XVIII. Introduction to Partial Equilibrium Welfare Economics

A. Positive Recap. To this point we have developed a positive model of market behavior based on the optimizing decisions of individuals who engage in production as an indirect way of getting other desired goods.

i. Our analysis implied that *specialization* can be a fruitful method of increasing one's own utility in a setting where markets exist.

ii. Moreover, production as a means rather than an end implied *profit/income maximizing* behavior by those who engage in production for eventual sale.

iii. We have used comparative statics (both mathematical and geometric) to analyze how individual, and therefore market, equilibria will change if there are exogenous changes in the circumstances of an individual's consumption/output decisions.

iv. In applied work most of these various relationships can be (and most have been) estimated using a variety of statistical tools and data.

B. Transition to Welfare Economics. In addition to the scientific, or *positive*, part of economics, there is a parallel and very large literature that analyzes the normative properties of economic outcomes using a variety of moral theories--although it is fair to say that most of the work is based on one or another strand of utilitarian social philosophy. The field of normative economics is called *welfare economics* because it basically assesses the extent to which the "welfare" of individuals is maximized in some sense. If welfare is not maximized, normative economics often attempts to determine whether it can be increased by new economic activities (exchange, specialization, saving) and/or government policies.

C. Elements of Welfare Economics. In order to assess whether "society" is doing as well as it can requires some method of ranking social states. Consequently, at the heart of every normative analysis of market outcomes is a *normative* theory of some kind. Roughly in order of usage, economists use the following *operational* normative theories: (i) the Pareto Criteria, (ii) Utilitarian (Social Welfare Functions, of which cost/benefit analysis is an especially widely used and somewhat problematic special case), and (iii) Contractarian Analysis.

i. **The Pareto Criteria**:

a. Social state A is *Pareto Superior* to social state B, if and only if at least one person strictly prefers A to B, and no one strictly prefers B to A.

b. A Pareto superior move makes at least one person better off and no one worse off. (V. Pareto argued that in this case social welfare can be said to have unambiguously been improved.)

c. Social state C is *Pareto Optimal* (also called Pareto Efficient) if and only if no *feasible* social states are Pareto Superior to C.

d. Essentially a social state is Pareto efficient if there is no way to change things in a manner that will make at least one person better off without making someone else worse off.

e. Note the "making at least one person better off" is not just a matter of personal income or wealth. It is a matter of whether "utility" increases.

f. Assessment of individual welfare should include consideration of all the "goods" that an individual believes influence his well-being. (This might include consideration of the individual's own social philosophy and matters of personal altruism or malice.)

g. Unfortunately, often there are many social states that are Pareto efficient in a given problem. [The Utilitarian and Contractarian theories discussed below (generally) aim for a proper subset of the range of states that can be Pareto efficient.]

ii. Utilitarian Social Welfare Functions

a. A (Bergson) *social welfare function* characterizes social welfare, W, as a function of individual utility levels: $W = w(U_1, U_2, U_3, ... U_N)$ with *positive partial derivatives for each person* in the community or society of interest.

b. Two widely used *special cases* of social welfare functions are the (i) Bentham or Utilitarian Welfare Function: $W = \Sigma U_i$ and (ii) the Nash social welfare function $W = \Pi U_i$.

c. A Pareto efficient state can be characterized with a social welfare function by maximizing W subject to some a production possibility frontier (global resource/production constraints).

d. However, it bears noting that *different social welfare functions* (ones that weight individual welfare differently) will select *different* Pareto efficient policies and allocations of wealth.

e. Most social welfare functions are assumed to exhibit diminishing marginal returns in the wealth of each individual. This causes them to have a tendency to recommend egalitarian distributions of wealth.

iii. The Contractarian approach uses *agreement* as its sole index of social welfare. Although its approach differs, its conclusions are in much the same as those that emerge from applying the Pareto criteria.

a. Rather than deal with explicit agreements between "real" people, the contractarian methodology often appeals to a hypothetical agreement from behind a "veil of ignorance" or a "veil of uncertainty." (The Rawlsian veil of ignorance assumes a situation in which individuals perceive themselves to be equally likely to be anyone in the society that follows from their agreement. Agreement is more likely to be obtained in such circumstances. Why?)

b. Note that if *all* affected parties must agree to any change in a social state, or its institutions, only Pareto Superior moves may be made. (Why?)

c. The use of agreement as an index of social welfare allows "the social ranking" to emerge from individual decisions/evaluations rather than from those of the theorist--as would be the case when a theorist chooses a particular social welfare function.

d. However, it bears noting, that although the process analyzed differs, the Rawlsian veil tends to make everyone behave as if they were Benthamite utilitarians. That is to say, it is often assumed that each individual maximizes *expected utility* in a setting where one's own identity is not known. (Note that $U^e = \Sigma_i U_i P_i$ has effectively the same maximand as the Bentham social welfare function if $P_i = P_j$ for all i and j.)

e. Rawls argues that persons behind the veil may be very risk averse and choose to maximize the welfare of the worst of individual. (What is the relevance of risk aversion here?)

