

8 Production process and dynamic economics

NICHOLAS GEORGESCU-ROEGEN

Cambridge Univ. Press.

1. An epistemological exordium

Traditionally, a living creature is expediently defined as an element of nature that feeds itself, defends itself and reproduces itself. The thought that this characterization naturally applies to humans as well opens the way to a more telling substitution, namely that the essential activities of any life-bearing structure are production, consumption, self-defence and self-reproduction. Clearly, any such a structure must produce the elements on which it feeds or with which it defends itself. Production is an essential activity of all living world.¹ Take an oyster (which Plato considered to be the most remote animal from a human): it is engaged in production as it keeps opening and closing its valves to catch the micro-organism on which it feeds. Even a green plant – not to forget – produces its 'food', primarily carbohydrates and proteins, from other 'factors'.

Production of all living creatures other than the human species is an activity governed by instincts, by innate tropisms. The human condition is essentially different. Like all life-bearing species, humankind has evolved biologically; it still does. By contrast, however, the evolution of humankind has not been limited to soma, to the mutations of our biological organs. A million years ago the earliest of our ancestors began to use for everyday needs things that were not part of their soma. They gradually became accustomed to using, say, a club picked up from the woods in order to add more power to the arm. It was through such a simple change at first in the manner of production that the human species embarked on a new and (as it proved later) crucial evolution, namely the exosomatic evolution.

Ever since, humans have been guided to supplement their somatic organs by countless exosomatic – detachable – ones. I consider them 'organs' because a mind different from ours might not distinguish between, say, a

hand that breaks bread and a knife that cuts it. By now these exosomatic organs enable us to run faster than a cheetah, swim faster than any fish and fly higher and faster than any bird, in spite of the fact that we are not endowed with the heart and the muscles of cheetahs, nor with the gills and fins of fish, nor with the hollow bones and the wings of birds.

There is still another upshot of the exosomatic evolution. The minds of natural scientists have been tormented by the question of the origin of the universe or of the origin of life on earth (some, even of the origin of mathematics). Sociologists have also sought an explanation for the origin of society. Only economists seem to have shown no interest in how the economic process began (although the origin of economics has been a constant object of debate). Yet the answer is in hand: because the exosomatic organs are desirable their production increased and spread, and because they are detachable they soon began to form the object of trade.

And because relativism seems the dominant tenor of our day, I should not fail to consider the assertions that in production many animals differ only in kind, not in essence, from *homo sapiens*. In support, our attention is directed especially to the behaviour of many primates. Hard to explain, however, is that the champions of relativism have failed to mention other instances even more impressive. Think of the bees or the beavers, which are clear tool users. A truly striking case is supplied by a Galapagos woodpecker finch (*Cactospiza pallidus*). On discovering a worm inside a tree trunk, that astonishing craftsman looks around for a cactus spine of the appropriate length to reach the worm, cuts it and uses it to bring out its prey. That finch does not only use an exosomatic tool, the spine, but it also makes it. Notwithstanding, these facts and many others of the same nature do not bring any water to the relativist's mill. For humans not only use tools for getting food or for providing comfort, they also make tools to be used for making other tools. Henri Bergson pointed out long ago that humans are the only animals that 'make tools to make tools'. Even in the evolution of *homo* this step represented a momentous mutation. Ever since, 'machines to make machines to make machines' has been the basis of humankind's production activity, as Joseph A. Schumpeter noted with his characteristic penetrating esprit.²

It is thus in total reason that production is a fundamentally important activity of ours, far more important than all others. Certainly, intended and planned production is a human activity far older and, moreover, far more critical than participation in a stock exchange market. In addition, several important phenomena of the economic life have their origin in the