

Institutional and Ecological Economics: The Role of Technology and Institutions in Economic Development

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Abstract: This paper examines the roles of institutions and technology in economic development from the institutionalist perspective as well as from that of ecological economists who are concerned with sustainability of development. Both schools are critical of mechanistic, deterministic models used in neoclassical economics, of over reliance on market solutions, and of “value free” economics. Both use biological metaphors to describe the operation of economies. But there are important differences in how ecological and institutional economists have approached growth and development, primarily whether technology and human knowledge are inherently leading to destructive consequences and whether natural forces or institutions are the ultimate constraint to economic growth.

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In this paper, we discuss parallel and competing ideas in ecological and institutional economics about economic growth and development by focusing on the roles that technology and institutions play in each of their approaches. Both are critical of mechanistic, deterministic models used in neoclassical economics, of over reliance on market solutions, and of “value free” economics. Both use biological metaphors to describe the operation of economies. But, there are important differences in how ecological and institutional economists have approached growth and development. Many of these stem from the different views of technology and institutions, which we explore here. Some of these are reconciled in the work of Kenneth Boulding who was both an ecological and an evolutionary economist. We believe a continued cross-pollination and synthesis between these schools can lead to a more comprehensive

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approach to economic growth and development than is found in neoclassical economics.

The institutionalism of Clarence Ayres, Gunnar Myrdal and John Kenneth Galbraith pioneered the idea that economic development is more than economic growth. Economic development occurs when there is a broadly based increase in the standard of living (or quality of life). While many aspects of the institutionalist view have permeated neoclassical thinking about development (Brinkman 1995; Jameson 2006) this differentiation between growth and development has not, but it has been accepted by many ecological economists (Daly 1996). However, in addition to being broad-based and contributing to a better quality of life, ecological economists argue that true economic development needs to be sustainable over time. Their most important contributions have been to recognize first, that there are life-giving, nonrenewable resources for which there are no substitutes, and second, that population growth combined with a rising standard of living will create waste, which may exceed the capacity of the biosphere. We believe these insights along with the important contributions of institutionalism can help develop a richer and more pluralistic approach to economic development that we touch on at the end of this paper. We begin first with key points from institutionalism.

Economic Development from the Institutional Perspective

Beginning with Thorstein Veblen, institutional economists in the United States have disagreed with the classical and neoclassical focus on accumulation of capital as the driving force behind economic growth and development. Institutionalists identify technology and its relationship to cultural habits and institutions as the key to growth (Veblen 1908). Development is more than growth. It describes an ongoing (evolutionary) process that will continue to raise standards of living for a broad spectrum of the population over time. Development is related to the new "states of mind" that come with changing knowledge and its implementation through technology.

In institutionalism, technology represents positive forces enhancing human capabilities and expanding resources. Lower (1987) contrasts the conventional view of technology as "gadgery" or "individual creativity" (1150-2) with Veblen's concept of "habits of thought" (1908; [1914] 1922). This describes the broadly accepted knowledge within a culture that Veblen terms an "intangible asset" belonging to the community and which serves as the basis for cumulative economic change. Technology is not the latest in high tech weapons or power plants but the generalized knowledge of a people about how the world operates. This leads not only to invention by a few but appropriate uses of tools by the many. Veblen's "instinct of workmanship" ([1914] 1922) is the basis for curiosity and trial and error experimentation. It leads to innovation and the implementation of new ways of doing things in tools and processes (Ayres [1944] 1962).

While neoclassical economics treats technology as exogenous,¹ institutionalism sees technology (knowledge) as not only the creator of physical capital but a determinant of what is a resource (DeGregori 1987). For example, until humans have

sufficient knowledge they cannot see coal or oil as a resource for heat. Similarly, knowledge and its widespread acceptance can be the basis for using resources much more efficiently and finding ways to recycle waste rather than use and deplete resources.

Any society needs a certain level of institutions to support an economy and its development, but institutionalists are inclined to view them with skepticism. Institutions are often a negative force preventing adaptation to new ways of doing things. "Institutions" refers to Veblen's (1908) habits of thought as well as to the organizations and structures that many today are calling social capital. Religious beliefs, the materialistic view that "more is better," competitiveness or cooperation are also institutions. Throughout history new technologies and modes of thought have flowed to societies where institutions were flexible, sometimes because they were weak and undeveloped (Ayres [1944] 1962; Street 1987). In addition to retarding innovation (ancient China), institutions can also skew the distribution of economic rewards toward a powerful group (Bourbon France), repress scientific inquiry (Galileo) or emphasize materialism as the source of happiness (present day America).

