

Title: The Effects of Online Review Platforms on Restaurant Revenue, Survival Rate, Consumer Learning and Welfare

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Abstract: This paper quantifies the effects of online review platforms on restaurants and consumer welfare. Using a novel dataset containing restaurant revenues and information from major online review platforms, I show that online review platforms help consumers learn faster about restaurant quality. The effects on learning show up in restaurant revenues and survival rates. Specifically, doubling consumers' exposure to Yelp, the dominant platform, increases the revenue of a high-quality new independent restaurant by 8-20% and decreases that of a low-quality restaurant by a similar amount. Doubling Yelp exposure also raises the survival rate of a young high-quality independent restaurant by 7-19 basis points and reduces that of a low-quality restaurant by about the same degree. Other platforms have similar effects but in smaller magnitude. In contrast, online review platforms do not significantly affect the revenues or survival rates of chains and old independent restaurants. Building on this evidence, I develop a structural demand model with social learning. Counterfactual analyses indicate that online review platforms improve the welfare for restaurant goers by \$2.5 per person per meal, equivalent to a 12.6% discount on the average meal price. Despite large effects on individual restaurants, online review platforms have little impact on the total industry revenue.

Keywords: consumer learning, online platforms, Hidden Markov models, dynamic structural models, differentiated products

Methodology: difference-in-difference analysis, structural demand model with Bayesian learning

Contribution: The contribution of this paper is three-fold: (1) First, the paper is the first that quantifies the welfare value of online review platforms by estimating a demand model with social learning. In particular, it incorporates learning from both online reviews and other information sources, a feature that allows a more accurate account of the effects of online reviews than most models in the existing literature. (2) Second, this paper is the first to document a number of empirical results, including online reviews' effect on survival rates of firms, their opposite effects on high- and low-quality young independent restaurants, zero effect on chain restaurants, and the dominance of Yelp's effect over other platforms'; (3) Third, I develop a novel structural demand model with social learning that utilizes the aggregate revenue data at the product level. The constant expenditure model is particularly convenient for expressing consumers' utilities in terms of revenues instead of quantities. The combination of a social learning model with a constant expenditure model to estimate demand using aggregate revenue data is new.

Dynamics: The social learning model incorporates Bayesian learning, which makes the demand of restaurants state dependent and thereby **dynamic**. I use Gaussian Hidden Markov approach to estimate the structural demand model.