CHAPTER 7

Change and Growth

When you are criticizing the philosophy of an epoch, do not chiefly direct your attention to those intellectual positions which its exponents feel it necessary explicitly to defend. There will be some fundamental assumptions which adherents of all the variant systems within the epoch unconsciously presuppose. Such assumptions appear so obvious that people do not know what they are assuming because no other way of putting things has ever occurred to them.

—ALFRED NORTH WHITEHEAD

... economics adheres strictly to the importance of equilibrium as part of any theory. ... equilibrium is a central concept in economics. Virtually all economic theories have as primary desiderata that the behavior described must be consistent with some notion of equilibrium. ... it is the interest in equilibrium itself that distinguishes economics from other social sciences. To be sure other social sciences discuss spillover and feedback effects but among social scientists, only economists insist on a physical-sciences-style equilibrium as part of the analysis.

—EDWARD LAZEAR

Equilibrium is a concept of statics (a branch of Newtonian mechanics), which is concerned with bodies at rest or moving at a constant velocity. It is a condition in which all acting influences cancel each other out, resulting in a stable, balanced, or unchanging system. *Equilibrium* is a polar word—there is more than a whiff of something desirable about it.

Adam Smith, writing during the first stages of a historic transformation, was highly aware of the existence of change in the economy in real time. A century later, the historian Henry Adams observed that the central fact of the modern world was the acceleration of change. A perceptive observer, one who is not blinkered by outmoded theory, is instinctively aware that the most important characteristic of our capitalistic market economy is change, which powers growth. Change is the very essence of the system: “The essential point to grasp is that in dealing with capitalism we are dealing with an evolutionary process. It may seem strange that any-
one can fail to see so obvious a fact which moreover was long ago empha-
sized by Karl Marx” (Schumpeter 1942, 82).

In this chapter, we will examine the canonical paradigm of equilib-
rium in economic theory; general equilibrium theory, which is the over-
arching theoretical concept of neoclassical economics; and the ways in
which these relate to growth. The thrust of the argument is that the
assumption that the economy is a stable system, that there are forces that
move the system toward equilibrium values after any disturbance, frustrates
the ability of theory to arrive at a correct understanding of the dynamic real
economy. The argument will probably be difficult to accept since it runs so
directly counter to the mind-set that has been embedded in economics for
well over a century.¹

Today’s Worldview

The genesis of the concept of equilibrium and its dominance in economic
theory are perhaps understandable in light of the cultural and intellectual
environment of the nineteenth century. But with the progress of science in
the last century—correcting our concept of reality—Schumpeter’s insight
is irresistible.

It is only very recently in historical time that human beings have
become aware that we live in history—that there is a past that differs from
the present and we proceed into an unknown future. Earlier most people
tended to regard the passage of time as a recurrence of familiar moments.
The cycle of seasons and the phases of the moon and the sun were all rep-
resentative of the cycle of time. The repetition of the familiar provided the
framework for human experience (Boorstin 1979, 229–34).

Most people now accept the idea of history and realize that day-by-
day we move on into the novel, the untrod new world of the future. We are
not, as the concept of equilibrium implies, at or continually returning to a
destination. We are on a journey into the unknown. Today’s intellectual
environment is more in harmony with Schumpeter’s insight than it was in
1912 when his message was largely ignored. It should be difficult now for a
modern mind to deny his thesis that changes “are theoretically and practi-
cally, economically and culturally, much more important than the eco-
nomic stability upon which analytical attention has been concentrated for
so long” (1912, 255).

Physics itself is now a historical science. With Hubble’s discovery in
1929 that the universe is expanding, the universe could no longer be con-
sidered a system in equilibrium. It has a beginning and changes over time.
Our own sun will eventually swell into the solar system and put an end to all its planets. Before then, an asteroid randomly smashing into our earth may kill us off, just as 65 million years ago the dinosaurs were eliminated. During its limited life span, our solar system is not immutable: the spin axes and orbits of planets change, comets come zooming in and out, and asteroids and fragments of comets smash into planets. Our whole solar system is moving at 40,000 miles per hour in the direction of the star Vega. And our galaxy, the Milky Way, is traveling in the direction of the constellation Hydra at a speed of 1.4 million miles an hour.

Our very earth, we now know, is no longer firm or reliable (a lesson easily learned by anyone who lives on the West Coast of the United States or in Japan). We cannot understand our planet if we refuse to recognize that the continents are moving, carried by sliding plates that collide or ride up over one another. Here new land is forming; there the ground is disappearing into the fiery bowels of the globe.

In biology, as in economics, the lure of the Newtonian equilibrium metaphor initially overrode reality. As late as the 1970s, ecological textbooks still taught that highly diverse systems were stable. When disruptions occurred, built-in forces would bring the system back to the normal equilibrium. It is only very recently that this approach has been superseded and it has been realized that “the over-all system, instead of being in equilibrium, may be in a state of more or less continuous upset—reeling from one disturbance to another, and never reaching a well-ordered normal state” (Ford 1988, 54).

