi^2(1, N = 573) = .46$, $p = .50$). As usual, the integrated format also yielded higher purchasing than the sequential format ($\chi^2(1, N = 582) = 10.65$, $p < .001$). Together, these findings suggest that even in a variant of the integrated format where there are only 2 choice options (just like the sequential format), the integrated format can still significantly increase purchasing. This experiment is included in the pooled analysis ("AE"), but the third condition (articulated-binary-integrated) is omitted.

Experiment AF: Increasing the number of choice options in the sequential format

Method

Participants (N = 401) were assigned to one of two between-subjects conditions: QS vs. QI. All participants saw a hypothetical choice to purchase Extra spearmint gum for a discounted price (88 cents, with a maximum purchase quantity of 2 packs). Then, participants all answered the same prompt: "Please indicate what you would do in this situation." In the QS condition, there were 3 choice options: "Not buy gum," "Buy gum," and "Buy gum with excitement!" In this way, we created multiple purchasing options that do not involve/specify purchase quantities (as that would make this condition into a QI condition). In the QI condition, there were also 3 choice options, one also containing the qualifier "with excitement!" Specifically, the options were: "Not buy gum," "Buy 1 pack of gum," and "Buy 2 packs of gum with excitement!" After making their choice, QS purchasers specified their desired quantity by answering "You indicated you would buy gum. How many packs would you buy?" without choice options "1 pack of gum" and "2 packs of gum."

Results and Discussion

We predicted that the QI format would still increase purchasing relative to the QS condition, even though both contained two purchasing options and one non-purchase option. Indeed, QI participants were

significantly more likely to indicate that they would purchase any packs of gum (63.17%) than were QS participants (51.24%; $\chi^2(1, N = 401) = 5.96$, $p = .015$). Thus, even when there are multiple purchasing options in both formats, the integrated format still prevailed. Together, experiments AE and AF suggest that it is not the mere number of choice options driving this effect; rather, it matters if those quantities are directly integrated into the choice set. This experiment is included in the pooled analysis.

More Details on Theories Tied to the Number of Steps (Table 1, Difference IV)

Another key difference between the two formats is the number of steps or "clicks" they involve. Purchasing in the sequential (QS) format involves more actions than does purchasing in the integrated (QI) format. If customers are averse to decision effort or to the "cost of clicking," this could reduce purchasing in the sequential format: QS customers may choose to minimize consideration effort or time spent and opt out of the impending second quantity decision by choosing not to buy (Shugan 1980). Yet, Experiment AE rules this out as the primary mechanism. It finds that even in a modified version of the integrated format where customers explicitly *cannot* resolve the choice in a single action, this format still prevails over the sequential format. As further evidence, we also conducted Experiment AA, described below. Experiment AA tightly controlled the amount of time participants spent in each format, eliminating any potential time-saving benefits of opting not to purchase.

A related possible mechanism is that perhaps, customers are unaware about "what is coming up" in the QS format or have some uncertainty over what the ultimate purchase options will be. This could potentially deter them from choosing to purchase. If so, the quantity integration effect should be weaker in situations where the two QS decisions are presented right beside one another than when they are presented separately (with the second choice only revealed upon clicking). Experiment U from the pooled analysis was designed to test this possibility; we present a summary of this study below.

Experiment AB: Controlling the Time Spent

Method

Four hundred three Mechanical Turk workers (46% female; M_{age} = 35.6 years, SD_{age} =11.5 years) were randomly assigned to one of two conditions (selling format: QS vs. QI) in a between-subjects design. All participants read that they would make a purchase decision and that one worker would be selected to receive a monetary bonus and any products that he/she purchased. They then learned that the main sections of the survey "will take a total of 30 seconds, regardless of what you choose. So, please take your time and choose carefully." Next, participants read, "If you are selected, you will receive a $20 bonus. If you'd like, you can use this money to purchase Lemome notebooks (pictured below) for $6 per notebook (current price on Amazon: $9). You can buy up to 3 notebooks. Any money you do not spend on notebooks will be given to you as a bonus." All participants then responded to the same call to action, "What would you like to do?" The choice options in QS were "Not buy any notebooks" and "Buy," while the choice options in QI were, "Not buy any notebooks," "Buy 1 notebook," "Buy 2 notebooks," and "Buy 3 notebooks." There was a hold timer on this page requiring participants to spend at least 10 seconds on it.