We can see the negative force of institutions on sustainable development in the following three examples. While the use of technology is often referred to as a market decision, DeGregori (1974) points out that "market decisions operate in a context of past and present public and private decisions." This may create a "need" for ever increasing amounts of energy. Rapidly rising per capita consumption long after basic needs have been met strains the capacity of the environment to absorb the waste generated as well as the resource inputs needed. Veblen ([1899] 1973), Galbraith ([1958] 1969) and other institutionalists see conspicuous consumption as a habit of thought, fostered by a society with a demand for status markers. Geographic and economic mobility leave a vacuum about how to define who has what status relative to others that conspicuous consumption can fill. In addition, both Veblen (1908; [1914] 1922) and Galbraith ([1958] 1969; 1996) observed that the organization of modern industrial economy around a powerful corporate structure twists the definition of "needs" into what will help corporations grow and profit.

An important aspect of institutionalism is its emphasis on the central role of people. They are not only the source of knowledge and technology but also the creators of the institutions that facilitate or limit applications of technology for economic development. There is constant feedback and interaction between institutions and technology in any society, which leads to a process of accumulative knowledge and habits around how to use resources. What we have is a dynamic evolutionary system that recognizes the power of technology in creating change, but we also need to be aware of its limitations.

Nelson and Winter (1974) describe institutions that protect obsolete technologies (for example, replacing fossil fuels with renewable resources like wind) and keep technology on a linear path. Because of inherent uncertainty in the future, once a particular pattern or technology works individuals and institutions are reluctant to change. This can lead to problems like path dependencies and locked-in uses of dominant technology. New technologies that can lead to a more sustainable

world might be locked out of the system. Cowan and Gunby (1996) cite a particular chemical control for agricultural pests remaining the dominant technology despite being inferior to other types that could have been used because of habit and inertia. Many more examples of energy saving or waste minimizing technology that would be profitable but is not in general use are given in Hawken, Lovins and Lovins' *Natural Capitalism* (1999).

The dynamic interplay between institutions and technology has been explored in institutionalist economics in many ways (Nelson 2005) that other economists can learn from regarding sustainable development. We now turn to the particular contributions of ecological economics.

Economic Development from the Ecological Economics Perspective

Ecological economics is a relatively new field, still in its early stages of development. It is transdisciplinary rather than multidisciplinary, drawing on the expertise in many fields that affect the economy and nature. Ecological economists study the complex dynamic and interdependence between our ecological and economic systems. They believe the interaction between these two systems can lead to uncertain, irreversible, and unsustainable outcomes that can affect both systems dramatically.

The idea of sustainable development and the impact that economic growth has on that development is the central issue of concern for ecological economics. Ecological economists have two major reservations about economic growth: 1) they believe it is not sustainable given the interdependency between economic and environmental systems; and 2) they question its ability to create well-being and happiness.

For neoclassical economists economic growth is the answer, and not the problem, when dealing with environmental issues. Neoclassical economists believe that sustainable development can be achieved through the development of new technologies and market forces. Ecological economists, on the other hand, believe that there are significant limits to the development of technology and that redistribution is necessary to solve poverty and economic development rather than more economic growth. This discussion has led to two definitions of sustainable development that are referred to as a weak and strong sustainability. Weak sustainability is satisfied when the loss of a nonrenewable or renewable resource (natural capital) can be compensated with a substitute of another kind of capital. Strong sustainability sets up a constraint where the stock of the existing natural capital should not decrease even if substituted by human-made capital because of its unique qualities. The present debate between neoclassical economists and ecological economists is around the issues of defining sustainability, the role of economic growth and determining environmental quality.

In the first section of this paper, we talked about the role technology and institutions play in explaining economic development for institutionalists. They have a much more limited role for ecological economists in understanding sustainable development. However, evolutionary economics has had a significant influence on

ecological economics. To understand the parallels and differences between ecological and institutional economists and to better understand the role of evolutionary economics in ecological economics we turn to Kenneth Boulding.²

Boulding's (1991) definition of evolutionary economics focused on the similarities and differences of economic and biological systems. In *The Economics of the Coming Spaceship Earth* (1966), Boulding had argued that our long-term survival depends upon a shift from a cowboy economy with an anthropocentric set of values to a spaceship economy. Like Galbraith, he questioned whether increased consumption and production are the way to define well-being and quality of life. In Boulding's paradigm, there are more actors than producers and consumers: there are also exhaustible resources and waste disposal. The economy is a closed rather than an open system, with exhaustible resources and limits to pollutants the world can absorb.