Darwin’s theory is now supreme. Present life forms can only be understood in terms of their past. New species develop, and others disappear. The environment, with which individuals and species must cope, is itself evolving due to the struggles of all species to survive. The process is open-ended and stochastic. In reproduction, DNA is copied, but never perfectly, and mutation is constantly taking place. Change is inevitable. As Darwin commented,

natural selection is daily and hourly scrutinizing, throughout the world, the slightest variations; rejecting those that are bad, preserving and adding up all that are good; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life. (Darwin 1952, 42; italics in original)

The relationship between the sexes is fundamental in human society, yet even gender roles are in flux. For most of human existence, the difference in reproductive responsibility resulted in a difference in the social and economic roles the two sexes performed. In today’s technologically
advanced economies, with extremely low birth rates, the connection between the reproductive and gender division of labor has been broken. In most high-income countries, the proportion of men at work has fallen: young men stay in school longer and older men retire sooner. In the United States, the proportion is dropping toward 50 percent. The number of women taking paying jobs has been constantly rising. Whereas a hundred years ago less than a fifth of American women had such jobs, now the proportion is beginning to approach 50 percent. Within a few years, there is likely to be very little or no difference in labor participation rates between men and women. So, again, there is nothing permanent.

Social changes and demographic trends affect the economy. In the high-income countries, retirement has become a normal expectation, the nonworking elderly currently relying on nonearned incomes represent a large proportion of the population, and whole areas of the country are peopled by older, nonworking individuals.

For most of human history, population numbers grew very slowly. From 8000 B.C. to around 1750 A.D., it took between one and three millennia for the world’s population to double. Then the rate began accelerating, doubling first in a century and then in around thirty-five years after World War II. Now, while population numbers in some countries are still rising, the rate of growth is slowing and in some countries the numbers are starting to drop.

History, geology, astronomy, biology, and physics now accept the concept of process as central to understanding. Ceaseless change, the day-by-day move into the novel, and the untrodden world of the future also characterize the modern economy.

Change and the Economy

Before modern times, economic change, if it occurred at all, was very slow and was often even repressed by despotic governments. The situation is very different now. Marx and Engels’s summary description of the first phase of the capitalist market economy in the *Communist Manifesto* is classic. The bourgeoisie

has been the first to show what man’s activity can bring about. It has accomplished wonders far surpassing Egyptian pyramids, Roman aqueducts, and Gothic cathedrals. . . . The bourgeoisie cannot exist without constantly revolutionizing the instruments of production. . . . Constant revolutionizing of production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation distinguish the bour-
geois epoch from all earlier ones. In place of the old wants, satisfied by
the productions of the country, we find new wants, requiring for their
satisfaction the products of distant lands and climes. In place of the old
local and national seclusion and self-sufficiency, we have intercourse in
every direction, universal interdependence of nations. The bourgeoisie,
by the rapid improvement of all instruments of production, by the
immensely facilitated means of communication, draws all, even the most
barbarian, nations into civilization.

The bourgeoisie, during its rule of scarce one hundred years, has cre-
ated more massive and more colossal productive forces than have all pre-
ceding generations together. Subjection of Nature’s forces to man,
machinery, application of chemistry to industry and agriculture, steam
navigation, railways, electric telegraphs, clearing of whole continents for
cultivation, canalization of rivers, whole populations conjured out of the
ground—what earlier century had even a presentiment that such pro-
ductive forces slumbered in the lap of social labor? (1848, 5–6)

The sweep of the economic change since the Communist Manifesto was
published in 1848 has been even more astounding. Beginning in England
and Scotland in the eighteenth century, the Industrial Revolution spread to
the United States, Western Europe, Japan, and Eastern Europe, and since
World War II it has affected most of the rest of the world.

During most of the period since the beginning of the Industrial Rev-
olution, the number of weekly, annual, and lifetime work hours has
decreased. Modern workers scarcely realize how short their workweek is
compared to that of workers during the initial stages of industrialization. In
the 1820s, mill girls in Lowell, Massachusetts, were awakened at 4:30 for a
fourteen-hour day, six days a week, with short breaks for meals. They were
on their feet all day tending the deafening spindles and looms. When the
native-born Americans called for a ten-hour day in the 1840s, they were
replaced with successive installments of immigrants: Irish, French Canadi-
ans, and Southern and Eastern Europeans. It was only on the eve of World
War II that British workers were granted a week’s paid annual leave
through an act of Parliament. Now workers in the high-income countries
work less than half as many hours a week as a century ago and have several
weeks of annual vacation to boot.

Veblen and Myrdal, who like Schumpeter were outside of the
accepted economics canon, noted that economic processes have positive
feedback, with small effects reinforcing each other. This results in a cumu-
lative impact on an economy, driving it farther and farther away from any
initial assumed equilibrium.

It is well known to development economists that if a region can in
some way “get the jump” on other regions in its economic development, it
is likely to attract additional capital, entrepreneurs, and better qualified labor and thus increase the initial disequilibria among other regions (Myrdal 1968). While in some cases the clustering of an activity in some defined place is clearly logical; in many instances it is purely a matter of chance that an initial entrepreneur happened to pick a particular town. The town may have been the entrepreneur’s birthplace, there may have been a strong university department nearby, or a key person may have simply liked the climate or the proximity of beaches or ski resorts. Eastern Uttar Pradesh became (and still is) India’s carpet belt when the Moghul emperor Akbar imported carpet weavers from Persia in the sixteenth century.

