Using longitudinal methods for analysis of a short-term transportation demonstration project

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Abstract. This paper documents an application of panel, or longitudinal data collection in the evaluation of a TSM (Transportation Systems Management) demonstration project. The project was a four-week demonstration of staggered work hours in downtown Honolulu during February—March 1988. The 4 wave panel survey elicited commuting experiences of approximately 2,000 downtown employees at two week intervals before and during the project. The sample involved both employees who participated in the project by shifting their work hours, and those who did not. The panel survey was augmented by floating-car observations of travel times on major routes into downtown Honolulu on the same four dates.

The purpose of the analysis was to determine whether employee commute times were affected, and if so, how these changes were distributed among various employee segments. Two methods were used. First, travel time changes were estimated using paired t-tests. Second, regression equations were used to estimate project time savings as a function of trip length, route, and location of residence. Results show that travel time savings due to the project were typically small, less than ten percent. Nonparticipants experienced greater savings than participants, and some segments of participants experienced longer travel times during the project. The panel method proved to be an effective way to measure project travel time impacts and shows that the method is appropriate in short time applications.

1. Introduction

Longitudinal, or panel, analysis has become the method of choice for many aspects of travel behavior research. Longitudinal methods have been advocated because of the dynamic nature of the travel choice process (Clarke, Dix & Goodwin 1982; Davies & Pickles 1985; Kitamura 1990).
These dynamics include dependencies among travel choice sequences, lags and leads in responses to changing conditions, and interrelationships between perceptions, attitudes and choices. Under such conditions, longitudinal methods are required to properly specify relationships between travel choice factors and establish causality. Longitudinal methods have also been advocated because of their superior statistical efficiency and capacity to measure small changes compared to cross-sectional methods (Smart 1984; van de Pol 1984; Uncles 1988). Finally, longitudinal methods are particularly appropriate for analysis of attitudinal responses (Duncan, Justin & Morgan 1987).

The primary focus of longitudinal analysis has been on behavioral changes that can be effectively observed with panel survey waves one year apart, e.g., car ownership and mode choice, or life cycle characteristics and car use. The existence of several extensive panel surveys have made it possible to examine these "macrodynamics" processes (Clarke, Dix & Goodwin 1982). Some examples include the Dutch Mobility Panel (Golob, Schreurs & Smit 1985), the Michigan Panel Study of Income Dynamics (University of Michigan Survey Research Center 1972) and the Australian Automobile Panel (Hensher 1986). Long and intermediate term dynamics are particularly amenable to panel data; problems of sample consistency and retrospective data are minimized, while external temporal changes can generally be controlled.

Longitudinal methods have been used less frequently in short-term analysis, although their advantages with respect to measurement of small changes and of attitudinal responses are clear. This paper presents results of a panel study of responses to a short-term change in employee work schedules. The study provides a comprehensive evaluation of employee travel experiences, and thus demonstrates the advantages of using longitudinal methods for this type of research problem.

2. The research problem

The State of Hawaii conducted a one month staggered work hours demonstration Project to determine whether a large-scale shift in work hours among downtown workers could reduce traffic congestion. Evaluation of the Demonstration Project had several objectives:

- to determine the magnitude and pattern of traffic impacts, if any;
- to identify Project impacts on employees both at home and at work;
- to assess employee perceptions of the Demonstration Project; and