FUNDAMENTAL ECONOMICS

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Summary

Economics is the study of optimal use of scarce resources to promote social welfare. Of particular interest has been the role of prices in achieving a socially optimal allocation of resources through co-ordinating the actions of self-seeking individuals in a decentralized economy. Alternative notions of economic equilibrium and their efficiency properties are sketched. Finally, some of the basic issues in dynamic economics are elaborated.

1. Introduction and Overview

One of the most influential texts on introductory economics, by Paul Samuelson, defines the scope of the subject as follows:

Economics is the study of how people and society end up *choosing*, with or without the use of money, to employ *scarce* resources that could have alternative uses—to produce various commodities and *distribute* them for consumption, now and in the future, among various persons and groups in the society. Economics analyzes the costs and the benefits of improving patterns of resource use.

(Samuelson, 1980)

In what follows, we shall first seek to examine and amplify this definition in some depth, and discuss some basic concepts and methods of theoretical analysis. Theoretical models in economics—not unlike those in many other disciplines—are simplified versions of reality. Successful models or “theories” capture the essential features or driving forces of the complex world, and provide illuminating explanations and/or useful predictions. Historical evidence provides valuable lessons, and helps us in formulating hypotheses and conjectures on how or why certain events took place in the past, or are likely to take place in the future, given the “appropriate” environment. However, in the absence of controlled experiments, the explanations and predictions offered by economic theories can be expected to be only “approximately” valid.

“Microeconomics” deals with an individual economic unit (for example, a consumer, a firm, or an investor) or an individual market. It also captures the interactions among decision-makers and markets, and explores the efficiency properties of alternative resource allocation schemes. By contrast, “macroeconomics” focuses on aggregate quantities (level and growth of national income, national consumption and investment, rates of unemployment and inflation) for an entire economy. The objectives of full employment, price stability, and long run growth have been of abiding interest to macroeconomists. Fundamental concepts and techniques from micro and macro theories are used to explore specific issues in “applied” areas.

Central to the subject is the question of “optimal” (or “best”) choice under relevant constraints (dictated by scarcity of resources, technical knowledge, or economic institutions). “Optimization” has been a unifying theme in both micro and macroeconomics. In the context of optimization, theoretical analysis seeks to clarify issues like:

- What is the criterion of choice for an individual unit or for the entire society?
- What are some of the more realistic behavior rules that economic agents (consumers, owners of firms, managers of firms, social planners, bureaucrats in the public sectors) can be expected to follow?
- What are the basic constraints on choice, and how should one design economic organizations and activities to overcome the constraints?

In Section 2, we recall the simple static theories of optimal choices for consumers and producers who are assumed to be “price takers.” This “price taking” behavior is a central assumption of the “competitive” or Walrasian model of resource allocation, and is realistic only when there are a large number of agents in the economy. Here, the consumer is assumed to maximize its utility (or to choose the consumption plan that is best according to its preferences), and the firm is assumed to maximize its profit. The demand for and the supply of a commodity are derived from solving constrained optimization problems: the consumer faces a “budget constraint” whereas the producer is subject to a “technological constraint.” The implications of profit maximizing behavior have been explored in alternative market structures, in which the price taking behavior is patently unrealistic, when there is, for example, a single seller (monopoly), a single buyer (monopsony), or a small number of sellers (oligopoly). More generally, we now have models of bargaining over the terms of transactions among a group of agents. The difficulties of passing from individual choice rules to a “social choice rule” that meets some reasonable axioms have been explored following the masterly work of Kenneth Arrow, but this important issue is not taken up in the present theme. The notions of "social optimality" ("productive efficiency" and "Pareto efficiency") that we explore in this review are widely used in welfare economics, and their limitations as social choice criteria have been spelled out. A "social welfare function" (satisfying the usual properties of an individual utility function), according to which a social planner evaluates alternative allocations, is also a key tool of analysis, and is illustrated in the context of intertemporal economics.