On the following page, QS participants who had chosen to purchase then selected the quantity, answering, "You indicated you will make a purchase. What would you like to do?" with choice options matching the QI condition: "Not buy any notebooks," "Buy 1 notebook," "Buy 2 notebooks," and "Buy 3

notebooks".[23] On the same page, all participants (in both formats, regardless of whether they purchased) also answered a free-response question, "Why did you make the purchase decision you made?" There was a hold timer on this page that required participants to spend at least 20 seconds on it. Thus, regardless of what decisions participants had made and regardless of their condition, they had to spend the same required minimum amount of time. Finally, participants provided demographic information.

Results and Discussion

QS participants were significantly less likely to purchase (29.40%) than were QI participants (39.60%; $\chi^2(1, N = 403) = 4.69$, $p = .03$, $\varphi = .11$); quantity integration promoted a 35% relative increase in purchase likelihood. Among purchasers, QS participants bought a similar number of notebooks (M = 1.41, SD = .75) as did QI participants (M = 1.31, SD = .59; t(137) = -.83, $p = .41$), suggesting that the selling format did not discernibly affect the purchase quantity. Overall, the QS condition sold fewer total notebooks (83; N = 201) than did the QI conditions (105; N = 202). In sum, changing from a QS to a QI format increased total volume sold by 27%. Thus, even when required to spend a set amount of time decision-making, participants were more likely to purchase in QI than in QS.

Experiment U: Putting the Two QS Decisions on the Same versus Different Pages

Method

Participants imagined online shopping at home and encountering a sale on scented candles. They could purchase up to 3 candles. All participants answered, "What would you like you do?" For QI participants, the options were, "Not buy any," "Buy 1 candle," "Buy 2 candles," and "Buy 3 candles." For QS-different-page and QS-same-page participants, the initial purchase options were "Not buy any" and "Buy." For QS-same-page participants, a second question was presented immediately beneath this first question on the same page. It asked participants to, "Please specify the quantity" with choice options of "1 candle," "2 candles," and "3 candles." If QS participants selected the "Not buy any" option on the first question, this second quantity question disappeared (from there, selecting the "Buy" button would make it reappear). Thus, for QS-same-page-participants, the quantity decision appeared at the same time as the purchase question. For the QS-different-page participants, the quantity question was presented to purchasers on a second page after the initial purchase decision.

Results and Discussion

Significantly more QI participants made a purchase (60.40%) than both the QS-different-page participants (40.00%; $\chi^2(1, N = 201) = 8.36$, $p = .004$) and the QS-same-page participants (42.42%; $\chi^2(1, N = 200) = 6.46$, $p = .01$). The two QS conditions did not meaningfully differ from one another ($\chi^2(1, N = 199) = .12$, $p = .73$). Thus, regardless of whether the two questions were displayed together, QS still yielded lower purchase rates than QI, suggesting it is unlikely that uncertainty about the second choice in the QS condition is driving the effect.

Other Psychological Mechanisms and Theories

Purchasing Mindsets: "Whether to Buy" versus "Which to Buy"

[23] One participant chose to buy in the first choice but selected "Not buy any notebooks" in the second; coding this response as either a purchase or non-purchase does not affect the results.

When approaching a purchasing situation, consumers may adopt a mindset, in which a set of cognitive processes and judgment criteria are triggered, that subsequently guide decision-making. Xu and Wyer (2007) coin and explore "which-to-buy" versus "whether-to-buy" mindsets. They compare two ways of approaching a choice. In one case, people may begin by not at all considering the possibility of non-purchase. For example, in Study 1 of Xu and Wyer (2007), participants view two computers and are required to choose between the two, without any regard for the possibility of choosing "none" (this design is also used for the other studies in that paper). Conceptually, this is what Parker and Schrift (2011) define as a "forced choice" paradigm without a "no-choice option." Xu and Wyer (2007) find that after engaging in such a forced choice without a no-choice option, consumers subsequently act as if they have pre-decided to buy. That is, consumers who first consider "which option to buy," without considering the possibility of buying none, are more likely to subsequently purchase their preferred option than are consumers who do not first engage in this comparison process; this carry-over pattern is evidence for the distinct mindsets.

