CONSUMER BUYING BEHAVIOR ON THE INTERNET: FINDINGS FROM PANEL DATA

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Online retailing became big business in late 1998, as millions of people placed orders for holiday gifts online and retailers scrambled to upgrade their distribution networks to cope with the growth (Cyberatlas.com, 1999). Companies planning for the growth of online retailing need reliable estimates of the growth of online shopping. Data about online consumer purchasing behavior are also needed to help companies define their online retail strategies for Web site design, online advertising, market segmentation, product variety, inventory holding, and distribution. Forecasts are more likely to be reliable if they are based on the behavior of online consumers, rather than consumers' stated intentions, or worse, the guesses offered by Web marketing "experts."

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TABLE I
Advantages and Disadvantages of Panel Data for Survey Research

Advantages	*Disadvantages*
Additional measurement precision by matching responses from one time period to another	Panel "conditioning" may bias responses (also called "testing effect") in that panel members become atypical as a result of being on the panel
Observe changes in *individual* behavior over time as well as monitor behavior of particular cohorts over time	Panel attrition may cause response bias although incentives can reduce this
Panel data are generally more accurate than cross-sectional data	Panel selection bias—respondents are not representative of the underlying population (e.g., exclude very rich or very poor or transitory)
Although expensive to establish initially, the costs of panels can be lower over the long term.	
More information can be collected since existing background information need not be repeated each time period.	

The Wharton Virtual Test Market[1] (WVTM), started in November of 1997, is both an ongoing survey of Internet users concentrating on electronic commerce and an online-laboratory that can help gauge customer reactions to new strategies and products. It offers an inexpensive and efficient way to estimate the size and composition of the online consumer population and a means to gain feedback on new products and approaches. Because the WVTM is also providing one of the few sources of panel data measuring changes in the behavior of online consumers over time, it is as—we will argue later—particularly useful for understanding trends.

This paper reports the findings from the second year of the WVTM survey—the first opportunity to examine how individual panel members have changed over time. We first summarize the advantages and disadvantages of using panels for collecting data, and then describe the techniques used to create an online panel (the WVTM) to collect data about consumer purchasing behavior on the Internet. Our major contribution is the results of the second

survey of WVTM panelists (hereinafter referred to as the WVTM2)—in particular the changes over time within individuals that only a panel such as the WVTM can reveal. We then close by modeling changes over time within individuals to forecast total online spending for the year 2000 using a Monte Carlo simulation.

Panel Data

Panels are used widely in market research to study consumer purchase patterns, test new products, and evaluate promotional campaigns. Panel surveys use longitudinal data comprising responses to the same or similar questions by the same participants over more than one time period.

Dynamic panels rotate panel members to maintain a representative sample of the population and to reduce testing effects or panel conditioning (dynamic panels provide the audience estimates for TV ratings). In contrast, static panels only retain the original panel members and, apart from unavoidable attrition, do not change over time (e.g., a study of the careers of people who graduated from high school in 1972).

The advantages and disadvantages of panel data are listed in Table 1. Panel data have three major disadvantages, or unique sources of bias: attrition bias, panel selection bias, and condi-

[1] The Wharton Virtual Test Market is one of the major research projects sponsored by the Wharton Forum on Electronic Commerce, a research group funded entirely by corporate sponsors.