Chapter 9: Information, Ignorance, and Expectations

I. Additional Aspects and Effects of Informational Scarcity

The last two chapters have explored implications of choice settings in which one could not be certain about the consequences associated with one's actions. The consequences may be probabilistic—as when one purchases a lottery ticket or purchases a product with qualities that can be characterized with utility functions. Or, the consequences may be results of such complex or chaotic processes that no probabilistic representation is possible. In the latter case, individuals may use probabilistic ideas to try to assess the relative merits of alternatives using subjective (or Bayesian) rather than objective characterization of probability functions. Such subjective assessments, for example, allowed us to use expected utility and expected profit models to characterize decisions about the research and development activities of firms. In this way, individuals can be systematic about their choices in settings of uncertainty—given what they know or believe, even in cass in which those making the choices acknowledge that the domain of possibilities and the probabilities assigned to them are simply "educated" guesses.

In this chapter, we'll explore the implication of one meaning of the term "educated," namely as being in position of more "information" and better "models" of the range and likelihood of outcomes associated with the alternatives available in a given choice setting. Such information and models can also be objects of decisionmaking, and such choices are significant determinants of the extent to which one's educated guesses are reasonable or not, or less mistaken than others. One may become more educated in those way by, for example, investing more in education, reading more broadly, or deeply, or simply attempting to think more systematically about the possibilities associated with a given choice setting.

Most choices about information are, in a sense, choices under Knightian uncertainty. One does not know exactly what one will learn or, in most cases, what could be learned until one learns it. To know what could be learned beforehand suggests that one already knows what is to be learned. And, insofar as learning is possible, that possibility implies that accurately anticipating how valuable a bit of learning will be cannot be known beforehand except in a general sense. "If I take more economics courses, I'll know more economics afterwards than when I started" is not the same thing as knowing what will be learned—otherwise the examinations taken during a course would be a waste of time. Students would already know the answers.

Acquiring and processing information and developing more realistic models of the linkages between choices and consequences can often reduce uncertainty and thereby improves decisionmaking in settings in which uncertainties exist. By reducing the number of uncertain factors, a clearer understanding of the possibilities and their consequences often leads to better (less error prone) decisions. On the other hand, there are also cases in which more education reveals more uncertainties than one knew about beforehand—thus education does not always have the effect of reducing uncertainties, even when one's understanding of a choice setting become better informed.

In the models developed in previous chapters, such improvements were impossible—either because decision making was already fully informed and rational, or because risks and uncertainties associated with a "given" choice settings were themselves "given," which is to say assumed to be unalterable features of those settings. In effect, those models assume that no learning is possible. Decisions to learn and the consequences of learning or not were thus beyond the scope of those models. In this chapter we take up the economics of learning.

We begin with one of the simplest areas in which learning is possible—namely learning about the prices of a particular good or about the qualities of similar goods sold by different merchants. It turns out that the prices one pay and qualities that one consumers is partly a matter of choice—not matters of luck that are entirely beyond one's control.

II. Learning as Sampling

In the leanest neoclassical models, all knowledge problems and transactions costs are assumed away, in which case the law of one price holds. If consumers know the prices of every good on offer, they will always purchase goods at the lowest available price. Thus, only one price can exist, namely one that equals the average cost of production (for the marginal firm). Once that price emerges, any price lower than that price, will attract all the buyers in the market, the firm will lose money, and go out of business. Any price higher than that will attract no customers—since they know better. It is this type of logic that was implicitly relied on for the neoclassical price theory worked developed in chapter 5. Unique equilibrium prices emerged in those models.

That logic is clear---but what if there are transactions costs and information about prices is not freely available to consumers? Stigler (1966) argues that consumers would sample prices and purchase goods at the lowest price in their sample. His theory has often referred to as the search theory of information but is better thought of as the sampling theory of prices. He argued that the easier it was to search for prices (e.g. the less costly sampling is) the narrower is the range of prices that tends to emerge in a market for a homogeneous product. Searching (sampling) limits the range of prices paid for goods and services because consumers all choose to purchase the good at the lowest price in their sample. This also tends to reduce sales and profits from the higher priced merchants, which is sufficient to reduce the dispersion in prices at which goods are actually sold.

