

**“Price Salience and Product Choice” by Tom Blake, Sarah Moshary, Kane Sweeney, and Steve Tadelis**

*Summary by Michelle Fang*

This paper studies the effect of price salience on whether a product is purchased and the quality of the product, conditional on purchasing. One way in which a product's purchase price is made more salient is that the fees are listed more clearly upfront. Theory predicts that when fees are made more salient, consumers reduce the quality and quantity of goods they buy because they perceive the product as being more expensive compared to when fees are hidden. Specifically, the authors study the quantity and quality choices of online shoppers in the context of percentage fees as salience changes the perceived marginal cost of quality, and show strong effects of salience on choice in the context of online ticketing. Many readers will have experienced the pain of shopping for tickets, choosing seats, and then learning about the platform's fees at the very end of the process. Existing behavioral theory predicts that the platform sells more tickets when it uses this method compared to prominently displaying fees up front. The paper uses data from Stubhub to test and confirm this conjecture.

Past research demonstrates that consumers experience trouble inferring final prices when taxes are not displayed and undergo a cognitive difficulty in calculating prices when presented as percentages instead of dollars. For instance, in the case when a percentage fee is applied to all goods in a market, price salience affects consumers in two primary ways. First, holding the final price constant, salience causes all goods to appear more expensive, which leads more consumers to opt out of the market. Second, increasing salience of a percentage tax increases the perceived marginal cost of quality, making the consumer more inclined to substitute a cheaper and lower quality good. Online event ticket sites offer a good setting to study the effect of price salience because researchers can experimentally vary the user experience, in particular, the place in the purchase funnel where fees are added to base prices. Using both a model and data from a large-scale field experiment with StubHub, the authors quantify the effects of price salience on consumer choice.

The authors create a model with a consumer who makes a purchase decision under either the Upfront Fee (UF) setting, where all fees are clearly displayed upfront, or the Back-end Fee (BF) setting, where fees are shown only at checkout. In both scenarios, consumer choice depends on the perceived price of the ticket rather than its true final price. The authors assume that upon reaching the checkout phase, when the actual price is revealed, the consumer will continue with the final stage of the purchase funnel instead of returning to the selection stage with a newfound understanding of the pricing model. The model assumes first, that consumers do not anticipate fees, in which case perceived prices may not be lower than actual prices, and second, that obfuscation and last-minute fees do not upset consumers. The model leads to two main predictions of fee obfuscation on consumer choice. First, a “quantity effect” is predicted where the consumer is more likely to purchase if she has invested to get to the end of the purchase funnel and finds a surprise fee than if she was presented with that fee at the start. Second, a “quality upgrade effect” is anticipated where consumers buy higher quality items under the Back-end Fee

treatment than they would under the Upfront Fee treatment. Overlooked in earlier studies due to a lack of vertical product differentiation in study settings, the quality effect presents itself when BF consumers, conditional on purchasing, upgrade to higher quality tickets compared to UF users.

The dataset is generated from an experiment conducted in August 2015 by StubHub, a leading online secondary ticket marketplace. Originally, StubHub used an UF strategy where the consumers' first viewing of the ticket inventory showed its final price including fees and taxes. StubHub then experimented with a BF strategy where fees, such as shipping and handling, were only shown after a consumer had selected a ticket and proceeded to the checkout page. StubHub randomly selected 50% of users for the UF experience and the remaining 50% were BF users. The experiment thus creates variation in salience while allowing detailed data of consumer choices, signals of purchase intent, and final purchases to be measured.

The dataset allows the authors to show that price obfuscation distorts both quality and quantity decisions for product choice. The paper presents several findings. First, the authors find that a BF strategy leads to approximately a 21% increase in total revenue. Then, they decompose the impact of obfuscation on the quantity and quality of tickets purchase and found that 28% of the revenue boost can be attributed to the quality upgrade effect. Consumers upgrade to higher quality products when they observe lower prices initially. Finally, the authors use the dataset to consider other possible forces that might influence salience, including: misinformation, search friction, and seller responses.

Specifically, the price salience experiment at StubHub was conducted between August 19 and 31 of 2015. Treated consumers assigned to the BF experience were initially shown ticket prices without fees which were added at the checkout stage. Control consumers assigned to the UF experience were shown prices with all fees included as well as clear announcements that the prices shown included all fees. The authors measure the difference in the likelihood of a BF and UF user purchasing at least one ticket. They call this the "quantity effect." The change in average price of a ticket conditional on purchasing at least one ticket is called the "quality upgrade effect." The BF treatment caused both quantity and quality effects relative to the UF treatment; postponing fees to check-out caused more consumers to purchase tickets and more expensive tickets. The change in the likelihood of purchasing a ticket and the average purchase price drive the change in StubHub's revenue.