XIX. The Welfare Properties of Exchange

A. The Edgeworth Box (Geometry: Lecture, Nicholson)

B. Production, specialization and Welfare (Geometry: Lecture, Nicholson)

XX. The Welfare Properties of Short and Long Run Competitive Equilibrium: Diagrams, Areas and Welfare

A. There are several economic assumptions that underpin the graphical "area" based analysis used in most text books and for some of the diagrams used in lecture:

i. First, the market **demand** curve can be used as social marginal benefit curve for all consumers of the good being traded when the individual demand curves are derived from personal

Marginal Benefit (evaluation) curves, represent Hicksian income compensated demand curves, or equivalently are cases where income effects are unimportant.

ii. Second the market supply curve in the short run and in the **Ricardian** case is the marginal cost curve, the short and long run supply curves respectively, for the industry in question.

iii. The long run supply curve in a **Marshallian** analysis is the industry's long run average cost curve, which happens to be the same as its long run MC curve in the case where LR supply is horizontal (e.g. no technological externalities).

iv. The area under a "marginal X" curve is "total X," in all cases where total X has the value 0 at Q = 0. (Substitute for "X" such words as cost, benefit, utility, product, revenue, profit, etc...)

B. In cases where there are no benefits or costs involved in production and consumption than those directly borne by firms and consumers, *the area between the Demand and Supply curves represents* net social benefits from production and exchange. That is to say, that area is *the money value of all gains from trade in the market of interest*.

C. In cases where there are benefits or costs involved in production or consumption that fall on other firms or consumers (in the same or other markets) a new curve has to be introduced that reflects the marginal costs or benefits borne by these other persons. These are the external marginal damages or benefits generated by production or trade in the market of interest.

D. Note that the LR competitive equilibrium in a market without externalities maximizes social net benefits, or the realization of potential gains to trade between consumers and firms. (Any other output level will reduce social net benefits!)

E. The graphical tools also allow you to use comparative Statics to determine who wins and loses as circumstances or policies change.

XXI. Externalities in Competitive Markets

A. The very appealing nature of the output decisions of perfectly competitive markets is somewhat diminished when it is acknowledged that production and consumption often *impose costs and benefits* on third parties not directly involved in the decision making and/or exchange processes. The existence of such *externalities* provides a prima facia case against the efficiency case made above.

i. The logic of externality problems is straightforward. Since relevant decision makers do not have to take account of spillover costs and benefits generated by their choices (activities), there tend to be unrealized gains to trade at the margin. Activities with negative marginal externalities *tend* to be over engaged in, and those with positive (beneficial) marginal externalities tend to be under engaged in.

ii. A good deal of civil, criminal, regulatory, and environmental law can be rationalized using externality based arguments.

B. There are essentially three types of externalities:

a. Pecuniary externalities: effects of changing relative prices on the value of individual holdings of wealth. (Automobiles impoverished buggy whip manufacturers.)

b. Technological externalities: effects of one firm's (or consumer's) output decisions on the costs of other firms. (Effluent upstream increase the cost of drinking water down stream.)

c. Consumption externalities are the most studied. Consumption externalities occur when one person's activity(s) directly affects another person's utility level. Here the effect is directly included in an individual's utility function. (Al enjoys Bob's garden. Jane is made "ill" by Dick's red shirt, or choice of music, etc.)

C. [Illustration: a simple mathematical example.] Suppose that Al and Bob are neighbors, and that Al likes to barbecue steaks on a grill in his back yard. The resulting smoke affects both Al and Bob, neither of whom care for smoke. Suppose that Al allocates time between cooking outside and inside, and for purposes of analysis that these are the only two uses of his time. Al's cooking time constraint is T = I + O. The amount of smoke produced is S = s(O), his output of barbecued food is F=f(O) and of indoor food is G = g(I). His utility function is U=u(F, G, S) with F and G being goods and S a bad. Bobs decision calculus is not of particular interest so his welfare can be represented as Ub = ub(K,S) where K is some other activity, held constant at this point (alternatively it could have been optimized various smoke levels).

i. Substituting yields: U = u(f(O), g(T-O),s(O))

a. Differentiating with respect to O yields: $U_F F_O - U_G G_I + U_S S_O = 0$ at O*

b. Note that the last two terms represent the marginal cost of outside cooking. The first is AL's marginal benefit from barbecued food.

ii. The Pareto optimal level of barbecuing can be characterized using W = w(U,Ub) where W is a social welfare function, U is Al's utility and Ub is Bob's utility.

a. Differentiating with respect to O yields

$$W_U [U_F F_O - U_G G_I + U_S S_O] + W_{Ub} Ub_S S_O = 0 \text{ at } O^{**}$$

b. Note that *only in the case where the last term is zero* does Al's private maximizing choice yield a Pareto optimal result. (Note that the terms in brackets characterizes Al's choice since these are Al's f. o. c. for his O*.)

c. [Explain why we can use an "arbitrary" social welfare function to characterize a Pareto optimal state.]

iii. In principle the externality could be internalized by imposing a (Pigovian) tax on Al's barbecuing time, but clearly this will be difficult to do precisely. [Why?]

XXII. Problems

A. Suppose that Al is one of N consumers of Z which is produced by a company that dumps its effluents in a river and decreases Bob's enjoyment of fishing down stream. Al allocates his/her wealth between purchasing Z and purchasing good G which is produced without externalities.

i. Geometrically demonstrate the nature of this externality. Carefully label all net benefits and costs.

ii. Develop a mathematical model of your diagram in part i.

iii. Now use utility functions and social welfare functions to demonstrate the suboptimality of the externality that consumers in this market impose on Bob. (Characterize all functions and note all assumptions necessary for your analysis.)