General equilibrium theory get economics essay

General equilibrium theory has constituted an indispensible building block of neoclassical economics. This paper looks at the various components of the general equilibrium model and seeks to determine the conditions under which its assumptions hold. It also looks at the role the theory plays in economic analysis. The paper goes further to talk about the foundations on which the theory is built. Despite its sharp defence, the general equilibrium theory is still fraught with inconsistencies and its assumptions are highly implausible.

General Equilibrium Theory (GET)

Analysis of equilibrium in a production-exchange economy looks at the interaction of both firms and consumers in a typical economy. Consumers seek to maximise their utility subject to a constraint while firms seek to maximise profits subject to production constraints. Thus the properties of consumer and producer behaviour are derived from simple optimization problems. These interactions help in determining the equilibrium set of prices for the goods produced in the economy. Prices depend on individual choices because in all markets demand should equal supply. But before finding these prices, one has to determine whether such equilibrium exists or not.

Starting the discussion of GET with a production-exchange economy, it is assumed that each firm is a competitive and a price-taker. Hence a firm has no influence on the prices of goods – only takes prices as given and will optimize accordingly. Assume there are k number of goods in the economy. Each firm in the economy uses inputs to produce outputs. These give each firm's net output vector, yj, where inputs are taken as negative entries and outputs as positive entries. Firm j therefore earns revenue pyj when using the production plan yj, where p is the price vector for the goods produced. Each firm has a production possibilities set (PPS) (the set of feasible net output vectors), Yj. These are assumed to be irreversible. Thus a net output vector produced cannot be used as an input vector to produce those inputs as outputs, e. g. labour, which is used as an input, cannot be produced as an output. It is also assumed that each PPS is closed, convex and bounded below. By convexity, we mean that if two production plans, y and yi, are in the same PPS, then production plan, yii, created by taking a proportion, Î± Ïµ [0, 1], of y and yi will also lie in that set. The set being closed means that if vectors close to the production plan of firm j, yj, are in the production possibilities of that firm, Yj, then yj will also be in Yj. This assumption guarantees continuity of each firm’s net supply function, so that even if an individual firm exhibits non-convexity in its technology, on aggregate, “ the induced discontinuities may be smoothed out” (Varian, 1992, page 344).

The aggregate net supply function is the sum of the individual net supply functions. Thus, the aggregate PPS is the total of each firms PPS. Given that each individual firm’s production plan yj, maximises its own profits, then an aggregate production plan y, comprising of all individual production plan, will also maximise aggregate profits.

Consumers seek to maximise the utility they obtain from consumption subject to a constraint. Let c be the consumption of a good and L represents the amount of time they spend on leisure. These two factors are included in each consumer i’s demand functions, xi. The consumer has an endowment of time, which he can choose between time spent working l and time spent on leisure L so that Li= l + L. Each consumer is also constrained by his earnings from providing his labour time, wl, where w is the wage rate. It is assumed that individuals' derive their income from two sources; from firms which are owned by consumers and from their labour endowment where leisure is treated as a good sold to firms (Varian 1992, pp. 342). Thus the constraints of time and the earnings from working form each consumer's endowment, Ï‰i. Hence, the maximisation problem for the economy as a whole is represented as:

Max u(x)

Subject to px= pÏ‰;

where Ï‰ is the total endowment of commodities and x is the collection of consumption bundles (x = (x1, x2, …, xn)).

Since consumers own the firms in the economy as this is a private economy, they are entitled to the share of the firm's profits, Tij (consumer i's share of firm j's profits), where = 1. Given the price vector p, each firm j chooses the production plan yj that maximizes profit pyj(p). Consumer i's budget constraint therefore becomes:

pxi= pÏ‰i + pyj

Summing all the continuous consumers' individual demand function gives the economy's aggregate demand function, X(p)= which is also continuous at price p. The aggregate excess demand function, z(p), is given as the difference between the aggregate demand function and the aggregate supply function. The aggregate supply function is the total of the aggregate supply function of all the consumers Ï‰ = and the aggregate net supply function Y(p). Thus, the aggregate excess demand function becomes;

z(p) = X(p) – [Y(p) + Ï‰]

It is homogeneous of degree zero and will be negative when aggregate supply exceeds aggregate demand, and will be positive when aggregate demand exceeds aggregate supply.

Walras' Law

In a production economy like this, Walras' Law states that if the above equation holds, then, for all price vectors, the value of the aggregate excess demand will be identically zero: pz(p) â‰¡ 0. i. e it is zero for all possible choices of prices, not just equilibrium prices (Varian, 2002, pp. 550). If this equation pz(p)= 0 holds, then demands will equal supply in all markets and we say that the system of markets is in general equilibrium.

From the Walras' Law, it implies that the sum of price-weighted excess demands, summed over all markets, must be zero so that if one market has positive excess demand, another must have excess supply and if all but one are in balance, so is that one. Once an equilibrium has been established in one market, all other markets will also be in equilibrium. Walras' Law therefore holds for all price vectors in and out of equilibrium since at any price, consumers' budget constraints satisfy their net demands. Walras' Law can therefore be used to ensure that zero excess demand for each good is sufficient to ensure that a good's price vector contains equilibrium values, assuming prices are homogenous of degree zero. This implies, given that households have balanced budgets, the sum of excess demands across all markets must equal zero, whether or not the economy is in a GE.

