

Payment Choice using Big Data: New York Taxis

Krzysztof Wozniak*

Federal Reserve Board

January 15, 2019

Extended Abstract

The market for payments is a preeminent example of a two-sided market, wherein participants on each side of the market provide each other with network benefits. In retail payments, although the payment choice lies with the end user making the payment, their decision is impacted by multiple considerations from both sides of the market. These include adoption decisions, such as the end user's decision to adopt a payment method and the merchant's decision to accept it, as well price and non-price incentives faced by end users. Interestingly, the price incentives are often concentrated on one side of the market. For example, banks use rewards to incentivize end users to use payment cards, but merchants rarely surcharge payment card usage, either because such a practice is explicitly prohibited, or because they are afraid of driving their customers away. This paper aims to understand the extent to which merchants can use non-price mechanisms to influence end users' payment choice.

In this paper, we use the New York TLC data set of taxi trips to investigate the extent to which merchants can impact end users' payment choice. The data set contains information on more than 6 billion taxi trips taken in New York City and surrounding areas over the course of 2013; key variables for our analysis include payment choice, pickup and drop-off addresses, and a unique taxi driver identifier. Our identification strategy takes advantage of a unique feature of the taxi market, namely that merchants (taxi drivers) conducts business in multiple locations (pickup address). This allows us to use driver- and location-fixed effects to separately capture unobservable demand-side and supply-side characteristics, respectively. We find that, despite not being able to offer monetary incentives to their customers, taxi drivers can have a significant impact on their payment choice: examining drivers by their ability to encourage cash usage, drivers at the 90th percentile can make it almost 20 percentage points more likely that a customer will pay cash, relative to drivers at the 10th percentile.

Our paper sets out to take full advantage of the available data set by using the entire data set in the analysis. We are able to do this thanks to judicious application of frontier programming

*Authors' affiliation: Federal Reserve Board, 20th and C Streets NW, Mail Stop 188, Washington, D.C. 20551.

techniques, including parallel processing on a high-performance cluster environment, as well as distributed file systems that greatly reduce memory requirements associated with analyzing big data.

References

- Brian, Gabriel Krummenacher Mario Lucic McWilliams and Joachim M. Buhmann**, “Fast and Robust Least Squares Estimation in Corrupted Linear Models,” *Advances in Nueral Information Processing Systems Paper*, 2014.
- Buchholz, Nicholas**, “Spatial Equilibrium, Search Frictions and Dynamic Efficiency in the Taxi Industry,” *Working Paper*, 2018.
- Farber, Henry S.**, “Why you Can’t Find a Taxi in the Rain and Other Labor Supply Lessons From Cab Drivers,” *Quarterly Journal of Economics*, November 2015, *130* (4), 1975–2026.
- Guillaume, Alessandro Lizzeri Frechette and Tobias Salz**, “Frictions in a Competitive, Regulated Market,” *Working Paper*, 2018.
- Haggag, Kareem and Giovanni Paci**, “Default Tips,” *American Economics Journal: Applied Economics*, July 2014, *6* (3), 1–19.
- Jackson, Kirabo and Henry S. Schneider**, “Do Social Connections Reduce Moral Hazard? Evidence from the New York City Taxi Industry,” *American Economics Journal: Applied Economics*, July 2011, *3* (3), 244–267.
- Kareem, Brian McManus Haggag and Giovanni Paci**, “Learning by Driving: Productivity Improvements by New York City Taxi Drivers,” *American Economics Journal: Applied Economics*, January 2016, *9* (1), 70–95.
- Nicholas, Matthew Shum Buchholz and Haiqing Xu**, “A Closed-Form Estimator for Dynamic Discrete Choice Models: Assessing Taxicab Divers’ Dynamic Labor Supply,” *Working Paper*, 2017.
- Paramveer, Yichao Lu Dean Foster Dhillon and Lyle Ungar**, “New Subsampling Algorithms for Fast Least Squares Regression,” *Advances in Nueral Information Processing Systems*, 2013.
- Thakral, Neil and Linh T. To**, “Daily Labor Supply Adaptive Reference Points,” *Working Paper*, 2018.