Reading note on Carrasco et. al. (2005)

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Does habit exist in household consumption? While previous papers have examined habit persistence, they do not control for individual household unobserved heterogeneity. By using records of household consumption spanning eight consecutive quarters, the authors rule out the household fixed effect with "estimation in difference." Overall, they show habit formation in food consumption but limited evidence of habit in service and no evidence of habit in transportation consumption.

Since habit can explain various observations, such as the excess consumption smoothness in light of income shocks, some researchers model habit in their theory and see their predictions improved. However, scholars still lack convincing micro evidence of habit formation. Past attempts to tackle this problem face unobservable household heterogeneity that may lead to overestimation or underestimation of the habit effect. This paper deals with the problem using panel consumption data, which covers eight consecutive quarters. The number of periods allows the authors to identify habits while controlling for time-invariant unobservables.

Modeling habit (or "intertemporal separability") into the utility functions, the authors then present two equations, MRS and Euler equation, to estimate the habit parameter. The basic idea to rule out household fixed effects is to estimate the difference between two consecutive periods. The difference then takes away the fixed effect in the error term by extra transformation. However, since the error term now includes two periods of choice variables, they must use the choice variables before these two periods as instruments to estimate the difference equations. With data on the consumption of foods, services, and transportation, the authors present the findings of the habits in each three consumption categories.

Without controlling for household heterogeneity, the results do not show evidence of habit formation (i.e., cannot reject the null hypothesis of $\gamma_j = 0$), which aligns with the conclusion of previous research. Using estimation in difference, however, the authors find evidence of habit formation in food and service consumption for the MRS equation. Estimates in the Euler equation support habit formation in food but not in service or transportation. The discrepancy between the two sets of results demonstrates that the household time-invariant, unobserved variables hide the effect of habits. Lastly, the authors show the price and income elasticities of the two MRS estimations (levels and in difference) to

explain the appropriateness of using the "estimation in difference" approach. The results using difference appear to be more convincing since the elasticities derived from this approach are more consistent with past literature.

The main strength of this paper is that it controls for household fixed. Their findings on habit formation are thus more convincing than previous research. Evidently, its strong empirical strategy benefits from the completeness of the data. The final dataset contains 2606 observations with at least five consecutive interviews. In addition, information on three main categories of household expenditure, food, service, and transportation, allows for a comprehensive investigation of habits.

Despite the authors' innovative strategy, this paper is less satisfying in some ways. First, the article falls short of explaining the different findings for three good categories. To explain why we see no evidence of habit in transportation expenditure, the authors justify by saying they do not include durable goods in transportation category. However, we should not include durable goods in a study of quarterly consumption habits anyway, so their justification is questionable. Second, the F-test for MRS and Euler returns a relatively low range of values: 2.15- 18.38. This range suggests weak instruments since the conventional rule of thumb is 10. Finally, the paper is confusing to read. The authors use many different terms that could baffle the readers. For example, the terms "intertemporal separability," "intertemporal substitution effect," and "habit formation" appear to have similar meanings, so the readers may be confused when these terms occur together without proper discussion. The structure is also not straightforward as some additional test outcomes are often written in between the main results. Notwithstanding its shortcomings, the paper could be the first compelling micro-level evidence of habit in consumption, contributing significantly to the study of intertemporal consumption behavior.