The use of markets and prices to organize economic activities, and to allocate resources efficiently through a decentralized system of decision-making, has been a prominent theme since Adam Smith. The "partial equilibrium" analysis (forged by Alfred Marshall, which is outlined in Section 3), focusing on a single market, is still the basic tool to explain the determination of the price of a single commodity, and to predict its change in response to variations in the forces of demand and supply. An equilibrium price is determined by the equality of demand and supply (at the intersection of demand and supply curves depicting the relationship between price and quantity on the opposite sides of a market). Two striking ideas behind the partial equilibrium analysis need emphasis for their broader appeal. First, a "market-clearing equilibrium"represents a balance of market forces and, second, the market price adjusts to move towards such an equilibrium and achieve a consistency of the plans of the firms and households participating in the market.

In Section 4, we introduce the concept of an efficient allocation, and a discussion of "trade offs" in an economy with scarce resources leads to the concept of a "production possibility frontier." Its use in the Ricardian theory of comparative advantage, a landmark in the development of international trade theory as an explanation of the possibility of gains from trade, is briefly sketched.

General equilibrium analysis deals with all the markets simultaneously, and attempts to capture the interdependence of production and consumption decisions in an economy with many agents and many commodities. It is important to recognize, first, that a partial equilibrium analysis based on a "ceteris paribus" assumption is not adequate even for posing some of the basic issues in many areas of applied economics. In the theory of planning, an important theme was to identify the leading industrial sectors that can accelerate long run growth. The theory of international trade attempts to explain the pattern of exports and imports. In economic development, we are concerned with the effects of migration from the rural to the urban sector, or with the dynamic process through which an economy with a predominantly agricultural sector is transformed into one with a vibrant industrialized sector. Such a list of questions, beyond the purview of a partial equilibrium approach, can be expanded effortlessly. Second, the prediction on how a market will react to specific measures may be widely off the mark if there are strong linkages with other markets. In view of these considerations, "miniature" general equilibrium models with a relatively small number of endogenous variables have been explored thoroughly. Indeed, it has been argued that a good definition of the pure theory of international trade (in which models with two countries and two commodities have played a distinguished role) is that it is "general equilibrium theory with structure." In Section 5.1, we sketch a simple Keynesian model, describing the determination of income and interest rate in the short run. Another general equilibrium framework, the input–output model of Leontief, has been used extensively in the literature on development planning, and this is a simple but powerful tool to capture linkages among various industries. Its appeal rests on the possibility of computing answers to policy problems. Its use is illustrated in Section 5.2.

In Sections 5.3 and 6, we review the Walras-Pareto theory and its limited scope in some detail (and somewhat formally) for a number of reasons. First, it is viewed as a canonical model of a decentralized resource allocation mechanism. It describes a resource allocation scheme in which prices, treated as parameters, can co-ordinate independent decisions based on “private” information. In addition, while these decisions are made in “self interest” (the mechanism utilizes individual incentives), the resulting allocation achieves Pareto efficiency for the whole economy. The rigorous elaboration of this model has been widely acclaimed as one of the most notable achievements of economic theory in the twentieth century. It raised questions that provided the points of departure for voluminous research on extensions of the mainstream theories. It is now commonplace to explain many issues in environmental economics or development economics in terms of asymmetric information, incomplete markets, strategic behavior, or externalities. It forced economists to re-examine a number of policy issues from new angles. Finally, we believe that a good understanding of its limits and scope is essential for any scientific assessment of the roles of the market and the state in achieving objectives like allocative efficiency, distributive justice, or economic growth. Experience with central planning has been invaluable in understanding the limits of a “command system” in co-ordinating economic activities. On the other hand, it is also acknowledged that “markets do not and cannot operate in a vacuum,” and that the state has a vital role to play in supporting the “real” and “financial” market systems with sound macroeconomic policies so as to avoid destabilizing volatility in employment, prices, or interest rates. Indeed, for the long run sustainability of development, or promoting “human development,” the state must lead if the markets prove inadequate. The empirical evidence from developing countries—the remarkable success stories and the periods of crisis—seems to suggest that the real question is not whether the government should intervene, but where and when it should intervene, and how.