An Individual's Sampling Decision

Suppose that Al knows her own demand function $Q^D = q(P, Y)$ but doesn't know the price at which the good of interest will be purchased. However, he or she knows that the more sampling of prices he or she undertakes, the lower that price will be—where sampling might involve driving to numerous shops and inquiring about the price of the good he or she is thinking about purchasing or simply time spend on the computer looking at alternative web-sellers for the good of interest. In each case, sampling has an opportunity cost—namely the value of the time spent searching plus any other expenses such as fuel for one's vehicle or electricity and internet service for one's computer or cell phone. In terms of the Al's expected overall expenditure (E^e) on the good of interest is the amount spent to purchase Q units of the good (PQ) plus the opportunity cost of sampling (C). This can be written as:

$$E^e = P(N)q(P(N), Y) + c(N) \qquad (9.1)$$

where N is the number of shops or web-sources sampled and q is Al's demand function and c(N) is the opportunity cost of search. The expected price, P(N), is a function that declines with sample size at a decreasing rate ($P_N<0$ and $P_{NN}>0$). The sampling cost function, c(N, Y), increases with the sample size at an increasing rate ($C_N>0$ and $C_{NN}>0$). Differentiating equation 9.1 with respect to N characterizes Al's optimal sample size for his or her searching efforts—e.g. efforts to learn what the lowest available price is for the good of interest.

The first order condition looks similar to the usual ones, but in this case, Al is interested in minimizing her total cost for purchasing the good of interest and undertaking search.

$$P_N[Q + PQ_P] + C_N = 0 \equiv H \; at \; N^* \qquad (9.2)$$

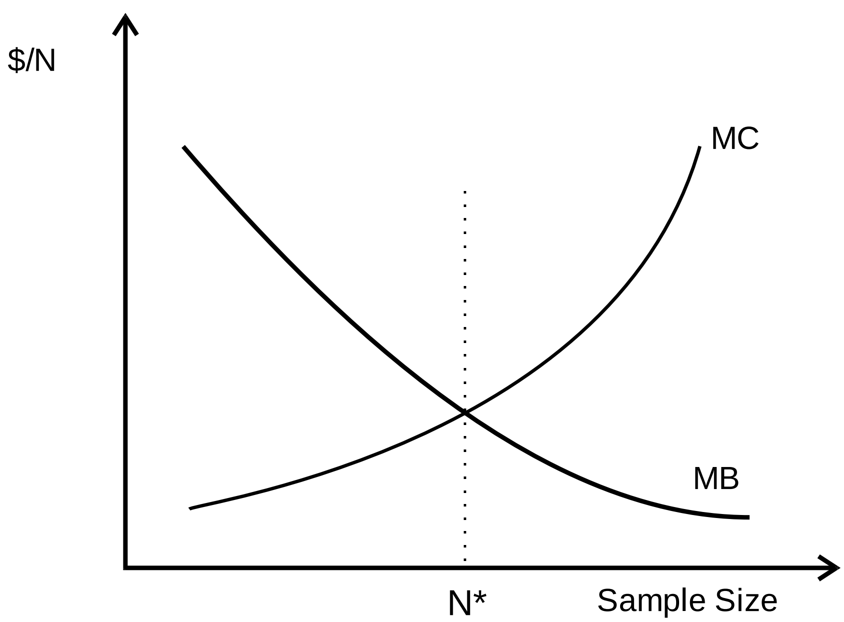
Or alternatively as:

$$-P_N[Q + PQ_P] = C_N \ at \ N^* \tag{9.3}$$

The first term in equation 9.2 is Al's expected marginal benefit from sampling which is the marginal reduction in the expenditures on the good associated with sampling prices. The second is the marginal cost of sampling. Al's expected marginal benefit from searching varies with the extent to which prices tend to decline with search (P_N) with the quantity likely to be purchased (Q), the price ultimately expected to be paid (P) and the price sensitivity of his or her demand function (Q_P).

Equation 9.3 expresses the first order condition in somewhat more conventional MB=MC terms. Al's overall expected cost for the good is minimized when the marginal benefits of search (the negative of expected marginal expenditure savings) equals the marginal cost of searching (sampling). Figure 9.1 illustrates equation 9.3.

Figure 9.1: Cost Minizing Search



Comparative statics of this relationship can be characterized using the implicit function differentiation rule. In this case, Al's income, Y, is the only exogenous variable.

$$N_Y^* = \frac{H_Y}{-H_N} = \frac{P_{NN}[Q+PQ_P]+P_N[Q_P P_N+P_N Q_P+PQ_{PP}P_N]+C_{NN}}{-(E^e{}_{NN})}$$

(more to come later)