Microsoft, the dominant company in the computer industry, is located in Seattle simply because founder Bill Gates likes it there. There may have been innumerable locations that would have been just as good. Whatever the cause, once growth begins in a specific place, the forces drawing people and enterprises there become cumulative. Each arrival attracts others until some kind of saturation point is reached.

In the economy, just as Darwin observed in nature, speed in making changes is essential to survival. Sony’s Beta video cassette recorder may have been technically superior to the dominant VHS model, but VHS won a slight market advantage by coming first to the market. This became cumulative as customers, fearing to wind up with an “orphan” instrument, chose the market leader. Quite soon, VHS became the standard. As most motion pictures were soon available only on VHS, the beta VCRs became unsalable.

A similar network dynamic rules in many products for which the learning curve is important. The high-technology sector, by its nature, is able to exploit increasing returns. It may cost immense sums in research to produce a new product in the drug, computer, or airplane industries. Boeing’s new 777 aircraft, for example, took eight years to research and design and it cost $8 billion to produce a prototype. After a product is developed, the cost of an additional unit is relatively cheap and the average cost falls rapidly as more are produced (Arthur 1993). The producer that aggressively exploits its increasing returns can gain a great advantage over its competitors and later entrants. Compaq, a producer of computers, having gained market share through advertising, began in 1992 to cut its prices by around 30 percent a year. Its increasing volume made possible improvements in design and manufacturing costs. By 1994, it had cut its combined labor and overhead costs by 75 percent over the two-year period. Labor costs were reduced to an absurd 2 percent of total cost for some of its products (Economist 1994c, 59).

As a country becomes industrialized, massive structural shifts take
place. In 1776, probably 90 percent of the American labor force was engaged in agriculture. Today that figure is less than 2 percent. After the mechanical cotton picker was introduced in the 1940s in the cotton-growing Mississippi Delta, the number of farms fell from 105,000 in 1940 to 6,000 by 1990 and the number of sharecroppers working on the farms fell by 98 percent, sending millions of blacks north. The number of persons resident on farms, 40 percent of the total American population in 1900, had dropped so far by 2000 that the government no longer bothered to count them annually. Now American tourists visit farms (organized for the purpose) to marvel at what agriculture is like.

Sweeping changes characterize all countries in the course of industrialization. In the European Union by 2000, less than 5 percent of the population remained in agriculture, contributing less than 2 percent of GDP. Economic forces push surplus labor out of agriculture. Sometimes, new jobs are created in the process of industrialization rapidly enough to absorb the people squeezed out of agriculture. At other times, countries experience large-scale unemployment or underemployment for decades. However the transition occurs, it proceeds with enormous dislocation and secondary economic and social impacts.

Great Britain’s industrialization was built on coal, iron and steel, and textiles. In 1920, there were 1,250,000 miners of coal; at the end of World War II, there were 700,000 and by 2000 coal mining in Britain was no longer a significant economic occupation. In France in 1948, there were almost 200,000 coal miners. By 2000, there were only 6000, and the industry is expected to be discontinued by 2005. In the British steel industry, 80 percent of the workers lost their jobs from 1974 to 2000 and thirty-three out of the thirty-seven steel facilities of British Steel PLC were closed permanently. By 2000, pop music was contributing more to British export earnings than the steel industry and Indian-style restaurants employed more people. In textiles, the 1930s were one long agony as spindles and looms were scrapped and Great Britain switched from being a net exporter to an importer of textiles.

In another great structural change, the share of manufacturing output as a percentage of GDP in industrial countries has declined and is now under a fifth of the total. Everywhere in the high-income countries, the fraction of the labor force in manufacturing is decreasing. Workers have been moving out of factories into services. The share of manufacturing in the American nonagricultural labor force fell from 34 percent in 1950 to 14 percent in 2000. By 2000, there were around 2 million more workers employed in government than in manufacturing. Early in the twentieth-first century, it is safe to predict, manufacturing employment in the United
States will have dropped to under 10 percent of the labor force. In Great Britain, the proportion of jobs in manufacturing dropped from 37 percent in 1970 to under 18 percent in 2000; there are now some 3 million fewer jobs in manufacturing. In the same period, the labor force in manufacturing dropped by 17 percentage points in Germany and Italy. Similar drops have taken place in Australia, Austria, Canada, France, and Japan. WalMart, a discount retailer, has been the greatest creator of American jobs in recent years: in 2000 it employed 1.1 million workers—600,000 more than DaimlerChrysler, the largest industrial employer.

The net changes taking place among sectors conceal even greater changes occurring within each industry. A pervasive finding of recent research using longitudinal establishment level data is that:

Seemingly similar plants within the same industry . . . behave quite differently in terms of real activity at cyclical and longer-run frequencies. Even in the fastest-growing industries, a significant fraction of establishments decline substantially; similarly, a large fraction of establishments in the slowest-growing industries grow dramatically. During severe recessions virtually all industries decline, but within each industry a substantial fraction of establishments grow. Likewise, during robust recoveries, a substantial fraction of establishments contract. Simply put, the underlying gross microeconomic changes in activity dwarf the net changes that we observe in published aggregates. (Haltiwanger 1999, 4)

Creative destruction, Schumpeter’s term, remains characteristic of successful capitalism: corporations that do not keep up with change die. From the beginning of the rubber tire industry in the United States, Akron, Ohio, was at its center. Akron firms dominated the world tire industry during most of the twentieth century. But in 1982 the last tire was made there. By 2000, of the three largest firms in the American industry one was Japanese (Bridgestone-Firestone) and another French (Michelin). The third, Goodyear, was still American but closely allied to Sumitomo, a Japanese firm. As in Darwin’s observation, the corporation that is most responsive to change is the one that survives.