In Section 7, we turn to a concept of equilibrium that allows for direct interaction among a group of decision-makers. It has been difficult to develop satisfactory theories of economic interaction with a relatively small number of agents who either can collaborate for mutual improvement from a status quo, or are in a potentially conflicting situation. Section 8 is devoted to dynamic economics. Descriptive models of trade cycles and long run growth have been studied with varying degrees of precision for a long time, and Frank Ramsey’s pioneering contribution in 1928 led to the study of optimal allocation of resources over time. A few important landmarks are visited. One of the most striking lessons is the following: when an economy does not have a predetermined terminal date, price-guided short-run optimization need not lead to a long run optimal allocation.

Among the more difficult issues in dynamic economics are the roles of history and expectations. Moreover, even in their simplest formulations, dynamic models may display extremely complex or “chaotic” behavior that defies long run predictions when measurement errors are unavoidable. In any case, the “laws of motion” of economic systems are themselves subject to shocks. “Decision-making under uncertainty” has been the subject of sophisticated research and, drawing from statistical decision theory, analytical progress has certainly been recorded. However, a general equilibrium analysis of uncertainty (based on relatively simple rules of individual behavior), which can cut through the complexities of real and financial markets and suggest appropriate policies to overcome inefficiencies and reduce the volatilities, has been elusive. Research in economic theory has deepened our understanding of the market mechanism, but in many ways, the step from a "micro" analysis to the "macro" framework is very tentative. Theoretical analysis has provided insights into the difficulties of making the "right" choices, but has often fallen well short of offering "concrete" solutions. Hence, the search for new paradigms for explanation and predictions of short run cycles, for long run sustainable growth in the era of market-driven globalization, and for developing institutional arrangements for sharing the gains from trade and technological progress within and among countries, continues.

2. Microeconomics of Demand and Supply

In a typical model of optimal choice with a single decision-maker (consumer, firm, government, regulator, social planner), it is useful to distinguish between exogenous variables, or parameters that an agent cannot control, and the decision variables (actions, choices) that an agent can control at least partially. The optimization problem is described in terms of choosing an action from a class of actions determined by the values(s) of the parameter(s) that maximizes a "payoff" or "return." The return typically depends on both the parameter(s) and the actions. Some of the mathematical techniques widely used in static models are calculus and linear and non-linear programming; for dynamic models, calculus of variations, the optimal control theory, and dynamic programming have provided the basic tools.

We start with the microeconomic theories of supply and demand.

Consider an economy with ℓ commodities. A "competitive" producer (firm) accepts the prices of these commodities as parameters and chooses a production plan that specifies the quantities of its inputs and outputs. The firm has a technology that may be described by a production function or, more generally, by a set with some specific structures. (If, for example, a firm is producing an output y by using two inputs x_1 and x_2, the Cobb-Douglas production function specifies that the maximum output from a choice of inputs (x_1, x_2) is $y = x^{\alpha}_1 x_2^{1-\alpha}$, $(0 < \alpha < 1)$.) The constraint on the choice of the production plan is the requirement that the plan must be in the technology (the chosen level of output must be consistent with the choice of inputs given the technological knowledge). The profit from a production plan is the difference between total revenue (the sum of all receipts from the sale of output(s)) and total cost (the sum of all expenditure on inputs) at the given prices. The profit maximizing production plan specifies the supply of outputs and the demand for inputs. As an implication of profit maximization, two remarkable conclusions emerge. If the price of a particular commodity increases (decreases)—with all other prices remaining the same—a producer typically increases (decreases) its supply of that commodity. If that commodity is used as an input, the producer typically decreases (increases) its demand for that commodity.

The model of a "competitive" consumer (household) specifies the prices and the wealth as "parameters." It chooses a consumption plan subject to the "budget" or "wealth" constraint that the expenditure on the consumption plan must not exceed its wealth. The "rational" consumer is assumed to be able to rank all consumption plans as to their desirability; in other words, given two plans, the consumer is able to say whether it is indifferent between the two, or whether one is strictly preferred to the other. This ranking is assumed to be "transitive": if a plan *a* is preferred to plan *b*, and *b* is preferred to another plan *c*, then *a* is preferred to *c* (a similar property is imposed on the indifference relation). Under general conditions, this "preference" or "ranking" relation can be described by a utility function *u* (a rule that assign a number to every plan, with a higher number being interpreted as strict preference, and all plans about which the consumer is indifferent are assigned the same number). The optimization problem is to choose the best plan subject to the wealth constraint (equivalently, to maximize the utility function subject to the budget constraint). A solution to this problem is the demand of the consumer.

