Chapter 5

Measuring Welfare in Discrete Choice Models

5.1 Introduction

In their daily lives, consumers choose discretely–what model of car to buy, which beach to visit, whether to use public transportation, and so on. On the surface, the neoclassical model of preferences and demand appears ill-suited to analyzing such discrete choices or to providing a framework for welfare analysis. Nevertheless, there is a well developed and useful literature on econometrics and welfare measurement in this choice setting. The heart of this literature is the McFadden (1974) random utility model, which found its initial applications in transportation. Hanemann (1978) was the first to develop and apply this approach to valuing environmental and natural resources.

The random utility model, as a basis for discrete choice modeling and welfare measurement, departs from the standard neoclassical model in two ways. First, it models an individual's behavior on a *choice occasion*–that is, it models a single choice among a finite set of mutually exclusive alternatives. This contrasts with the neoclassical model that characterizes consumption decisions as a budget allocation process within a period of time, for example a year. Second, the random utility model incorporates a stochastic term reflecting the researcher's ignorance right from the start, rather than adding it in an *ad hoc* way to the demand function after the entire constrained utility maximization process has been rationalized. Both departures from the neoclassical model give the discrete analysis an element of realism.

Modeling the choice occasion rather than modeling choices across a season

also simplifies the conceptualization of welfare measures. Specifying utility in terms of random and deterministic influences makes the modeling ideally suited for the econometric analysis of choices and it provides the probability distributions for the estimates of the pertinent welfare measures.

The genius of the random utility model is the integration of randomness and behavior. Individuals know their preferences and act accordingly. Researchers make mistakes in the specification of models and in observing and measuring variables with error. Researchers work in a world without full knowledge so they can only formulate hypotheses about the probability of behavior.

The discrete choice model handles choices among alternatives successfully without excessive econometric problems and yields welfare estimates with comparative ease. This is not surprising as the discrete choice model is simpler in structure than the models of more complex optimization decisions that give rise to ordinary demand functions. The distinction in conventional demand analysis between first order conditions and demand functions essentially disappears from the discrete choice model.

This simplification, however, comes at the cost. In the context of the utility theoretic version of the discrete choice model, often called the random utility model, one can derive the model of behavior, get logically consistent measures of welfare, and find empirical means of implementation. It does not provide a complete model; the connection between a single discrete choice and the frequency of such choices per period of time is not addressed. When policies or events make the alternatives in a discrete choice more or less attractive, we might expect that some people will want to alter the frequency of choices. Persistent pursuit of a solution has led to a model that is more general in some ways than the discrete choice model, the generalized corner solution model of Phaneuf, Herriges, and Kling (2000). This model construction is a substantial improvement over the random utility model but lacks its ease of implementation and simple interpretation.

Throughout the chapter we use examples from recreation because almost all efforts to use the random utility model to estimate welfare measures are found here. This is not surprising. The random utility model solved a perplexing problem for researchers who were attempting to value changes in environmental quality using the logic of Chapter 3. While it might make perfect sense to view an environmental amenity as a quality characteristic of a recreational experience or trip, such as in the case of water quality and beach use, it is generally difficult to *observe* variation in the demand for trips in the face of differing quality levels. Obtaining data embodying enough variation in quality at a single recreational site, together with behavioral response to this differing quality, is impossible in a cross-section analysis because all recreationists face the same