The experiment was performed on several million users who visited the ticketing platform during the 10-day experimental period. The authors can track site visits since a user's last cookie-reset; they found that BF and UF users are likely to visit the site at similar hours of the day and equally likely to use Apple computers, giving them confidence that randomization was successful. The authors also refer to a second experiment that StubHub performed in 2012 that was randomized at the event level rather than the user level. This experiment serves as a robustness check for the 2015 experiment as the earlier study is not affected by a potential contamination concern across groups because tickets to each event retain their treatment status.

The paper finds that the differences in purchase can be observed in terms of quality, quantity, and revenue. The quality upgrade effect is demonstrated by BF users who,

conditional on purchasing, spend 5.42% more than UF users over a 10-day period. The authors provide supporting evidence using data on seat locations. BF users are more likely to purchase first row seats, row A through D, and the likelihood declines for rows later in the alphabet. Moreover, the results show that price obfuscation increased the consumer's propensity to purchase at least once over the 10-day experimental time period by 14.1%. Additionally, within each cookie session, consumers in the BF group are 12.43% more likely to purchase a ticket during that visit. Since the 10-day elasticity is larger than the session elasticity, the authors believe that the long-run effects of salience may be even greater than the levels estimated in their experiment. Finally, consumers in the BF group spend almost 21% more than those assigned to the UF group. The authors find revenue effects in the same day and over the 10-day experiment period to be large and statistically significant at the 1% level. Specifically, StubHub's data revealed that obfuscating a 15% fee leads to a 21% increase in revenue.

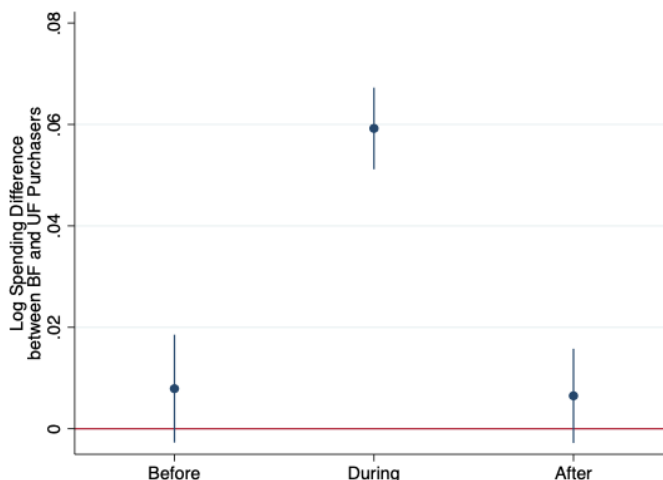
Furthermore, the authors use individual-level click stream data to explore how consumer behavior relates to misinformation. BF users are more likely to exit at checkout, after first seeing the fee, while UF users are more likely to exit before selecting any ticket. Moreover, BF users are more likely to go back multiple times to examine other ticket listings, which suggests that Back-end Fees make it more difficult for consumers to compare prices. Conditional on arriving at the review and submit page, BF users are 19% more likely to select tickets than UF users but are 45% less likely to purchase at checkout. The authors present evidence that obfuscation will widen consideration sets. Since StubHub presents their ticket inventory in a price ascending order, consumers view expensive tickets by actively scrolling down. BF users scroll 10% more often, a statistically significant difference at the 1% level. Data from cookies show that BF users are 56% more likely to view multiple ticket listing. Consumers viewing more than two tickets suggests that price obfuscation effects extend beyond an initial confusion of fees.

Another important question that the authors raise is whether consumers learn about fees over time. For instance, a consumer could behave in three ways after their first experience on StubHub. First, consumers can act as if they don't anticipate fees every time they visit the site to purchase a ticket. Second, consumers could anticipate a fee but can't predict the exact level. Third, once a consumer makes a purchase, they can learn to update their beliefs of StubHub fees so that they don't make the same mistake twice. The authors acknowledge that experienced users may react differently to salience due to other reasons, such as an increase in income. However, they hypothesize that frequent StubHub users would be more aware of fees and less sensitive to salience. The authors used the number of visits to StubHub prior to the experiment saved on cookies to measure user experience. Since a former study demonstrates that 31% of users clear cookies within 30 days, this is only a short-term measurement of experience. Splitting users into three groups—new users (no recorded visits), low experience (1-9 visits), and high experience (10 or more visits)—the authors found that the treatment effect is smaller for high experience users. The revenue effect is 15% for high experience users compared to 21% for new or low experience users. Thus, it can be inferred that the impact of changing salience is stronger in markets where consumers purchase infrequently.