As an implication of utility maximization, an important conclusion on the response to demand for a particular commodity is derived. A commodity is an inferior good if its demand falls as the wealth of the consumer increases (prices remaining the same). Suppose now that the price of a single commodity *k* increases (decreases) with all other prices and wealth remaining the same. If the commodity *k* is not an inferior good, its demand typically decreases (increases).

3. Partial Equilibrium: The Marshallian Approach

In the development of economic theory, a privileged role has been enjoyed by the notion of a "partial equilibrium" analysis in which our attention is focused on a single market. The demand and supply "curves" for a single commodity depict the two sides (buyers and sellers) of the market. Formally, let p be the price of the commodity. It may be demanded by households for direct consumption and/or by firms for use as an input. Denote by $D(p)$ the total quantity demanded in the market at price p (obtained by summing up the planned demands of all prospective buyers at p). Similarly, let $S(p)$ be the total quantity supplied at p (obtained by adding up the supplies of all prospective sellers at p). Assume that $D(p)$ decreases as p increases (the graph of $D(p)$, the demand curve, is "downward sloping") and $S(p)$ increases as p goes up (the graph of $S(p)$, the supply curve, is "upward rising"). The micro optimization problems of Section 2 suggest a justification of such assumptions.

Consider the market excess demand $z(p)$ at price p, defined as the difference between demand and supply:

$$z(p) = D(p) - S(p) \qquad (1)$$

An equilibrium price p^* has the property that $z(p^*) = 0$; in other words, p^* describes a state of the market in which the "forces" of demand and supply are balanced, and the individual plans of buyers and sellers can all be realized in principle. Hence, p^*, if attained, will perpetuate in the absence of any shift of either the demand or the supply curve. If at a "sufficiently high price" p_1, $z(p_1)$ is negative (that is, there is excess supply in the market), and at a "sufficiently low price" p_2, $z(p_2)$ is positive (that is, there is excess demand in the market), then there is a unique equilibrium price p^* (provided that the function $z(p)$ is continuous in p).

A graphical analysis enables one to predict the change of the equilibrium price in response to a shift of either the demand or the supply curve. If the demand curve "shifts outward" or "to the right," the equilibrium price moves up to clear the market. If the supply curve shifts to the right, the equilibrium price must drop. Formally, in calculus terms, suppose that the excess demand in the market depends on the price variable p and an exogenous parameter, written as $z(p, \theta)$. Assume that the relevant smoothness conditions hold, and, for any given θ, $\partial z/\partial p$ is negative (excess demand is decreasing in p). Then, the equilibrium price p^* depends on θ, and the rate of change of the equilibrium price with respect to a change of θ, denoted by $\partial p^*/\partial\theta$, is easily computed as:

$$\partial p^*/\partial\theta = -((\partial z/\partial\theta)/(\partial z/\partial p)) \qquad (2)$$

Thus, the signs of $\partial p^*/\partial\theta$ and $\partial z/\partial\theta$ (the rate of change of z with respect to θ) are the same, and the direction of movement of p^* can be predicted if the sign of $\partial z/\partial\theta$ is known. This, of course, is an example of the widely used technique of comparative statics, first systematically explored by Paul Samuelson (Samuelson, 1947). Next, let us touch on the question of stability. An argument, also familiar from Alfred Marshall, stresses that, if an actual economy is displaced from equilibrium, there are forces at work that will tend to drive it towards equilibrium. For our simple market model, the argument can be made precise and rigorous. If the initial p is less than p^* then the assumptions on the shapes of the demand and supply curves ensure that excess demand is positive. The unsatisfied buyers are expected to bid up the price, triggering a move towards p^*. Similarly, if the initial price is higher than p^*, an excess supply will induce unsatisfied sellers to offer a lower price, again moving p towards p^*. More formally, consider an adjustment process (in "continuous time") in which price goes up (or down) in response to positive excess demand supply. Then the structure of our model ensures that p^* is approached in the long run. A stability property enhances the predictive power of the model.

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Biographical Sketch

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