Theoretical Economics Letters, 2023, 13, 1281-1288
https://www.scirp.org/journal/tel
ISSN Online: 2162-2086
ISSN Print: 2162-2078

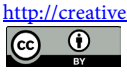
Economic Natural Selection: Interpretation of Natural Selection as Economic Selection in the Evolutionary Process

Jong Soue You

Department of Economics, Algoma University, Sault Ste. Marie, Canada
Email: jong.you@utoronto.ca

How to cite this paper: You, J. S. (2023). Economic Natural Selection: Interpretation of Natural Selection as Economic Selection in the Evolutionary Process. *Theoretical Economics Letters, 13,* 1281-1288.
https://doi.org/10.4236/tel.2023.135071

Received: August 6, 2023
Accepted: October 21, 2023
Published: October 24, 2023



Abstract

The paper proposes that natural selection hypothesis in the theory of evolution can properly be interpreted as economic selection in that the species that have adapted successfully to their changing environment through the optimizing economic behaviors resulting in efficient allocation of scarce resources have been selected by nature in the evolutionary process. It is the species' optimizing rational economic behaviors rather than their superior intellectual or physical strength that are responsible for their being naturally selected. In that sense, natural selection may be interpreted as economic natural selection. The paper presents the evidence that the species that have survived the natural selection process in general including the human species behave rationally through constrained dynamic optimizing behaviors which result in efficient allocation of scarce resources through decentralized decision making without a central coordination or control with the result that such species are selected by nature over those that do not.

Keywords

Natural Selection, Economic Selection, Economic Natural Selection, Economically Optimal Behavior, Efficient Decentralized Decision Making

1. Introduction

In the literature of economic natural selection it has been suggested that "the struggle for survival that had characterized most of human existence generated an evolutionary advantage to human traits that were complementary to the growth process, triggering the takeoff from an epoch of stagnation to sustained economic growth." (Galor & Moav, 2002). Frequently in the literature, an impli-

cit assumption is also made that an economic natural selection process will lead to rational economic behaviors by the economic agents (Frank, 2003). Winter (1964) presents a case for the firm striving to maximize profit, dominating the market, emerging from the competition as the fittest, and consequently being selected by nature. Nelson and Winter (1982) consider an evolutionary theory of economic change focusing on the firm behavior rather than the behavior of the individual members of the society. Gayon (2011) considers two different definitions of natural selection, "one of which contains reproduction and heredity as key elements whereas the other does not." The focus of the present paper is on the apparent behaviors of the species abstracting from their hereditary or genetic characteristics. The paper also focuses on the optimizing behaviors of species in general broadening the scope of economic analysis beyond the realm of human economic activities.

In a recent paper, You (2023) suggests that the natural selection process in the evolution of the organic and inorganic worlds is motivated by the fundamental economic motives of optimizing behaviors or constrained dynamic optimizing behaviors by the organic species and the inorganic matters, broadening the sphere of economic analysis beyond the realm of human society and necessarily inviting a participation of the natural scientists in economic analyses. The present paper takes this suggestion and elaborates it further with supporting evidence.

The purpose of the present paper is to make a strong case that it is the constrained dynamic optimizing economic behavior that is shaping the natural selection process in the evolutionary process. Specifically, the thesis of the paper is that the species that behave economically optimally are selected for survival and prosperity by nature. Evidence is provided that the constrained dynamic optimizing behaviors are not limited to the human society but represent the general optimizing behaviors in the world of nature including those of the colonies of ants and bees, the schools of fish, the flocks of birds, and the trees of the forest in the world of organic species.[1] These are only a few of the examples that resort to constrained dynamic optimizing behaviors resulting in efficient decentralized decision making to be naturally selected for survival and prosperity.

This paper is an attempt to shed a new light on the established knowledge base in economics and evolutionary biology in respect of natural selection through integration of the established knowledge in these disciplines. It does not contain new empirical findings. The paper is organized as follows. This introduction is followed by Chapter 2 which presents a brief survey of literature on economic natural selection. Presented in Chapter 3 is Economic Natural Selection Process in the Human Society. Chapter 4 presents Economic Natural Selection in Non-Human Organic Species. Chapter 5 concludes the paper.

[1]You (2023) presents evidence that constrained dynamic optimizing behaviors are not unique to human species but span the entire world of organic species and even of inorganic matters. For the purpose of this paper, however, only the world of organic species will be considered here.

2. A Brief Survey of Literature

There is a paucity of the literature on economic natural selection. A majority of literature on economic natural selection is on the firm behaviors or the behaviors of economic agents attempting to survive or adapt to the competitive economic environment in the human society rather than on the behaviors of the species attempting to survive the rigorous natural environment in the evolutionary process. On the latter concept of economic natural selection the literature is virtually non-existent.