The world, in which human beings live, is not Platonic but Heraclitean. As Heraclitus perceived, “nothing endures but change.” Everywhere the essence of vitality is change and conflict.

A friend once told me that when she was a young mother with a family of small children she had continually longed for a normal day. That is, a day when no child had an earache or was late, no one had lost his mittens or forgotten her homework, the car’s gas tank wasn’t on empty, the children liked their lunches, all the bills were paid on time. She finally realized that her days were normal days—chaos and unpredictability were simply
the routine of life. After she grasped this, that the real world was not Pla-
tonic, she was able to see the world as it is and enjoy her family life.

There is no utopia of order, stability, and harmony but a world of flux, constant change, and disorder. The Papal Curia eventually accepted that Galileo was right, and his remark applies to the economy, too: “Eppure si muove.”

General Equilibrium Theory

Well into the twentieth century it was taken for granted that the universe was in an unchanging state of equilibrium that was either created at some point in the past or had existed forever. It is understandable that the ideal of eighteenth-century rationalists was to discover the laws governing society. Just as Newton had worked out the laws governing physical nature, they felt it should be possible to explain the behavior of human beings using similar methods. Once everything was measurable, it would be possible to secure the answer to any problem, “Calculemus,” as Condorcet said (Berlin 1969, 57).

In the last quarter of the nineteenth century, while the economy of Western Europe was transforming itself in the second Industrial Revolution, Léon Walras concentrated on producing a theory of general equilibrium for the economy. Walras was the first economist to succeed in erecting a theoretical system inspired by this approach. His effort was motivated by Newton’s achievement in celestial mechanics. As Walras stated in the letter in which he applied for the chair at Lausanne, he was devoted to constructing “the science of economic forces, analogous to the science of astronomical forces” (Jaffé 1965, 2:210). From the time when Walras was nineteen years old and read Louis Poinsot’s *Elements de statique*, he was determined to construct economic theory as a physico-mathematical science on the same model, and with the same formal properties, that characterized classical mechanics and astronomy (Ingrao and Israel 1990, 88–89, 379, nn. 4–5). In his words: “One evening I opened Poinsot’s Statique, and this theory of equilibrium through the composition and decomposition of forces and couples appeared so clear and logical that I read the first half in one breath; the next day, I finished off the second half” (Jaffé 1965, 3:148). Walras saw an analogy between the functioning of a system of interdependent markets and the equilibrium of the system of celestial bodies in classical mechanics. Therefore, he thought he could build a theory assuming that maximizing by consumers and producers under certain conditions would result in a general equilibrium of the economy where amounts pro-
duced and demanded in every commodity and factor market would be equalized. Modern economic theorists have followed Walras’s model, though in recent years there has been less acknowledgment of inspiration from Newtonian mechanics.

The general equilibrium model of Walras, modified and improved by Cassel, Zeulhen, Neisser, von Stackelberg, Schlesinger, Wald, Hahn, Arrow, and Debreu, dominates modern economic theory, resisting the influence of the latest developments in modern science. Economic theory still mimics the seventeenth-century Newtonian mechanistic cosmos, with economic theorists intellectual slaves to long defunct and superseded natural scientists.

The major essentials of the general equilibrium theory are that a general equilibrium exists, that it is unique, and that it is stable. Perfect competition is assumed to prevail in all markets; economic agents are assumed to have unlimited, perfect knowledge and foresight and to be limitlessly greedy. Economic agents

are assumed to maximize their benefits relative to costs. Starting from a given set of assets, each agent trades and exchanges until an optimum position is reached. Trading will cease when all agents have reached their individual optima because no agent will have any incentive to change position, and the system as a whole will have reached an equilibrium. This is the essence of the complex body of mathematical general equilibrium theory that dominates today’s economics. (Fusfeld 1996, 307)

An equilibrium system is one in which each acting influence is offset by another, resulting in a stable, balanced, or unchanging system. Continuous growth within this framework can only be as a steady state, where everything grows in exact proportions. In equilibrium theory, there is a unique point toward which the forces of the system move, and this point can be calculated from the data, the set of axioms, variables, and parameters that belong to the system. The system operates in logical not historical time. In Newtonian mechanics, equilibrium was built to be a working description of the actual universe; in economics, general equilibrium is rather a Platonic ideal that the economy might achieve if messy uncontrollable real world forces and misguided human beings did not intervene.