Moreover, the paper examines the relationship between user churn and price obfuscation—specifically, whether the misinformation would cause marginal BF

consumers to abandon StubHub after seeing the fees in the checkout stage. The data reveals that BF users are 3.3% less likely to churn. Even though BF users might be upset by the actual price revealed at the end, they may also learn about StubHub's reliability, speed, and quality.

Figure 4: Spending Before, During, and After the Platform Switch to Back-end Fees

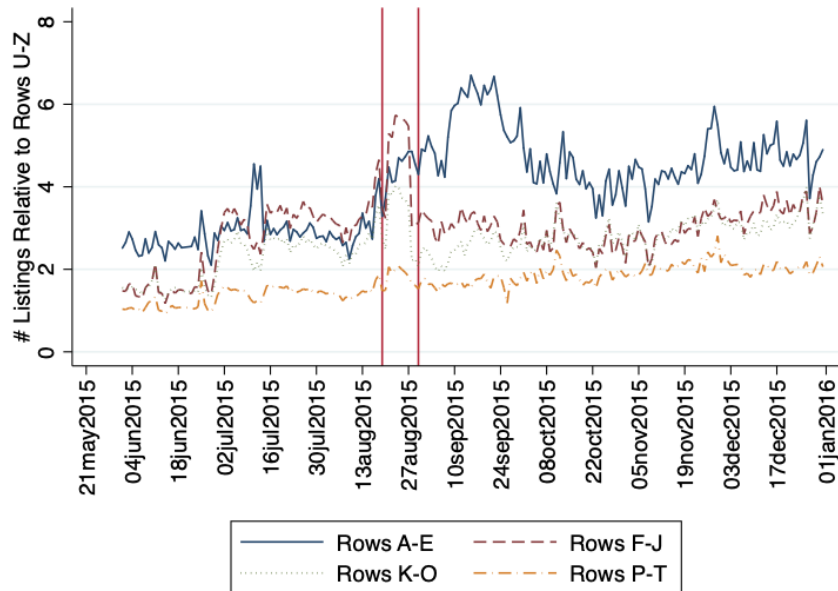


Ultimately, the comparison shows that salience effects will persist beyond the initial shock consumers experience due to misinformation. On September 1, 2015, StubHub switched entirely to BF, making the only difference between users assigned to BF and UF their relative experience with back-end fees. This tests whether salience effects are short-lived, checking whether previous UF users experiencing BF for the first time will spend more than previous BF users. The authors find that salience effects are persistent, meaning that users do not learn to anticipate the correct fee level, even after going through the purchase funnel with back-end fees.

The authors also examine how their findings relate to competition in the market. The authors reviewed data on search queries for its main competitors, Ticketmaster and SeatGeek, on GoogleTrends. The increase in SeatGeek queries in August of 2015 demonstrates that consumers attracted by BF at StubHub do not negatively affect its competitors' queries. Therefore, StubHub switching to BF is market-expanding.

Additionally, the authors investigated sellers' responses to the change from the UF to BF experience. After StubHub shifted entirely to Back-end Fees, consumers were more likely to purchase more tickets and more expensive tickets. The two-sided nature of the platform should influence sellers to list more expensive and higher quality tickets. The authors used row-numbers as a proxy for quality (A-E are front rows and U-Z are back rows) and found that sellers chose to list higher quality tickets after the platform transitioned to Back-end Fees. Estimates show that a ticket on StubHub is 15% more likely to be in row A than row B after the switch to BF.

Figure 7: Fraction of Listings by Row Letter



This supports previous research (Ellison and Ellison 2009) that sellers respond to the change in buyer experience. While most of the paper focuses on consumer behavior, this finding demonstrates that seller behavior changes too. The nature of two-sided markets creates these externalities which later complicates welfare analysis. For example, if price obfuscation increases seller profits, then more sellers might enter the marketplace, increasing selection and competition, and creating an offsetting effect that helps buyers. Overall, the increase in quality listings demonstrates that changes to one side of the market affect the entry decisions on the other side.

In conclusion, the authors use a dataset from the ticketing platform StubHub to demonstrate that hiding additional buyer fees until the checkout page will increase the quantity and quality of the product purchased, causing total revenue to increase by around 20%. In terms of economics, shrouding buyer fees increases the quality and quantity of goods purchased. The paper provides evidence to show how these effects extend beyond the first purchase and influence experienced users.