The key difference between Xu and Wyer (2007)'s mindsets and our work is that in all of our experiments, there is always an option not to buy. It is conceptually important that non-purchase is always allowed in both formats, as Parker and Schrift (2011) show that customers react quite differently to choices involving a "no choice" option than those that do not allow a "no choice" option. (The presence of the no-choice option changes how consumers resolve the decision, such as by changing which features draw attention and how consumers compare across choice options.) And in practice, non-purchase is commonly chosen in both formats in our experiments. Thus, the work of Xu and Wyer (2007) and Parker and Schrift (2011) provided helpful theoretical grounding for our predictions, but their settings are distinctly different from the present investigation.

Goal-Oriented Mindsets: Deliberative Versus Implemental

Drawing on Gollwitzer (1990)'s theory of action phases in goal attainment, prior literature establishes that consumers often approach a situation with either a deliberative or an implemental mindset (Chandran and Morwitz 2005; Dhar, Huber, and Khan 2007). Consumers in a deliberative mindset weigh the pros and cons of pursuing an action—in this case, evaluating the desirability of a purchase opportunity and deliberating over whether to buy. Consumers in an implemental mindset instead focus on the means and actions necessary to implement the decided goal, such as the details of where, when, and how to buy. Consumers are more likely to purchase when in an implemental mindset, because they focus less on deliberating whether to act and attend instead to information about how to do so (Dhar et al. 2007).

It is possible that when encountering a quantity-integrated choice, the presence of quantities induces consumers to focus first on the means of goal attainment—here, evaluating which quantity is the best—and only thereafter decide whether or not to purchase, which could increase their tendency to buy. To address this possibility, Experiment W from the pooled analysis tests whether inducing an implemental mindset would attenuate the quantity integration effect. We present Experiment W after the following mechanism (construal level) because Experiment W also addresses construal.

Construal Level/ Concreteness

The formats may differ in the level of construal (Trope and Liberman 2003) they invoke. A quantity-integrated option that includes a specific quantity may be more concrete (vs. abstract) than a sequential option merely indicating purchase. Note that a more concrete construal does not necessarily

increase likelihood of purchase; in some circumstances, concreteness reduces purchasing (Cho, Khan, and Dhar 2013; Goldsmith, Xu, and Dhar 2016). Nevertheless, we test this possibility by measuring construal.

Experiment W: Testing Deliberative versus Implemental Mindsets and Construal Level Mechanisms

Method. One thousand, two hundred ten Mechanical Turk workers (50% female; M_{age} = 36.8 years, SD_{age} = 12.3 years) participated. Participants were randomly assigned to one of six conditions in a 2 (selling format: QS vs. QI) X 3 (prime: implemental, deliberative, control) between-subjects design. All participants began by completing a task designed to prime one of three mindsets: implemental, deliberative, or control (no specific mindset). We adapted this priming procedure from Dhar, Huber, and Khan (2007)'s Study 4. As in that study, participants were asked to imagine that they were thinking about buying a car. Then, those in the deliberative condition then wrote down three pros and three cons of buying a car, and those in the implemental condition instead wrote down six steps they would need to take to buy a car. Those in the control condition instead wrote down six things they could do with a car. We expected that most participants would not actively be currently concerned with how to buy a car, and therefore expected that the control condition would match the deliberative condition (consistent with prior research, e.g., Henderson, De Liver, and Gollwitzer 2008). Thereafter, participants responded to a manipulation check (adapted from Brandstätter and Frank 2002): "Imagine you are about to buy a new car. Do you have a clear sense of what needs to be done to make this happen?" (1: Not at all to 9: Completely). Those in an implemental mindset should score higher on this measure.

On the following page, all participants read a scenario description, "Imagine you are online shopping at home. After some browsing, the following box pops up." An image displayed a pop-up with the words, "Scented Candle Sale! ~~$24.50~~ only $6.99!" Text beneath displayed, "in this store, you can buy up to 3 candles per purchase." Then, all participants answered, "What would you like you do?" For QS participants, the options were "Not buy any" and "Buy." For QI participants, the options were, "Not buy any," "Buy 1 candle," "Buy 2 candles," and "Buy 3 candles."

Thereafter, participants completed a 10-item Behavior Identification Form (BIF) questionnaire (Vallacher and Wegner 1989), which has been used to measure participants' momentary construal level (e.g., Burgoon, Henderson, and Markman 2013; Han, Duhachek, and Agrawal 2016). For each item, participants read a behavior (e.g., "Tooth-brushing") and choose one of two labels that they feel best describes the behavior—one that is abstract/high-level (e.g., "Preventing tooth decay") and one that is concrete/low-level (e.g., "Moving a brush around in one's mouth"). Participants received a score of 0 for each concrete construal they selected, and 1 for each abstract construal description; their responses were summed to form a BIF score.