The paradigm of general competitive equilibrium remains central in modern economics theory. Worse, it has become dogma. Contributions to macroeconomics that are guilty of a concern with real life have been criticized as ad hoc because they are not derived from the general equilibrium model (Hausman and McPherson 1993, 683). With no basis for the theory in reality, belief in it is akin to a religion.
The general equilibrium model has been worked on without any investigation at any stage, whether its basic axioms correspond to reality and whether the propositions derived from them by deduction can be verified (Kaldor 1985, 11–12). Weintraub goes further and says that the theory “is one in which empirical work, . . . facts and falsification, played no role at all” (1983, 37). Blaug agrees that it has no empirical content and the theory “would seem to lack any bridge by which to cross over from the world of theory to the world of facts” (1980,191). That is, the general equilibrium theory, a mathematical structure erected on a small number of basic axioms, is mathematics rather than a science whose truth is tested against the world of reality.

Note how desperately John Hicks was forced to stretch to try to salvage something from the theory once realism entered in the form of the recognition of imperfect competition. In his words,

it has to be recognized that a general abandonment of the assumption of perfect competition . . . must have very destructive consequences for economic theory. . . . It is, I believe, only possible to save anything from this wreck—and it must be remembered that the threatened wreckage is that of the greater part of general equilibrium theory—if we can assume that the markets confronting most of the firms with which we shall be dealing do not differ very greatly from perfectly competitive markets. If we can suppose that the percentages by which prices exceed marginal costs are neither very large nor very variable, and if we can suppose (what is largely a consequence of the first assumption) that marginal costs do generally increase with output at the point of equilibrium (diminishing marginal costs being rare), then the laws of an economic system working under perfect competition will not be appreciably varied in a system which contains widespread elements of monopoly. At least, this getaway seems well worth trying (Hicks 1946, 84, 85; see also Wiles 1983, 72)

The theory assumes that if all individuals make the right decisions equilibrium and optimum conditions will be established. This supposes that there exists some independently given and determinate set of right decisions. Such a set does not exist. What happens depends on what individuals do now. What individuals do now depends on what has happened in the past, how they understand the present, and how they forecast the future. When prices are determined by price expectations—and these may induce changes in wage and supplier costs, which in turn justify the price expectations—the optimum is obscured by ignorance of the future. And, moreover, it is indeterminate (Balogh 1973, 83).

In defense of general equilibrium theory, however, it might be argued that it is not meant to be a help to comprehension and explanation of the economy. The theory is meant to be a demonstration that a free market
economy leads to the highest level of consumer satisfaction (consistent with the given distribution of wealth). There is no doubt that a market-guided economy has many advantages, but this does not guarantee that it is a utopia. Free markets can do much in providing optimum or superior solutions to many economic problems, but they are not a unique philosopher’s stone that can cure all economic ills.

General equilibrium theory is not necessary to convince economists and laymen that competition and free markets are effective economic methods to secure a better use of resources. Experience, economic history, and awareness of the results of economic policy demonstrate this. A general equilibrium model for a capitalist economy is misleading, pointless, and irrelevant since it leaves out the very essence of the market economy, relentless, never-ending change.

Lest the reader be led to believe that no virtue can be found in the general equilibrium model, I should acknowledge that it has made one contribution to economics. Because of their exposure to the model, economists learn that changes in one part of the economy are likely to have repercussions in other parts (Solow 1997a, 108). When an economist is confronted with a real problem, the model reminds him or her to look beyond the margins of, say, the industry with which he or she is concerned. But general equilibrium reasoning is likely, then, to lead the economist astray since the tendency is to believe that the industry should be moving toward a tidy equilibrium. In the real world, there is not likely to be a tidy equilibrium: technology is changing, competitors are reacting, new products in another industry are making a product redundant, and so on. In fact, if an economist’s training includes economic history and a good exposure to empirical economics, he or she will have an even better idea of the repercussions and influences likely to result from any particular change and how much more comprehensive the model needs to be than what flows out of the general equilibrium mind-set. It should not require a theory of an imaginary economy to convince economists that in the real economy there is interdependence among its parts.

General equilibrium theory fits well with central planning, in fact better than with a capitalist market economy. By suppressing or ignoring individual variation, planners can command and maintain the attainment of their planned equilibrium. A general equilibrium model can be constructed for a centrally planned socialist market economy with a set of assumptions no more heroic than those for a capitalist market economy. One simply has to assume that workers, managers, and consumers will fully accept the decisions of the planning board as being the best for them and the economy. As in orthodox general equilibrium theory, $n$ equations with $n$
unknowns can be solved to determine the prices that will simultaneously clear all markets. Actually, one does not even have to assume that the central planning board has perfect knowledge of the demand and supply curves. Just as in a market economy, the agency can adjust prices by raising the prices of goods that are in excess demand and lowering the prices of goods for which demand is too low. As Oscar Lange argued, such a socialist economy would be better than capitalism because the state can distribute income more equitably, it can handle the problem of externalities better, and it can avoid monopolies.

In other words, if a successful general equilibrium model with realistic assumptions for a capitalist market economy could be built that would demonstrate that unrestricted competition necessarily leads to the highest possible level of consumer satisfaction under these conditions, this would not be enough. One must also prove that a similar model constructed for a centrally planned economy with parallel assumptions would not produce more consumer satisfaction.

