The Company We Keep: Endogenous Network Formation and Peer Effects in Churning

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Abstract

Understanding consumer churn behavior is of paramount importance for companies as it informs retention campaigns. Peer effects in churning are of particular interest in a wide range of products and services that are consumed in a social manner, such as mobile phone services, fitness club memberships, massively multiplayer online games, etc.

This paper contributes by addressing the endogeneity in peer connections, which is an acknowledged issue in empirical studies aimed to measure peer effects. This endogeneity presents a valid concern in modeling peer effects in churn and has not been addressed in this domain. We recognize that unobserved (by the researcher) individual characteristics might factor into both defining consumer's social connections *and* into her decision to churn. Therefore, estimates of the influence of churn of a consumer's peers on her churn will be biased if her choice of peers is not accounted for.

To tackle the peer network endogeneity issue, we model both the process of social network formation and the choice to churn. Following the methodology recently developed in Griffith (2018), who models the social networks of schoolgirls in India, we set the network formation as a simultaneous game, where agents make connection choices on a continuous scale, thus deciding on the connection strength. This approach allows the researcher to drastically reduce the computational burden typically associated with empirical estimation of network formation games and to recover the unobserved individual-specific parameters that affect both peer network formation and decision to churn. We then use the recovered unobserved individual-specific parameters to correct for peer connections endogeneity in the peer effects model of churn. Our peer effects model of churn is conditional on the observed network in which peers' decisions to churn are weighted by the connection strength. We also deal with the reflection problem by solving for the decision to churn as a fixed point to the system of peer effects equations.

We use data from the popular massively multiplayer online game *World of Warcraft,* where gamers form groups, known as guilds, to complete in-game tasks and to progress through the game content. In this product category, strong peer connection endogeneity is likely: less seasoned gamers tend to connect better and play more with other novices with little experience of playing online games in the past, due to lingo barrier and limited prior exposure to gaming culture; that unobserved "novice to gaming" characteristic can also explain dropping out of the game early. We find significant evidence of peer connections being explained by the unobserved structural parameters, in addition to observables, such as a game level achieved and some in-game demographics. Based on our estimation results, we run simulation studies to investigate how churn dynamics is affected by composition of gamers in the guild. We provide recommendations to inform company's policy of inducing formation of guilds with lower gamer churn rates.

Keywords: consumer churn, peer effects, network formation, network endogeneity, online games.