General Equilibrium Theory and Collective Decision Making

Outline
1. General vs partial equilibrium theory
2. Transformation functions and general equilibrium
   i. production
   ii exchange
3. Collective Decision making

1. General vs partial equilibrium theory
   General equilibrium theory or GE differs from partial equilibrium theory in that the latter examines a single market ignoring what goes on in other markets and may, even, assume that other markets are in equilibrium where p=mc (this gets into issues of second best which we do not consider here). GE takes the perspective that what happens in one market can have repercussions throughout a large number of directly and indirectly related markets. GE is the economists perspective of 'Systems analysis' in that the analysis looks beyond an individual market or setting. The boundaries of GE are somewhat difficult to establish. Early on a GE problem would limit itself to several markets since computing the equilibrium was difficult but with the computer power available today, large scale computable GE models are common. All of this is not to castigate partial equilibrium analysis. It remains a power analytical approach provided particular conditions are met. First, if the problem is dealing with a good or service for which there are few substitutes or complements or these are considered in the analysis or the good or service has a low income elasticity of demand, partial equilibrium analysis will do a very good job.

2. Transformation functions and exchange
   i. production
   GE takes account of the impact of changes in one market and examines how it may affect the equilibrium condition sin other markets; input and output markets are considered together. It may happen that an increase in demand for trucking services not only affects the trucking market but also the rail and air cargo market as well as the factor markets for capital, fuel and labor; this is the 'stuff' of GE models.

   Although all of these things happen simultaneously I treat them in a sequence or hold other things constant. Consider first the factor market in a two good world in which there is a fixed amount of capital, K and labor, L. These two inputs produce two products X and Y with production functions; X=f_x(k,l) and Y=f_y(k,l). I could treat n outputs and m inputs but the conclusions would not change.

   The markets can be illustrated graphically with the use of an "Edgeworth-Bowly Box" diagram. The dimensions of the box are defined by the amount of K and L. If there were an increase in total K, for example, the length of the box would increase. Note that capital
is used in the production of X and Y with no unemployment. One can handle unemployed resources in this framework but this is not of concern to us at this point.

Consider point A, at this point the ration of marginal products of k and l are different between two industries, X and Y. There are opportunities for gain by industry X using excess labor to but capital and industry Y using excess capital to but labor. This trading will continue until a point such as E where the two MRTS are equal. Note that we could just have easily moved to a point such as B along x’s isoquant rather than along y’s. Realistically we would likely end up somewhere in between on the ‘contract curve’. This is the locus of points along which the MRTS in X is equal to the MRTS in Y. Note that a point such as E defines a given output of X and a given output of Y. The same is true all along the contract curve. Therefore, the contract curve determines the production possibilities frontier or production possibilities curve (PPC). It is clear that the contract curve will be determined by the production functions or shape of the isoquants. Therefore, any change in these isoquants will show up as a change in the PPC.

Point E will be a point on the PPC and will define a given output of X and Y. Individuals i and j earn income from their labor in producing X and Y and in their ownership (if any) of capital in producing X and Y.
ii. Exchange
The figure below illustrates the 'exchange box'. The process is the same as that which occurred in the factor market equilibrium. Point B on the PPC defines how much of good X and Y are produced. Suppose the initial endowment point in exchange space is point f. Here we can see the MRS for individual i is not equal to the MRS for individual j, at point f the indifference curves cross. As before there are gains from trade. Individual i gives up x in order to buy y and individual j gives up y in order to buy x. They move to an equilibrium point such as e where the MRS for i = MRS for j = price x/price y. That is the trading by i and j for x and y with their incomes derived from labor and the ownership of capital, will result in a Pareto optimal point such as e. All points on the contract curve are Pareto optimal.

How does one select from among the set of Pareto Optimal points? There have been a number of 'welfare' criteria introduced into economics. One criteria is called the Kaldor criteria. It states that one point on the contract curve is better than another if the gainers can compensate the losers so neither will be worse off; in other words, if the gainers gain sufficient amounts that they can compensate the losers to make them as well off as they were previously and still have sufficient left over to gain, the new equilibrium is better.
3. Collective Decision making

Thus far the assumption has been that decisions are made on the basis of a single criterion:

- deterministic: cost minimization or output maximization
  - individual utility
  - net social benefit

- stochastic: maximum payoff
  - expected utility

A single criteria approach assumes that all affected parties agree to it and that persons who do accept the criteria can impose it on those who do not.

When does everyone agree? This was established in the above section on GE. Contract curves provide the set of Pareto efficient outcomes. Maximization of Net Social Benefit gets us to a Pareto Efficient allocation - given the distribution of income. However, a Pareto efficient outcome is not necessarily Pareto superior. NSB does not determine where on the contract curve is better. As we saw another criteria such as the Kaldor criteria needs to be introduced.

The reasons not all improvements can be made Pareto superior are:

- transactions cost
- attaining true valuations
- endorsement of the status quo distribution

With any case in which there are winners and losers, there is difficulty on the 'agreement criteria':

- things may or may not even out in the end
- small group/large group problem (disbenefits focus upon small groups while benefits are more widely disbursed)
- bias in favor of wealthy due to income effect bias

Imposition of Criteria

- considered undemocratic
- assumptions of altruistic public servants
- bureaucrats are budget maximizers

the alternatives are:

- voting but may end up in a situation in which no voting scheme for which a rational outcome is guaranteed
- logrolling

What to do? where does this leave us?
(a) strive for Pareto improvements
   - use the market mechanism whenever possible
   - full recognition of social costs
   - compensation in practice rather than in theory

(b) negotiation
   - within projects
   - between projects
   - consider both what to do and how to distribute benefits

(c) role of systems analysis
   - technical efficiency means an increase in the possibility for Pareto improvements by selecting least cost way of achieving certain outputs
   - capacity to see opportunities for Pareto improvements, linkages between economic behavior and benefits, and provides the means of assessing valuation over time.
   - capacity to acknowledge and manage risk and uncertainty which are inherent in the undertakings of large projects

(d) Vision of How Transportation System should be planned & Managed
   - driven by demand
   - self regulating
   - ongoing process of adjustment in anticipation of expected and in response to unexpected

(e) There is much more to learn before proceeding
   - demand analysis
   - supply analysis
   - measures of social cost

Such knowledge is worthless (or worse) without an understanding of how it can be put together to make sound choices. This course is intended to give you a framework for doing it.