At this point, QS participants who had previously indicated they would make a purchase selected the quantity. They answered, "How many candles would you buy?" with options 1, 2, and 3. We included this question after the BIF to ensure that the BIF could accurately capture differences in construal level after participants' initial purchase decisions, which is the point at which we find our effect. Finally, all participants provided demographic information.

Results: Manipulation check. As expected, participants responded to the priming manipulation check assessing their implemental orientation similarly in the deliberative (M = 7.58, SD = 1.58) and control conditions (M = 7.56, SD = 1.63; $t(816) = -.15$, $p = .88$). Thus, to maximize power in testing for a possible interaction with selling format, we combined these conditions and contrasted them against the implemental prime. Implemental participants scored significantly higher on the manipulation check (M = 7.78, SD = 1.43) than did deliberative and control participants (7.57, SD = 1.60, $t(1208) = -2.15$, $p = .03$).

Results: Purchase rates. QS participants were significantly less likely to purchase any candles (29.8%) than were QI participants (41.0%; $\chi^2(1, N = 1210) = 16.72$, $p < .001$, $\varphi = .12$). To test whether the priming manipulation moderated this quantity integration effect, we regressed purchase on selling format (QS vs. QI, effect-coded, i.e., -1 vs. 1), prime (implemental vs. deliberative/control, effect-coded) and their interaction. This analysis revealed a main effect of selling format ($\beta = .28$, $SE = .07$, $z = 4.31$, $p < .001$), wherein QI (vs. QS) participants were more likely to buy, but no significant main effect of the

prime (β = .03, *SE* = .07, *z* = .45, *p* = .66), and no significant interaction (β = .09, *SE* = .07, *z* = 1.39, *p* = .17). In fact, the pattern we found is directionally opposite of the one predicted by the above-mentioned mindset account. That is, the implemental mindset directionally increased the size of the effect, rather than attenuating it. These findings suggest that implemental mindsets are unlikely to explain the quantity integration effect.

Results: Construal level. We found no differences in construal level between the QS (*M* = 6.42, *SD* = 2.93) and QI formats (*M* = 6.33, *SD* = 2.85; *t*(1208) = -.50, *p* = .62). This persisted regardless of whether or not participants had made a purchase (*p*'s > .54). Regressing construal level on selling format (QS vs. QI, effect-coded), purchase (purchased vs. did not purchase, effect-coded) and their interaction revealed no significant effect of format (β = -.03, *SE* = .09, *t*(1206) = -.36, *p* = .72) nor of purchasing (β = .002, *SE* = .09, *t*(1206) = .02, *p* = .99), and no interaction (β = .03, *SE* = .09, *t*(1206) = .38, *p* = .71). Consistent with prior research (e.g., Tu and Soman 2014), and even though a full purchasing scenario separated the two, there was also a link between implemental mindsets and construal level, whereby participants who had initially been primed with the implemental mindset showed a marginally less abstract construal level (*M* = 6.16, *SD* = 3.00) than did control/deliberative participants (*M* = 6.48, *SD* = 2.83; *t*(1208) = 1.83, *p* = .07).

Results: Quantity purchased. In this experiment, among those who purchased, QS participants purchased significantly more candles (*M* = 2.23, *SD* = .82) than did QI participants (*M* = 1.93, *SD* = .88; *t*(426) = -3.57, *p* < .001). A regression predicting the amount purchased among purchasers from selling format (effect-coded), prime (implemental vs. deliberative/control, effect-coded) and their interaction uncovered only this main effect of format; there was no significant effect of the prime (*p* = .74) and no interaction (*p* = .62). Despite selling more units per purchaser, the QS format still sold fewer total candles overall (401; *N* = 605) than did the QI format (478; *N* = 605). Changing from a QS to a QI format increased total sales by 19% in this experiment.

Discussion. Implemental mindsets and abstract versus concrete construal do not appear to play a pivotal role in the quantity integration effect. Priming an implemental mindset did not attenuate the quantity integration effect (if anything, it non-significantly accentuated it), and the selling formats did not induce different levels of construal.

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