Understanding Changes in Purchase Behavior due to Aging for Consumer Goods: A Hierarchical Gaussian Process Approach

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Abstract

In many countries, aging of the population has become an increasingly important issue among marketers. As the population of senior consumers grows, demand for certain product categories is expected to change and marketers need to appropriately re-design marketing strategies for better capturing their needs and wants. Despite its importance, the relationship between aging and actual purchase patterns is under-studied due to limited data availability. The goal of this paper is to estimate dynamic changes in purchase behavior due to aging, using unique individual-level panel data that keep track of the same group of consumers' purchases over ten years at a large supermarket in Japan. We extend age-period-cohort analysis by modeling dynamic changes in purchase behavior using a Hierarchical Gaussian Process. Our approach allows us to separately identify population-level changes in purchase behavior due to aging from cohort and period effects without making ad hoc functional form assumptions. Furthermore, it allows us to estimate dynamic unobserved heterogeneity that captures individual deviations from the population average. Together with a large scale survey on lifestyles, we are able to examine how observed consumers' lifestyles explain the unobserved individual deviations. Using 36 consumer goods categories, we study the effects of aging on category spending, # unique items bought, average paid price, and # new product trials, and show that the effects of aging vary significantly across product categories and across purchase behavior measures. We group the 36 product categories into several groups based on the estimated patterns of aging effects, and discuss appropriate marketing strategies for each group of product categories.

Keywords: Aging and Category Purchase Behavior, Age-Period-Cohort Analysis, Hierarchical Gaussian Process

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