On the idea of recognizing the analogy between economics and evolutionary biology it could be argued that both disciplines recognize that driving force of mutations in biology and creative destruction in the economic progress are based on the cost-benefit principle in that the economic prosperity is the outcome of Schumpeterian experimentation in risky prospects while the biological mutations face the survival risks.[2] Another aspect of the analogy between economics and evolutionary biology is that both disciplines can benefit from the use of game theory in their analyses. For example, it has been recognized that there are various efficient cooperative strategies between species in their effort of attaining their objectives of survival and reproduction. It has also been recognized that squirrels and beavers exercise inventory policies.

On the concept of economic natural selection within the sphere of the human economic behavior, Jean Gayon (2011) is perhaps as good a starting point as any for the survey of the literature. Gayon starts by asking a question: what concept of selection? He goes on to discuss two cases of adoption of evolutionary ways of thinking by modern economists: Nelson and Winter's (1982) evolutionary theory of economic change and evolutionary game theory (1990s and after). Gayon holds a view that natural selection may be understood in two different senses, one of which contains reproduction and heredity as key elements whereas the other does not. Gayon considers generalization of the concept of natural selection proposed by Lewontin (1970) and concludes that generalization of the concept of natural selection falls into two categories, one which holds reproduction and heredity as crucial components and the other which does not. Lewontin has explored the first possibility and proposed generalizing Darwin's natural selection through a formulation that avoids referring to any particular level of organization. In Gayon's view, Nelson and Winter(1982) propose nothing less than an alternative to the neoclassical theory of microeconomics along the lines of Alchian (1950).

Granted that Gayon's view may be valid as far as it goes, it does not address the issue raised by You (2023) that the sphere of economic analysis to date has been unnecessarily human-centered and has failed to embrace the realm of the behaviors of non-human organic species, not to mention the physical movements of inorganic matters. Unfortunately the literature is silent on this issue and thereby points to one of the areas of possible future research, specifically a

[2]Richard Dawkins (1976) states that "the purpose of life is survival and reproduction."

possibility that the origin of life on earth may have been motivated by the energy-dissipation-driven adaptation of matter as suggested by Michaelian (2011). A promising area of future research appears to be one of strengthening the empirical evidence for this hypothesis along the lines of England (2013).

3. Economic Natural Selection in the Human Society

The economic development and growth of the human society is perhaps the most glaring example of how the constrained dynamic optimizing behaviors by the humans made them naturally selected for survival and prosperity. Economic theory explains clearly how the constrained dynamic optimizing behaviors by the humans make it possible for the humans to allocate scarce resources efficiently through the decentralized decision making process (Dixit, 1990)[3]. These optimizing behaviors by the humans are responsible for the humans being naturally selected in the evolutionary process, making it a perfect example of "economic natural selection." It is striking that the efficient resource allocation in the human society is made possible by the decentralized decision making with no central coordination or control. History has shown that attempts at central coordination or control through central planning have produced invariably disastrous results. The human societies which resort to optimizing behaviors through decentralized decision making have been shown to be naturally selected over those which do not.

The pre-industrial human societies in the eras of Roman and Ottoman Empires in the West and the feudal societies of Chinese and Korean dynasties in the East lacked efficient decentralized decision making system and failed to be naturally selected. The modern experiments with central planning in the Soviet Union, China, and other centrally planned economies have failed to be naturally selected for the same reason.

4. Economic Natural Selection in Non-Human Organic Species

According to Dawkins (2009), the optimum height of a tree is determined by the equality of the marginal benefit and marginal cost of additional height. The marginal benefit of additional height is represented by the additional carbohydrate energy photosynthesized from the additional sunlight the additional height makes possible. The marginal cost of additional height is the additional amount of carbohydrate energy needed for the tree to grow the additional height. Why do some trees grow tall and some not as tall? It must be because different trees face different sets of environmental constraints. Every tree must solve a set of constrained dynamic optimization problems subject to a set of environmental constraints to determine its optimum height and, in fact, in all decision making.

[3]With specific reference to economic growth in the human society, Galor and Moav (2002) suggest that the struggle for survival that had characterized most of human existence generated an evolutionary advantage to human traits that were complementary to the growth process, triggering the takeoff from an epoch of stagnation to sustained economic growth.

