Chapter 8

Public Goods in Household Production

8.1 Introduction

In this chapter we continue the analysis of the household production models introduced in Chapter 3. Now we investigate models in which the non-market or public good is used as an input together with privately purchased goods to produce a commodity that the household values. At first the problem is framed in terms of a public 'good'. For example, a household might combine fishing effort with public fish stocks to produce recreational catch. In our subsequent discussion of defensive expenditures we adopt the more usual practice of framing the problem in terms of a public 'bad'. Households defend themselves against the consequences of environmental degradation by making a variety of decisions, such as purchasing bottled water or pesticides, spending extra time in food preparation, installing water or air filters, etc. In either case, the public input has the effect of altering the costs of 'production' of some household produced commodity rather than affecting utility directly.

This chapter begins with a generic treatment of the problem but, as is usually true in non-market valuation, the general case offers little promise for welfare measurement. This is followed by a consideration of the alternative restrictions that allow exact welfare measurement. Applications based on averting behavior or defensive expenditure models are more prevalent and motivate much of the remainder of the chapter. These commonly used approaches are applicable in more general circumstances but, as we will see, provide only bounds on welfare measures. Finally, we discuss the often used 'cost of illness' model

in which increases in pollution reduce the health state and lead to monetary consequences. We postpone discussion of a related problem–the welfare effects of environmental change on the production of a good bound for the market–until Chapter 9.

Averting and defensive behavior models have received far less attention than the recreational demand and hedonic models of earlier chapters, and their use in welfare measurement is not always straightforward. Yet they offer considerable promise because defensive and averting actions are applicable to such a wide variety of settings.

8.2 The Structure of the Problem

The story begins with an environmental or public good, q, that can be viewed as an input into some sort of household production process. The utility function used here has a simple specification. One of its arguments is a composite commodity purchased on the market and denoted z_2. The other is the commodity, z_1, which the household produces with a combination of purchased goods, $\mathbf{x}$, and the public good, q. Household time is likely to be an input as well, but will be subsumed in the vector $\mathbf{x}$ for simplicity. Doing so presumes a well-defined price for time, yet we know from Chapter 4 that the value of time is difficult to measure and often non-parametric. All the issues that arose in that chapter remain problems here. We will not repeat that discussion here, but will implicitly assume a 'price' for time. Where this is a clear violation of reality, the arguments of Chapter 4 will be relevant.

Unlike our earlier treatments of the environmental or public good, q is now an non-priced input in production rather than an argument of the utility function. The preference function is given by $u(z_1, z_2)$ and the production function for z_1 by $z_1 = f(\mathbf{x}, q)$. The only way in which q affects the household is as an input into the production of z_1. We expect $f(\mathbf{x}, q)$ to be increasing in the purchased inputs and the public input. To fix ideas, we could think of z_1 as drinkable water and q as a measure of the water quality of the public drinking water supply. In this context, one of the $\mathbf{x}'s$ might be water filtering services. An alternative story might view z_1 as health, q as public programs for reducing pest populations that cause disease, and one of the $\mathbf{x}'s$ as privately purchased pesticides. We could also frame a recreational demand problem in these terms, so that z_1 could be recreational fish caught and q a measure of stock abundance. An x of importance would be the purchased input: trips to the fishing site. In each case we have mentioned one purchased input of importance and will, for the time being, suppress all other inputs.

The household buys a composite commodity, z_2, at price p, and x at price r,