The effort that highly intelligent economists have devoted to trying to construct general equilibrium models resembles the quest for the Holy Grail by the knights of the Round Table. In 1983, Professor Debreu was awarded the Nobel Prize for his general equilibrium model. The advanced version of the theory for which he won the prize turns out, as with all previous general equilibrium theories, to be of no help in understanding economic reality. His model assumes that there is no government, there is no money; and investors can perfectly protect themselves against uncertainty. There is perfect competition, consumers and producers have perfect knowledge of all prices and markets for contingent goods, consumers are never satiated (they always want more), there is perfect certainty about the future, and everyone obeys the rules of the game.

The theory and model as it exists today is truly a magnificent intellectual achievement. Future scholars are also likely to regard it as one of the inexplicable human obsessions of the past, ranking perhaps with the search for the fountain of youth but less productive of useful by-products than the thousand years’ vain attempt to find the magic philosopher’s stone.

One has to admire the persistence and even perhaps the near genius manifested in the ingenuity of the model makers as they have worked for generations in an attempt to perfect the theory. But one also has to mourn the waste and futility manifested in such a quest. The century-long journey down a blind alley diverted some of the most brilliant economic brains from work on diagnosing and correcting the real problems of the world and enticed them into the bogs of purely abstract and nonempirical economic reasoning (Blaug 1980, 192; 2001, 160). Imagine what could have been
accomplished if these economists had been inspired instead to work on the problems of the actual evolving economy.

Equilibrium

Whereas classical economists were concerned with the economics of a stationary state toward which the economy was believed to be evolving, modern economists use as their central concept the economics of an economy in equilibrium. This ignores the fact that the real economy is always in motion. It not only fails to arrive at equilibrium, but any notion of what equilibrium could be at a given moment is irrelevant to the changes driving the economy. Understanding the major force that drives change in market economies is fundamental. In stagnant, unchanging economies like those of ancient Egypt and classical China as well as in command economies the concept of equilibrium may be useful. This catches the immobility of such economies over time, since any movement away from equilibrium is self-correcting or results in action that brings the economy back into equilibrium.

One of the central consequences of an equilibrium model is stability. Any disturbances that move an economy or an industry away from equilibrium must have negative feedback or are overmatched by other equilibrating forces or causes that will restore the equilibrium. With negative feedback, small effects die away (as in diminishing returns and falling marginal utility), so equilibrium reestablishes itself. In reality, change usually drives the economy farther away. This is most clearly manifested in industries with increasing returns. Here it is obvious that the movement is away from notional equilibrium. Equilibrium does not recognize the economic consequences of growing knowledge and increasing returns. These are related to one another since a very large part of the increase in knowledge comes from learning by doing or is inspired by the need to overcome problems that arise in the course of production.

Keynes noted that it was Hume who began the economist’s practice of stressing the importance of the equilibrium position rather than the ever-shifting transition to it. However, Hume believed that it is in this transition that we actually live (1936, 343 n. 3). But Keynes did not fully grasp the fact that we do not live in a transition to an equilibrium position. The basic characteristic of a market economy is evolutionary change. That is, the economy is not in transition to a fixed, definitive equilibrium position any more than biological evolution is in transition toward some ideal creature. Evolution and change in the economy are processes driven from behind rather than pulled ever closer to a fixed goal. At any moment in time, one
may be able to say, all things being equal and with no unforeseen changes, that such and such will be the outcome. What is misleading is calling this projected outcome equilibrium. This implies that if the outcome does come about the forces involved will maintain it or, if it moves away, there are forces to restore it. The implication, also, is that attaining equilibrium is desirable.

In the premodern religious era, Christians and Moslems believed that this life was a time of trials and tribulation in preparation for the next world, where existence would be eternally happy and heavenly perfect. In a more secular age, Leibnitz and Voltaire’s Dr. Pangloss preached that this is the best of all possible worlds. The same idea of perfection as a goal was accepted by many believers in the theory of evolution. It was felt that evolution governs a path that leads ever upward and survivors must be the fittest in some transcendental sense. In economics, the same unconscious state of mind leads market idealists to believe that the economy is already in the optimum state (equilibrium), is groping for such a state, or would achieve equilibrium if it were not for wicked or ignorant human interference.

Unfortunately, neither in evolution, as Darwin observed, nor in the economy is it true that the optimum will result. It is perfectly possible that some species, the fittest by all measures, may have been destroyed simply because they happened to be in the wrong place at the wrong time. Those now occupying the niche of the extinct species may simply have been more lucky at the decisive time. If it is true that the dinosaurs became extinct as the result of a massive meteor smashing into the earth, this simply means that dinosaurs were less fit than the small ratlike mammals to survive an event that occurred once in sixty-five million years. Had the meteor missed the earth, dinosaur scholars might now be worrying about preserving primates as a species, with the most sensitive dinosaurs arguing that simply because one cannot find any use for them, does not mean that primates should be eliminated.

In the world of human institutions and relationships, if one must have a natural science metaphor it should come from biology or meteorology rather than seventeenth-century physics. And, of course, Marshall did use the biological metaphor in thinking about economics. In the course of his life, he became increasingly convinced that biology was more closely related to economics than Newtonian mechanics was. He observed that human societies, like biological nature, are constantly evolving. Since neither the precise direction nor the speed of a change can be precisely predicted, the “laws” of economics are no more than statements of trends or tendencies (See Kamarck 1983, 21–22; and Kaldor 1985, 58).

