

# Some online shoppers pay more than others, study shows

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Internet users regularly receive all kinds of personalized content, from Google search results to product recommendations on Amazon. This is thanks to the complex algorithms that produce results based on users' profiles and past activity. It's Big Data at work, and it's often advantageous for users. But such personalization can also be a disadvantage to buyers, according to a team of Northeastern University researchers, when e-commerce websites manipulate search results or customize prices without the user's knowledge—and which in some cases leads to some online shoppers paying more than others for the same thing.

This transparency issue is at the core of a first-of-its-kind study co-authored by five Northeastern faculty and students, including assistant professors Christo Wilson and Alan Mislove of the College of Computer and Information Science and professor David Lazer, who holds joint appointments in CCIS and the College of Social Sciences and Humanities.

In a new research paper, the team examined 16 popular e-commerce sites (10 general retailers and six hotel and car rental sites) to measure two specific forms of personalization: price discrimination, in which a product's price is customized to the user; and price steering, in which the order of [search results](#) are customized to the user.

"Overall, we find numerous instances of price steering and discrimination on a variety of top e-commerce sites," the authors wrote.

Among their findings:

- The researchers found evidence of personalization on four general retailers and five travel sites, including cases where sites altered prices by hundreds of dollars. Overall, travel sites showed price inconsistencies in a higher percentage of cases, relative to the controls.
- Cheaptickets and Orbitz implemented price discrimination by offering reduced prices on hotels to "members."
- Expedia and Hotels.com steered a subset of users toward more expensive hotels.
- Home Depot and Travelocity personalized search results for users on mobile devices.
- Priceline personalized search results based on a user's history of clicks and purchases; users who clicked on or reserved low-price hotel rooms received slightly different results in a different order, compared to users who clicked on or reserved expensive hotel rooms or clicked on nothing. However, because the different orders did not correlate to prices, this wasn't considered price steering.

Overall, most of the researchers' experiments on the 16 e-commerce sites did not reveal evidence of price steering or price discrimination. But price differences were significant in some of the cases where they did find this evidence, and the researchers reported that they reached out to the six companies identified in the study as implementing some form of personalization.

Their work—which will be presented at the 2014 Internet Measurement Conference in Vancouver next month—represents the first comprehensive study of e-commerce personalization that examines price discrimination and price steering for hundreds of actual users as well as many more synthetically generated fake accounts. The researchers

selected what e-commerce sites to study based on informal rankings of the "top" sites. They noted that popular sites such as Amazon and eBay were excluded because they function as online marketplaces, while companies like Apple were omitted from the study because they only sell their own products.

Wilson noted that he and his co-authors didn't seek to judge whether these practices are good or bad, stressing that price discrimination isn't an inherently sinister ploy to take advantage of people. In fact, it happens every day when someone gets a senior discount at the movies or a college student gets a price break on books. Indeed, coupons are technically forms of price discrimination, he said. The key factor is whether these practices are transparent. In most cases, discounts for select groups of people are clearly posted and widely understood, but the Northeastern researchers said such behavior is much harder to detect on e-commerce sites.

This unknown served as the primary inspiration for the team's study, which was conducted in April and May. The team examined each [site's](#) activity for typically over a two- to three-week period. The researchers developed a sophisticated methodology that set a range of controls to ensure that they could accurately identify evidence of price discrimination and price steering.

Here's how it worked: Let's say you want to buy a hammer through Sears' online site. Not only would you search for it using your personal laptop or smartphone, but you would also fire off identical queries at the exact same time from clean accounts devoid of cookies and search and purchase history. In theory, the results should be identical. There might be what is referred to as "noise"—inconsistencies that aren't due to personalization but rather other factors such as changes in inventory or the geographic diversity of the datacenters housing these e-commerce sites. But if the "noise" in your laptop search is greater than the "noise"

in the synthetic accounts, then you've got price discrimination or steering.

The higher-level goal of the group's research, Wilson said, is to study the effect of personalization algorithms on the Web, which goes hand-in-hand with the proliferation of Big Data.

"I get this question from people all the time: 'How do I get the best price?' The truth is I don't have a good answer," Wilson said. "It changes depending on the site, and the algorithms they use change regularly. Good advice today might not be good advice tomorrow. The point is that as a consumer, you're at a disadvantage unless it's transparent."

Provided by Northeastern University

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