We know that this is certainly the case for decision making by humans. All decision making by human beings is economic decision making and is assumed to be rational. It appears that it can also be argued that all decision making by non-human species is also rational economic decision making—rational in the sense of constrained dynamic optimization. This is clearly a case of efficient decentralized decision making by the trees in the forest, because of which they have been naturally selected, i.e., a case of economic natural selection.

Biologists have long observed that the colonies of bees (Tautz, 2009)[4] and ants (Gordon, 2016)[5] are organized on the basis of decentralized decision making by individual members of the colonies responding efficiently to their changing environmental constraints without any central control or coordination. In his recent paper, You (2023) cites the works by Gordon (2016) and Tautz (2009) which report that individual members of the ant or bee colonies solve the constrained dynamic optimization problems they are faced with as they interact with one another under their environmental constraints. You agree with Gordon and Tautz that these interactions represent the constrained dynamic optimal responses and they produce an efficient outcome without central control or coordination.

It is now widely understood that the world of the genome in organic life including that of humans is a highly efficient decentralized system of signaling and responses without a central control (Ridley, 1999), analogous to the efficiently functioning market mechanism in the human society. The brain does not control the body functions but the body including the brain functions as an integral system of signals and responses without a central control. This is a highly efficient biological system with decentralized signaling and responses—a product of natural selection. It is an evolutionary outcome of natural selection (Darwin, 1859)[6]. Natural selection ensures an efficient outcome. Any biological system designed to be controlled by a central command would not have the kind of flexibility and adaptability required for survival in the constantly and often unpredictably changing environment.

We also find that birds fly in formation, fish swim in schools and insects swarm. These are all examples of collective optimizing behavior. The collective behaviors of these organic species reflect the optimizing behaviors of the indi-

[4]In the words of Tautz (2009), "We are surprised to learn that no single bee, from queen through drone to sterile worker, has the oversight or control over the colony. Instead, through a network of integrated control systems and feedbacks, and communication between individuals, the colony thrives at consensus decisions from the bottom up through a type of 'swarm intelligence'."

[5]Gordon (2016) has this to say about the ant colonies: "An ant colony consists of many sterile female workers and one or more reproductive females. Even though these reproductives are called "queens", they have no power or authority. They just lay the eggs. Regulation without central control uses simple interactions ….. Ants interact by means of smell - when one ant smells another with its antennae, it can assess whether the other ant is a nest mate, and what task the other ant has been doing. The pattern of interactions produces the behaviour of the whole system. …. An ant uses its recent experience of antennal interactions to decide what to do next."

[6]To quote Darwin, "It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change."

vidual members of the group, which represent the solutions to the constrained dynamic optimization problems the individual members are faced with under their respective environmental constraints. It is well known that migrating birds fly in formation to conserve energy by taking advantage of the up-wash vortex fields created by the wings of the birds in front. Another hypothesized reason for their flying in formation is to facilitate orientation and communication among the birds. Fish swim in schools because schooling protects them from predators making it difficult for a predator to zero in on one single fish, encourages reproduction and apparently makes it easier to find food. Schooling also conserves energy, as each fish drafts in the wake of the fish ahead of him. This makes it easier for fish to swim long distances without exhaustion. These are the further examples of constrained dynamic optimizing behaviors and efficient decentralized decision making in the world of organic species.[7]

The discussions presented above lead us to believe that every act of an organic being is a result of some type of constrained dynamic optimization. We are also led to believe that the optimizing behaviors of the individual members of a group lead to an efficient outcome for the group as a whole without a central control. The optimizing process and the resulting efficient outcome are guided by an invisible hand. What is the nature of this invisible hand? The information driving the whole system is contained in the genome, which is the evolutionary outcome of natural selection. The evolutionary process of natural selection is a constrained dynamic optimizing process and also an efficient process. In this sense it can be said that the law of natural selection is a law of economically efficient evolutionary process, that is to say, economic natural selection.

Focusing on the human market economy in particular, several economists (Alchian, 1950; Friedman, 1953) have invoked the hypothesis of natural selection to justify the assumption that economic agents behave rationally and their behaviors lead to efficient resource allocation. Use of the rationality hypothesis in economic analysis can be justified although not everyone behaves rationally and not always since, as Blume and Easley (1992, 1993) correctly point out, "the market selects for those whose behavior is most nearly optimal." Natural selection ensures that "ultimately the market is dominated by seemingly rational individuals and prices converge to their rational-expectations equilibrium values." For the purposes of this paper, however, it should be made clear that the economic law of natural selection applies broadly not only to the human market economy but to the economies of all species.

5. Conclusion

The discussion above leads us to a conclusion that natural selection in the process of evolution of species can best be interpreted as economic selection in that it is the economically optimal efficient behaviors of the species that is responsible for its being selected by nature in the process of evolutionary process.

