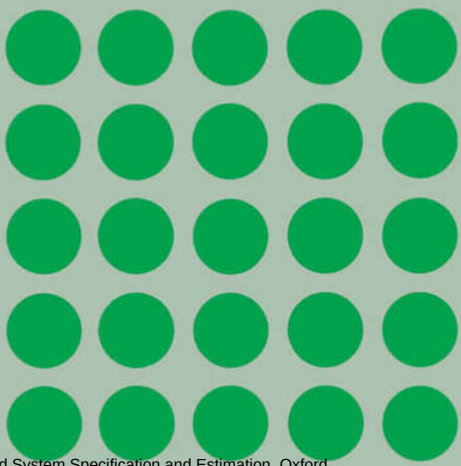
ROBERT A. POLLAK
TERENCE J. WALES

DEMAND SYSTEM SPECIFICATION & ESTIMATION



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To Vivian
and
To Wendy

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Preface

In this book we explore some of the important issues involved in bridging the gap between the pure theory of consumer behavior and its empirical implementation. The theoretical starting point is the familiar static, one-period, utility maximizing model in which the consumer allocates a fixed budget among competing categories of goods. The associated demand system is derived from the direct or indirect utility function and its parameters estimated on the basis of a set of price–quantity observations. Many issues must be addressed in moving from the theoretical model of utility maximization to estimation and interpretation of demand system parameters. We have not attempted a comprehensive treatment of all of the issues that arise in empirical demand analysis, but instead have focused on four issues that we believe are of primary importance: the assumptions made about the functional form of the utility function (i.e., the structure of preferences), the treatment of demographics, the treatment of dynamics, and the specification of the stochastic structure of the demand system. These four issues have implications for the empirical implementation of the theory of consumer behavior and for the interpretation of estimated demand systems.

In Chapter 1 we use a simple demand system—the linear expenditure system (LES)—to introduce the terminology and notation we use throughout the book. We use the LES to illustrate the four issues that we discuss in detail in four following chapters.

In Chapter 2 we discuss classes of functional forms for utility functions and for demand systems that play important roles in empirical demand analysis. Our main objectives are to elucidate the relationships among particular functional forms and to show how particular forms can be constructed from a set of basic building blocks. We begin by discussing demand systems classified by the role of expenditure. In addition to expenditure proportionality (i.e., homothetic preferences), we consider demand systems that are linear and quadratic in expenditure, and share systems that are linear and quadratic in the log of expenditure. We then discuss separability (e.g., direct additivity, indirect additivity, weak separability). We conclude Chapter 2 by discussing flexible functional forms (e.g., the translog, AIDS).

In Chapter 3 we describe five general procedures for incorporating demographic variables into demand systems. Each of the procedures replaces an original demand system by a related class involving additional parameters and postulates that only these additional parameters depend on the demographic variables. These procedures can be used to model the effects on consumption patterns not only of demographic variables but also of any other variables (e.g., environmental variables such as air quality) that affect demand patterns. We conclude Chapter 3 by discussing the role of demographic variables in welfare analysis, and, in particular, the problem of comparing the welfare of households with different demographic profiles.

In Chapter 4 we analyze two dynamic models based on changing tastes. We first discuss habit formation, examining alternative procedures for incorporating habits into arbitrary demand systems and studying their implications for short-run and long-run demand behavior. We then discuss interdependent preferences, a dynamic specification in which preferences and demand depend on the consumption patterns of other individuals or households. Finally, we consider the implications of these dynamic demand specifications for welfare analysis.

In Chapter 5 we discuss the stochastic specifications that form the basis of the empirical analysis described in Chapters 6 and 7. We present our standard stochastic specification for demand systems in share form—additive, independent (across observations but not goods), normal errors with 0 mean and a constant nondiagonal contemporaneous covariance matrix—and extend it in several directions. These extensions include first order vector autoregressive systems (we pay particular attention to the treatment of the first observation), error component models in which disturbances have a time-specific component as well as a general component, and random coefficients models. Our objective in Chapter 5 is not to provide a comprehensive survey of stochastic specifications but to lay the groundwork for our two empirical chapters.

In Chapter 6 we report demand system estimates based on a series of annual household budget data sets. Our results shed light on some of the specification issues discussed in the first five chapters. In particular, we compare demand system functional forms, and various procedures for incorporating the number of children and an indicator of their age distribution. We also explore several dynamic and stochastic specifications, including a simple error components model with a time-specific effect, and a random coefficient model for two different demand systems.

In Chapter 7 we report estimates based on annual aggregate time series data. As with the household budget data, we compare various functional forms and dynamic specifications. We also investigate estimation procedures that differ in their treatment of the first observation. Finally, we explore the possibility of pooling data from different countries under various assumptions about the existence of short-run and/or long-run

differences among countries. We estimate a pooled model using data from Belgium, the U.K., and the U.S. and find that the data reject pooling.

We have ignored many interesting and important issues relevant to empirical demand analysis. On the theoretical side, for example, we have ignored recent advances in the theory of aggregation and in the modeling of intertemporal demand, both with and without separability. On the estimation side, we have ignored recent work on nonparametric and semiparametric methods that have been proposed as alternatives to the parametric approach we have followed in this book. We have also ignored recent work on the analysis of qualitative or discrete choice. These important issues deserve careful treatment in a treatise on empirical demand analysis, but we have not attempted to write such a treatise. Instead, we have examined carefully four basic issues that must be dealt with in empirical implementation of the pure theory of consumer behavior. The reader, having grasped the treatment of these basic issues, will be well-positioned to explore other issues.

In writing this book we have accumulated debts to many people and are grateful for the advice and comments of our colleagues. We thank in particular John Bigelow, Angus Deaton, Howard Howe, Dale Jorgenson, Lawrence Lau, Jan Magnus, Michael McCarthy, David Ryan, and Robert Summers. We are also grateful to the National Science Foundation and the Social Science and Humanities Research Council of Canada for supporting our research and to Judith Goff for exceptional editorial assistance.

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