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NBER Digitization Tutorial

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Course of Graduate Study Pursued

I enrolled in the Ph.D. program in Economics at the University of Michigan in the year 2015. In the first year, I completed hard-core courses in economics (including microeconomics, macroeconomics, and econometrics), and passed the comprehensive examinations on microeconomics and macroeconomics. In the following years, I completed three sequences of field courses: industrial organization, advanced microeconomic theory, and advanced econometrics. At the end of my second year, I passed the comprehensive examinations on industrial organization and game theory, and econometrics, and became a Ph.D. candidate. My average GPA is 4.0.

My major fields of interests are Industrial Organization and Applied Microeconomics. My minor field is econometrics.

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Research Statement

My general research interests are in the platform economy. Topics that I am highly interested in include competition within and between platforms, consumer search on platforms, and providers' behaviors on platforms.

Digitization is deeply embedded in the platform economy. On the one hand, digitization brings digital goods and services, such as mobile applications and programming services. These digital goods and services are typically provided in platforms. On the other hand, digitization of consumers' and providers' information raises concerns about potential harm on consumer privacy and welfare. For example, providers on the same platform can track competitors' prices and update their prices more frequently than before, which might lead to pricing coordinations. I am interested in all of these topics.

My research project in progress is about consumer search and provider competition in mobile application platforms. It is motivated from two observations. Firstly, preferential ranks are widely used by platforms for their own products. Examples include Internet Explorer in Microsoft, YouTube Music in Google Play Store, and Apple Music in Apple's App Store. Secondly, public concerns about such platform behaviors are rising yet unsolved: both the EU competition Officials and the U.S. Justice Department have taken the first steps toward an antitrust case against Apple recently. This project asks and answers: what is the welfare effect of preferential search ranks of platform-owned products. It uses data on Apple's app store from April 2018 to February 2020 as the empirical context.

Theoretically, preferential search ranks of platform-owned products could be good or bad for consumers. On the demand side, if consumers strongly prefer platform-owned products to others such that the platform-owned products deserve the preferential search ranks, it would be good to remain the preferential search algorithm. On the supply side, less preferential search ranks of platform-owned products may encourage independent suppliers to provide better products at lower prices since they are more visible to consumers. Therefore, whether preferential search ranks of platform-owned products are welfare-improving remains theoretically ambiguous.

Methodologically, this project organically combines reduced-form analysis and structural estimation. Firstly, it exploits a natural experiment in Apple's app store to find causal effects of preferential search ranks of Apple's apps on independent apps. The natural experiment is an ex-post reported search algorithm change that made Apple's apps look less prominent in search results.[1] I set treatment group as independent apps in categories that have Apple's apps, and control group as independent apps in categories that do not have Apple's apps. A standard difference-in-differences analysis shows that with less preferential search ranks

[1] https://www.nytimes.com/interactive/2019/09/09/technology/apple-app-store-competition.html

of Apple's apps due to the algorithm change, the search ranks of independent apps indeed become higher by 3% , and downloads of independent apps increase by 9%, update levels of independent apps have also increased. However, there is no significant causal effects on prices or the conversion rates from search to downloads. These reduced-form evidences show two things. Firstly, search rank is an important shifter of search costs, and it significantly affects market outcomes in this digital marketplace. Secondly, update frequency is an important way of competition between providers, and it would be significantly affected by the preferential search algorithm.

Consistent with reduced-form evidence, demand estimates show that search ranks significantly affect consumer search costs. Moreover, demand estimates also reveal that consumers indeed prefer Apple's apps to others, as argued by Apple. However, a regression of search ranks on Apple-ownership shows that Apple's apps still enjoy 66 significantly higher preferential ranks than non-Apple apps, after accounting for differences in observed and unobserved qualities. It implies that consumers' preferences for Apple's apps cannot justify the preferential search ranks of Apple's apps. Finally, a two-stage update choice game is developed and estimated on the supply side to rationalize both update-or-not choice and the choice of update levels of providers. Counterfactuals are designed to quantify the change in welfare if the preferential weights on Apple's apps were lower in search results.

This project is a starting point of my journey into the platform economy. I believe I will have good use of economics of digitization in my future and deeper studies into the platform economy. I am looking forward to hearing presentations by, and to interacting with research leaders in the area of the economics of digitization. I am also highly interested in learning about the frontier research in this area during the NBER Digitization Tutorial.