Existence

The question of the existence of Walrasian equilibrium looks at whether a specified model possesses a solution or not. That is, whether there is any set of prices such that demand equals supply in all markets. To ascertain this, crucial assumptions are made regarding both the technologies and consumer’s preference.

It is assumed that a) production sets Yj are closed and convex; aggregate production possibility vectors contain a positive component and are assumed to be irreversible (Varian 1992, pp. 345); b) the aggregate excess demand function z(p) is not only continuous but also homogeneous of degree zero in prices. By continuous, we mean that any infinitesimal prices change should also result in infinitesimal changes in aggregate demand and that a small change in prices should not affect quantity demanded greatly; c) each consumer’s preference is closed, convex and bounded below. Thus, utility functions must be continuous, strictly increasing and concave; d) for all prices p, the value of the aggregate excess demand function be zero, i. e. pz(p)= 0; and e) each consumer holds an initial endowment vector in the interior of his consumption set and that there is non-satiation. (Varian 1992, pp. 344)

A Walrasian equilibrium exists and will be efficient if the above assumptions hold.

Uniqueness

We now look at whether there is one price vector that clears all markets in the economy given that Walrasian equilibrium exists.

The existence problem was formally solved by Arrow and Debreu. The key axioms necessary for a unique and economically meaningful solution Blaug (1996) cited are;

Returns to scale are constant or diminishing.

Every production and consumption good can be a gross substitute.

To ensure uniqueness, goods must be gross substitutes. Two goods are gross substitutes if an increase in the price of one good say good 1 leads to an increase in the excess demand for the other good, say good 2.

Thus if all goods are gross substitutes at all prices, and if p* is an equilibrium price vector at which all markets are cleared, then p* is the unique equilibrium price vector.

Stability

In the GE model, prices that prevail are those that coordinate the demands of consumers for various goods. By stability, we mean if something temporary disturbs the equilibrium, will the underlying market forces work to restore or move away from equilibrium? It is thus important to know whether, over time, a system in disequilibrium will return to equilibrium or move away from equilibrium. This analysed by price movements over time. Assume at equilibrium, the price vector of n goods is p*= (p1*, p2*,…, pn*) and at time t= 0, these prices are not equilibrium prices, such that p(0)â‰

p*. Then a system is said to be globally stable if the price vector at time t moves to the equilibrium price vector:

Walras called the continuous process of price adjustment as the tâtonnement process. This is used to explain the price adjustment process in a pure-exchange economy. There is mediator called the Walrasian auctioneer who announces a set of prices for goods at each instant of time. Buyers and sellers in the market make known their offers and demands for the goods at the announced prices. Trade only takes place if the price vector is an equilibrium one otherwise a new set of prices is announced until equilibrium is reached. In partial equilibrium, stability is ensured through restrictions on the shape of the excess demand curve-that it is negatively sloped (Gravelle and Rees, 2004: 176-78).

An alternative to the tâtonnement process is the use of Edgeworth box and the theory of the core (Gravelle and Rees 2004). Here, a set of equilibrium price vectors are found within " the core" which gradually diminishes and moves towards the Walrasian equilibrium price vectors. It is imperative to note that this model relies on similar assumptions to those listed above, especially demand curve convexity.

First Welfare Theorem (FWT)

The FWT is often perceived as the formal explanation of Adam Smith's " invisible hand". It basically asserts that, if markets are complete, any competitive equilibrium with transfers is Pareto optimal, thus any Walrasian equilibrium is Pareto efficient.

The FWT does not require stronger assumptions because we are in effect assuming that a GE (with convexity) already exists. Only assumption of local non-satiation of preferences is required for it to hold- that “ consumers are all locally insatiable and that none of the goods is noxious, so that preferences (and the utility functions Ui) are nondecreasing. We assume that each consumer has continuous preferences.” (Kreps, 1990, pp. 188)

Implications of the FWT

The FWT gives a general mechanism that the competitive market can be used to ensure Pareto efficient outcome. Assume there are only two agents involved, it is easy for the two to come together and examine the possibilities for mutual trades. This also applies to markets involving many agents. Thus the FWT shows that, the particular structure of competitive markets has the desirable property of achieving a Pareto efficient allocation (Varian 2002, pp. 561) and that consumers need to know only the prices of the goods in question. Therefore a competitive market will exhaust all the gains from trade.

If the behavioural assumptions of our model hold, then the market equilibrium is efficient. However, market equilibrium is not necessary “ optimal” since it may not be “ fair”. In an economy with externalities, for example, it is possible for equilibria to arise that are not efficient. The FWT is informative in the sense that it points to the sources of inefficiency in markets.

The Second Welfare Theorem (SWT)

The SWT states that every Walrasian equilibrium is Pareto efficient. Assume x*is a Pareto efficient allocation where each agent holds a positive amount of each good. For the SWT to hold, preferences must be convex, continuous and monotonic. If these assumptions hold, then x*is a Walrasian equilibrium for the initial endowments x*for i= 1,…, n.