In a biological metaphor, the central fact is change, and clearly this is the dominant fact in an economy as in all human events. An enterprise in
every aspect of its operations has to consider the changes that are happen-
ing within it and the economic environment in which it operates. In a com-
petitive environment, the objective is the constant search for more sales,
lower costs, improvements in products, or more saleable products; it is not
trying to achieve a stable equilibrium.

The tropical rain forest provides a helpful metaphor. As was described
in chapter 2, in the forest life and reproduction go on throughout the year
among weeds, insects, birds, parasitic fungi, spider mites, eelworms,
microbes, viruses, and other pests and parasites. Life takes on an infinite
multiplicity of forms, with fierce competition for survival and only rela-
tively few individuals in every generation surviving in any one place. There
is rapid evolutionary change in the face of new opportunities (Kamarck
1976, 17).

The biological metaphor, while it is better than that of Newtonian
mechanics, is not perfect for the economy. It fails in that the agents in the
economy are conscious players on their own account, not merely entities
acted upon by the environment. As every economist worth his or her salt
knows, the economy is a complex, constantly changing, adaptive system in
which each agent—individual, firm, industry, or nation—is constantly act-
ing and reacting to what the other agents are doing. The key to under-
standing is to grasp that the whole process is one of constant change. As an
opportunity is grasped and exploited by one agent, this may open up
opportunities for others as competitors, partners, parasites, or predators. In
the final analysis, the equilibrium optic obscures the real economy.

Just as physics has reconciled itself to the fact that one cannot have a
scientific theory or model of the world that is completely deterministic, it is
equally true that we cannot have a scientific model of the economy that is
completely deterministic.

An equilibrium is a position of rest or the final coherent state of bal-
ance. But the economy is never static, and both it and the society in which
it exists are constantly moving. At most, equilibrium is only a mathemati-
cal concept lacking existence or experience in the economy. In the real
world, time is a continuing, irreversible process. Time’s arrow points in
only one direction. Everything changes over time. Commodities in the
market “commonly go through a cycle of initiation, exponential growth,
slowdown and decline” (Vernon 1971, 70). Even the most apparently stable
institutions are at best merely in a temporary stasis among dynamic forces.
The structures or institutions within which a market exists are also in flux.
An economy is not a rationally organized, objective system but a dynamic
process that is continually in motion and constantly changing, with mil-
lions of participants acting on knowledge, most of which is on its way to becoming out of date.

Amartya Sen has pointed out that equilibrium reasoning is logically deficient: (1) equilibrium may not exist; (2) if it does exist, it may not be unique; (3) if it exists and is unique, it may not be stable; and (4) if it exists and is unique and stable, it may be inefficient in the sense of not achieving Pareto-optimality. Finally, the fact that competition exists does not imply the existence, uniqueness, stability, or efficiency of a general equilibrium (1991, 70, quoted in Streeten 1997, 50).

The Austrian school of economics correctly believes that, in terms of the equilibrium concept, all prices are disequilibrium prices and no equilibrium position can be achieved. The market works to discover information, make adjustments, and shift resources to cope with changing conditions. As there is no omniscient auctioneer who controls the market and establishes the point of equilibrium, transactions must take place at nonequilibrium prices (Kirzner 1997; Rosen 1997). The market process results in outcomes, not in equilibria.

In recent years, formal theoretical work has been conducted that does not fit into the accepted canon, for example, the work at the Santa Fe Institute on complexity, nonlinear dynamics, evolutionary game theory, and inductive rationality. Almost all of the models developed deal with multiple equilibria, which creates the problem of how equilibrium selection will be decided (through institutions or public policy). However, in this pioneering work, instead of reporting that the models result in multiple outcomes (avoiding the implication that these are desirable or likely to persist) for which some criteria for choice will have to be developed, the equilibrium mind-set still dominates.

The very idea of equilibrium is a notion that has no place for the influence of real time. The exogenous variables and the formal equations that determine the nature of the equilibrium are independent of time and history (Kaldor 1985, 62). “Sicut erat in principio, et nunc, et semper, et in saecula saeculorum. Amen.”

the model into which time as a logical variable has been incorporated is formed in such a way that the mathematical structure is unaffected by the passing of real time. The forms of differential equations that structure the system are themselves time invariant. The dynamic model that might be expected to have some explanatory relationship to the real world is therefore able to be started and restarted at any of differently assumed time dates and the nature of its behavior inspected. It is in this sense that logical time is capable of movement both backward and forward. For the dynamic scheme can be restarted and the relations
between the implications of time-invariant equations of motion can be inspected at any point of its logical time or its logical phases of development. (Vickers 1995, 5–6)

In focusing on the concept of equilibrium, real historical time is neglected. This deemphasizes the uncertainty and ignorance of the future that real life entails. In the economy, decisions take place in real time. Agents take decisions based on their unique knowledge and experience. This is dated knowledge, based on what is known of the past and perceived of the present. As for the future, an experienced and knowledgeable agent can make some guesses with varying degrees of confidence about particular aspects of the situation. While risks can be assigned probability distributions based on experience, there is always the element of uncertainty, which is not only unknown but unknowable. Theory usually tries to finesse this fact by assuming perfect knowledge or assuming that the future economic data could be interpreted as random variables that could be described by objective or subjective probability distributions. The idea that genuine uncertainty could be transmuted to probabilistically reducible risk is untenable. It assumes knowledge when essentially there is ignorance.