To move from the cowboy economy to the spaceship model there are three factors: matter, energy and knowledge. For Boulding the last is the most important. Human ingenuity and creativity is the foundation for economic development - a very institutionalist view. There are constraints, and using adequate information we can change existing patterns of behavior and institutional constraints.

Boulding's position was criticized sharply at the time as an exaggeration, particularly by those who held a weak sustainability position. However, this early work contained several major insights. For Boulding, the most important thing we can do is to change our *perception* that the economy exists in an open system as compared to a closed system. This leads to possible creation of new knowledge and institutions. With *Ecodynamics: A New Theory of Societal Evolution* (1978), Boulding explained economic development as being part of an evolutionary process ranging from biological to social to scientific evolution. He influenced the co-evolutionary work on sustainable development by Norgaard (1988; 1989; 1994) and Gowdy (1994a 1996b; 1994c) who argued that people, technology and institutions have coevolved with the environment. There is also a hint of evolutionary economics in the work of Herman Daly as he defines sustainable development as "a cultural adaptation made by society as it becomes aware of the emerging necessity of nongrowth" (1993, 268). What we see here is the influence that evolutionary economics has had on ecological economics, but what we see lacking in the analysis of ecological economists is the significance of technology (knowledge) and institutions in choosing different paths of economic development.

This leads us to some of the major differences between ecological economics and institutionalism. One of the major differences is whether technology and human knowledge are inherently leading to harmful and destructive consequences. The traditional example used is the nuclear industry, where knowledge is used to create weapons of mass destruction or power that leaves nondegradable and dangerous waste behind. Institutionalists would agree that knowledge or technology can be used in a destructive way, but see the cause not in technology per se, but in the institutions that use and develop that technology.

Another difference is the anthropocentrism that ecological economists would identify in institutionalism. The role of people is as central in institutionalism as the

environment is for ecological economics. What creates institutions and technology (knowledge) through the evolutionary process in socio-economic systems is people. While ecological economists see the environment as the ultimate constraint, institutionalists see institutions as the limiting factor. The outcome may be uncertain whether technology (knowledge) can overcome the constraints of institutions, but the potential source of change is people. Institutionalists would not have the same negative view about population growth that the ecological economists do, but would be more concerned with the institutional structures surrounding growth in population.

Toward a Pluralistic View that Replaces Narrow Neoclassicism

It is clear that the neoclassical approach to growth and development cannot deal adequately with sustainability or quality of life issues (Greenwood and Holt 2007) because of its underlying assumptions and methodology. Over-compartmentalization has resulted in a lack of adequate knowledge of science within disciplines such as economics and contributed to widespread belief that weak sustainability (increasing one form of capital if you deplete another) is an adequate solution. We think that when it comes to understanding substitutability of life-giving elements such as the biosphere most economists have had inadequate scientific knowledge behind their conclusions. We agree with Soderbaum (2000) that ecological and institutional economists have much to learn from each other.

The transdisciplinary approach of ecological economics is attractive, since it admits that big picture problems like the survival of the earth and humanity are not the purview of any one discipline or specialty. The biological metaphors used by ecological economists and Daly's (1977) four principles – enoughness, stewardship, humility and holism – are likely to resonate with the broader perspective institutionalists have regarding economic growth and development. However, most institutionalists would argue that 1) human well-being should be our central concern and 2) technology can be used for good or evil depending on the institutions in a society. Some interesting examples of this are found in the geographer Jared Diamond's *Collapse: How Societies Choose to Fail or Succeed* (2005). Many of the challenges these past societies faced were environmental in nature. It was the rigidity or flexibility of their institutions that played a major role in their demise or survival.

Notes

1. Some eminent neoclassical economists have recognized the problem of treating technical change as being exogenous. In Arrow (1962) and the new endogenous growth theory (Romer 1994; Pack 1994), technology is no longer assumed to be exogenous to the economy and the growth process, but the argument still is focused on technology, capital and labor, with no special role for natural resources.
2. There is overlap between evolutionary and institutional economics as seen in the Veblenian Association for Evolutionary Economics that publishes the *Journal of Economic Issues*. However, there are clearly camps of scholars within each that do not overlap. Evolutionary game theory is not all that institutional, although some of its practitioners will say that what they are doing is relevant to institutions. The new institutionalists are not all that evolutionary. In the extreme they produce static, neoclassical solutions involving minimization of transactions costs.

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