[7]The preceding paragraph is repetition of what the present author wrote in his earlier 2023 article.

In that sense, natural selection can usefully be interpreted as economic natural selection. This interpretation of economic natural selection is fundamentally different from the conventional concept of economic natural selection encountered in the literature of economic natural selection which focuses rather narrowly on the firm behaviors or the behaviors of the economic agents in the human society whereas the focus of the present paper is much broader and embraces the realm of economic behaviors of all species in the evolutionary process.

The main point of the present paper is that the idea of economic natural selection is not to be interpreted narrowly as being applicable only to the human economies but broadly as being applicable to the economies of all species. As such, the current research on economic natural selection can benefit from active participation by natural scientists. A notion that it is the constrained dynamic optimizing behaviors by the species that are responsible for their being naturally selected has other implications. It has been shown that the constrained dynamic optimizing behaviors result in efficient allocation of scarce resources in the human society without a central coordination or control and further that the evidence for efficient resource allocation through constrained dynamic optimizing behaviors, i.e., efficient decentralized decision making without a central coordination or control, in the world of non-human species seems to be overwhelming. This has practical policy implications for the human society that attempts at intervention in the individual optimizing behaviors are bound to produce sub-optimal outcomes.

Review of the literature on economic natural selection has revealed research on strengthening the statistical evidence for the energy-dissipation-driven adaptation of matter as the origin of life hypothesis as a promising area for future research.

Acknowledgements

The author wishes to acknowledge that he has benefited greatly from the helpful comments by an anonymous reviewer.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Alchian, A. A. (1950). Uncertainty, Evolution, and Economic Theory. *Journal of Political Economy, 58,* 211-221. https://doi.org/10.1086/256940

Blume, L. E., & Easley, D. (1992). Evolution and Market Behavior. *Journal of Economic Theory, 58,* 9-40. https://doi.org/10.1016/0022-0531(92)90099-4

Blume, L. E., & Easley, D. (1993). Economic Natural Selection. *Economics Letters, 42,* 281-289. https://doi.org/10.1016/0165-1765(93)90075-N

Darwin, C. (1859). *On the Origin of Species*. John Murray.

Dawkins, R. (1976). *The Selfish Gene.* Oxford University Press.

Dawkins, R. (2009). *The Greatest Show on Earth: The Evidence for Evolution*. Free Press.

Dixit, A. K. (1990). *Optimization in Economic Theory* (2nd ed.). Oxford University Press.

England, J. L. (2013). Statistical Physics of Self Replication. *Journal of Chemical Physics, 139,* Article ID: 121923. https://doi.org/10.1063/1.4818538

Frank, J. (2003). Natural Selection, Rational Economic Behavior, and Alternative Outcomes of the Evolutionary Process. *The Journal of Socio-Economics, 32,* 601-622. https://doi.org/10.1016/j.socec.2003.10.001

Friedman, M. (1953). *Essays in Positive Economics*. University of Chicago Press.

Galor, O., & Moav, O. (2002). Natural Selection and the Origin of Economic Growth. *The Quarterly Journal of Economics, 117,* 1133-1192. https://doi.org/10.1162/003355302320935007

Gayon, J. (2011). Economic Natural Selection: What Concept of Selection? *Biological Theory, 6,* 320-325. https://doi.org/10.1007/s13752-012-0042-6

Gordon, D. (2016). *Two Lessons from Ant Colony Organization*. World Economic Forum.

Lewontin, R. C. (1970). The Units of Selection. *Annual Review of Ecology and Systematics, 1,* 1-18. https://doi.org/10.1146/annurev.es.01.110170.000245

Michaelian, K. (2011). Thermodynamic Dissipation Theory of the Origin of Life. *Earth System Dynamics, 2,* 37-51. https://doi.org/10.5194/esd-2-37-2011

Nelson, R. R., & Winter, S. G. (1982). *An Evolutionary Theory of Economic Change*. Belknap Press: An Imprint of Harvard University Press.

Ridley, M. (1999). *Genome*. Harper Collins.

Tautz, J. (2009). *The Buzz and Bees: Biology of a Superorganism.* Springer. https://doi.org/10.1007/978-3-540-78729-7

Winter, S. G. (1964). Economic "Natural Selection" and the Theory of the Firm. *Yale Economic Essays, 4,* 225-272.

You, J. S. (2023). The Economics of Nature: Constrained Dynamic Optimization and Efficient Decentralized Decision Making in Nature. *Theoretical Economics Letters, 13,* 255-264. https://doi.org/10.4236/tel.2023.132016