_Growth_

A realistic understanding of economic growth is hampered by the mechanics equilibrium optic. It’s as though geographers insisted on working with the concept of a flat rather than global earth. It’s not surprising that economic theory has had problems in accounting for growth. A solar system or galaxy evolves but does not learn. An economy is a complex, adaptive system evolving from learning or adapting to experience. Applying the physical equilibrium model to the economy is consequently a categorical mistake. Nearly everywhere one looks one can perceive the economy mutating, transforming, and changing.

Economics cannot neglect history. The present is influenced by the past. There have been divergent roads, and the present path was not inevitable. There were many possible worlds, and to understand the one we have we need to know how it evolved.

Adam Smith observed that growth of the market led to specialization and this in turn led to increases in productivity. With lower costs, markets could be further extended, and more specialization became possible. With the specialization, the division of complex tasks into simpler ones led to the development of machinery, further cost reductions, and more growth in
the size of the market. In this process, specialized firms become possible and come into existence. With the growth of specialized labor and specialized firms and the stimulus that comes from the exchange of knowledge and experience, there arises a concentration of activities in a particular locality and even a particular country. This is the phenomenon illustrated by Silicon Valley today.

When in the eighteenth century in Great Britain production moved from the putting-out system to the factory, change accelerated. The mill owner was a production man, alert to the possibilities of changing techniques and the reorganization of work so as to cut costs or speed up output. The inducement to change inherent in the new technology—its calculus of efficiency, its systematizing of empirical research, and its growing ties to the discoveries of science—was greatly strengthened (Landes 1970, 122).

The evolution of economic growth theory has proceeded roughly as follows. In the early standard model, it was simply an increase in the aggregate quantities of labor, capital, and the use of land, which resulted in increased total output (recognizing, however, the existence of diminishing returns to inputs). This model was improved by recognizing that there was more to the story: there was growth in productivity (beyond that from specialization), the result of growth in capital per worker and spillover from exogenous innovation in the rest of the economy. In recent years, theorists have brought the innovation process into the model, making it endogenous, by assuming productivity growth from investment in human capital and research and development (Taylor 2000, 90–91). All this helps to explain growth, but it leaves out that which drives the process in competitive free market economies.

The advantage of a capitalist competitive market system is that in its essence it is driven to change, while a central planning system, like a secure monopoly, tends to become static. Capitalism is, as Schumpeter observed, “by nature a form or method of economic change and not only never is but never can be stationary” (1942, 42). It is this characteristic of capitalism that the Soviet and Eastern European socialist countries lacked, and it was one of the principal causes of their lag behind in spite of the tremendous sacrifices they imposed on their peoples.

Adam Smith’s contribution, in what was almost an offhand comment that has largely been overlooked, showed that he perceived that competition is the deus ex machina of growth in a competitive market economy:

The increase of demand, . . . though in the beginning it may sometimes raise the price of goods, never fails to lower it in the long run. It encourages production, and thereby increases the competition of the producers,
who, in order to undersell one another, have recourse to new divisions of
labour and new improvements of art, which might never otherwise have
been thought of. (1776, 706)

Schumpeter, in a more sophisticated analysis, essentially came to the
same conclusion: the force that powers the system’s incessant transfor-
mation in a competitive market is the fact that profits derive only from change.
In competitive equilibrium, price must equal costs to the entrepreneur. He
or she makes a profit only through competitive change: finding a new way
to cut costs, producing a different product, finding a new market not yet
exploited by competitors, and so on. Profits drive change—and growth
through change is the essence of the system (1912, 128–56).

Schumpeter believed that his emphasis on the innovating entrepre-
neur might make his theory obsolete in a world in which production was
dominated by large corporate organizations (Stolper 1942, 69). However,
he built better than he feared. In the modern corporate economy in the
industries that are subject to competition, intensive effort is devoted to
organizing and engineering change. Tens of thousands work in the
research laboratories of corporations, the government, and the universities,
all of them focused on generating change.

The most successful corporations, such as Dupont, 3M, Hewlett-
Packard, and GE, are those that are most devoted to innovation and
change. IBM noted that in 1997 more than half of its revenue came from
products that had been on the market for less than twelve months. Johnson
and Johnson describes its top priority this way: “Continuous, non-stop,
endless, relentless innovation” (Larsen 2000, 3).

In my own experience, I have seen the dramatic results that occur in
economies when competition and economic incentives are introduced. The
growth explosion in Spain in the 1960s that followed the freeing of the
Spanish economy from fascist-mercantilistic restrictions is a graphic exa-
ample. The outburst of innovation that followed the breakup of the Bell sys-
tem monopoly in the United States is another.

To better understand the economy, we have to include Smith’s and
Schumpeter’s insights in the conventional analysis. Baumol has it right:

Because the analysis is macroeconomic, it cannot easily take account of
the market forces and fierce competition among firms for priority in new
products and processes. Yet these, arguably, are among the key determi-
nants of the magnitude of the resources the economy devotes to innova-
tion and are at the heart of the explanation of the historically unmatched
production and growth performance of free-enterprise economies.
(2000, 13)