Implications of SWT

The SWT asserts that, under the conditions above, all Pareto efficient allocation is a competitive equilibrium. The SWT thus separates the problem of distribution and efficiency. The market mechanism is distributionally neutral and that competitive markets can be used to achieve balanced distributional welfare. This is done by price where it plays both the allocative role and the distributive role. The allocative role of prices indicates relative scarcity while the distributive role determines how much of different goods different agents can buy.

Criticisms of GET

The main idea of the Sonnenschein-Mantel-Debreu theorem (S-M-D) was that given the highly restrictive assumptions of the GET there was no guarantee of a stable and unique equilibrium price vector because of the behaviour of the excess demand function as the aggregate excess demand function was assumed to be convex. Accinelli refers to this as ‘ the most serious assumption needed to prove the existence of equilibrium’ (2002: 48). The S-M-D shows that when demand functions are aggregated the resulting function actually behaves in all sorts of ways that do not ensure stability or uniqueness and that specifically, convexity cannot be maintained (Kirman 1989, pp. 130-131).

S-M-D inflicted a fatal wound to the stability analysis in GET. It demonstrated that the only general properties possessed by the aggregate excess demand function were those of continuity, homogeneity of degree zero, the validity of Walras' Law and boundary condition. The S-M-D results showed, as Tohme´ (2006, pp. 214) summarized, ' that for every given system of equilibrium prices and its associated excess demands, an arbitrary economy can be defined, exhibiting the same aggregate behaviour and the same equilibria, i. e. prices do not convey all the relevant information about the economy, since a " mock" one is able to generate the same aggregate demand.' Kirman (2006, pp. 257) also argues that, ' the full force of the S-M-D result is often not appreciated. Without stability or uniqueness, the intrinsic interest of economic analysis based on the general equilibrium model is extremely limited.' While this sentiment would surely have found favour with Kaldor, it arguably falls short of his fundamental call for the ' demolition' of GET as a major inhibition to the development of economics as a science, and certainly as an empirical science.

Kaldor (1972) sees the GET to be seriously flawed as an empirical description of real-world economies. According to Kaldor, scientific progress was not possible in economics without a major act of demolition, by which he meant the destruction of the basic conceptual framework of the theory of GE. Kaldor's writings were to dismantle the whole edifice of GET.

Kaldor objected to the use of axiomatic assumptions in equilibrium economics. To him, unlike any scientific theory, ‘ where the basic assumptions are chosen on the basis of direct observation of the phenomena’, the basic assumptions of economic theory ‘ are either of a kind that are unverifiable’ – such as, consumers ‘ maximize’ their utility or producers ‘ maximize’ their profits – or ‘ are directly contradicted by observation’ (Kaldor, 1972, pp. 1238). The use of such assumptions, which were not just ‘ abstract’ but ‘ contrary to experience’ was in conflict with good science and thus rendered economics vacuous as an empirical science. He rejected the basic assumption of constant returns which dominated the equilibrium economics as well as the neoclassical economics. More particularly he detested the fact that ‘ the general equilibrium school has always fully recognized the absence of increasing returns as one of the basic “ axioms” of the system’. As a result, ‘ the existence of increasing returns and its consequences for the whole framework of economic theory have been completely neglected’ (Kaldor, 1972, pp. 1241-1242).

Kaldor asserts that GE is neither a description nor an explanation of actual economies, as these terms are understood by empirical scientists. Rather it is a set of theorems that are logically deducible from precisely formulated assumptions; and the purpose of the exercise is to find the minimum ‘ basic assumptions’ necessary for establishing the existence of an ‘ equilibrium’ set of prices (and output/input matrixes) that is (a) unique, (b) stable, (c) satisfies the conditions of Pareto optimality. (Kaldor, 1972, pp. 1237). He maintains that GE as articulated by Debreu, ‘ is shown to be valid only on assumptions that are manifestly unreal’ (Kaldor, 1972, pp. 1240) and Kreps

(1990, p. 195) sees it as a reduced form solution concept and that the Walrasian equilibrium only describes what we imagine will be the outcome of some underlying and unmodeled process.

Brief defence

Critics of the GET have questioned its practicality based on the possibility of non-uniqueness of equilibria. Supporters have pointed out that this aspect is in fact a reflection of the complexity of the real world and hence an attractive realistic feature of the model. Proponents of the GET argues that even if there are multiple Walrasian equilibria for a given set of preferences and endowments, it may still be the case that each of these equilibria are all locally unique in the sense that there is no other Walrasian equilibrium price vector within a small enough range around the original equilibrium price vector. As a consequence, the set of Walrasian equilibria is finite.

Conclusion

Both the GET and Welfare economics builds on the FWT and SWT and provides a very useful framework for debating the normative issues that surround the equity and efficiency aspects of public policy. Though it is built upon rotten foundations, GET gives an understanding of the whole economy using a “ bottom-up” approach, starting with individual markets and agents. It is the perfect example of the instrumentalist (positive) approach to economic theory that informs all neoclassical models.