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# COMPLEXITY AND ENTREPRENEURSHIP

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## ABSTRACT

*We do live in a complex economic world: the emergence of the market order can be identified with complexity. Our world is characterized by our incurable ignorance of its workings. Neither the government nor the entrepreneur has the answer to the problem of how to stir the market. The question is: "How to control without a controller"? For the answer, we turn to the emerging impersonal market mechanism of spontaneous order. The idea of the emergence of a complex order out of a decentralized but self-organizing economy sheds light on the proper role of the government and the entrepreneur. In short, we do look at the implications of the evolution of a spontaneous order of societal development for politics and entrepreneurship. The paper gives two managerially relevant insights as far as formulating and implementing public policy towards the role of entrepreneurship in a complex social order.*

*Keywords:* complexity; fundamental ignorance; evolution and spontaneous order; entrepreneurship

## INTRODUCTION

People are worried no one is in control in the present-day society. This is especially the case for the economic and financial world. Indeed, in a complex world no one, not even government, is in control and fundamentally also can control the complex economic world we do live in. To be even worse, the economy also has no goals. Though of course there are results: the growth in wealth and enhanced freedom. In a market economy, order evolves spontaneously without central direction. We do have individual economies, e.g., a household, an enterprise, which do have their goals and given set of means. We do not have, however, a market economy in the sense of an order that has a single order of ends. The allocational approach to economics, i.e. economics seen as a theory of choice, is inapt for the market order. The market is a network of many interlaced economies; it is not a large singular economy (Hayek, 1982, II: 107-108). Social welfare is not the result of a constrained maximization problem to be solved by the central planners. The two questions we do look at are the following. First, why is a society far too complex to be understood and controlled? In other words, why is it impossible for a government or anyone else to guide us to predetermined goals? Second, what are the proper roles of the government and the entrepreneurs in such a complex world and hence should guide public policy?

We do start with the reasons why we do live in a world of complexity and incurable ignorance. In a sense the highest wisdom we can achieve is "that I do not think I know what I do not know" as was said by Socrates (cited by Boetke, 2002). Next we do look at the spontaneous order, the impersonal market mechanism, we do live in. We do record the history of complex systems and the role and (im)possibilities of statistics in particular to get a grip on complexity. We do end with a look at the proper roles of the government and entrepreneurs in coping with our fundamental ignorance. As a result we do state two managerially relevant insights as far as formulating and implementing public policy towards the role of entrepreneurship in a complex social order.

## COMPLEXITY: WHAT IS IN A NAME?

Modern complexity research, in as well the natural as the social sciences, “studies how the interacting elements in a system create overall patterns, and how these overall patterns in turn cause the interacting elements to change or adapt” (Arthur, 2013). Next to modern complexity research, several other, often equally mathematically orientated, theories deal with complex phenomena, e.g., general systems theory, cybernetics and chaos theory. Spontaneous order exists throughout the cosmos though no one seems to be able to agree on exactly what that implies (Tucker, 1996). Hence there is no agreed-upon definition of such a complex term as complexity (Rosser, 1999; cp. Foster, 2005). Complexity theorists, or at least those operating in the economic arena, look at the evolution of human culture and the adaptive learning that goes on within large organizations. It is a view of the economy as emerging from the interactions of individual agents whose behavior constantly evolves, whose strategies and actions are always adapting. Biological and economic systems do work in the same way: the Darwinian metaphor of natural selection and the Adam Smith metaphor of the invisible hand fit together. The economy has the properties of a living organism---it runs itself. Friedrich A. Hayek of the Austrian school of economics popularized the term spontaneous order in economics in his 1960 classic, *The Constitution of Liberty* (Buros & McQuade, 2015). Hayek borrowed the notion from the Scottish Enlightenment in general and Smith in particular. He tried to convince people economic planning is impossible. This, however, has not prevented some economists, especially of the Santa Fe Institute in the U.S., an interdisciplinary center focused on the study of complex adaptive systems, from turning complexity into a rationale for government intervention (Tucker, 1996). For complexity theorists the market may be wrong and planners may be able to fix it. That, however, is directly opposed to the free-market conclusions of Austrian economics. In general, however, Austrian economics in general and Hayek in particular are at the cutting edge of complexity theory. Though there are important differences (Koppl, 2006; Kilpatrick, 2001).

We do start with the main reasons why our economic order is complex and look at the, nevertheless, spontaneously resulting complex order and the modern science of complexity economics, ic. Austrian economics.

### Human Diversity, Production and Real Choice

First, it is an open door, but still important to act accordingly in science, to say people are diverse. Just think of all the differences in character, experiences, goals, and wants. Or, more concrete, just think of all their different wishes for clothing: even in China people do not dress in the Mao suits of earlier days. If this is the situation no simple social system fits. A second reason is the complicated production system we do have. The economy is based on an ever-widening labor specialization. All the necessary decisions have to be coordinated in time and space (Lemieux, 2011); dispersed information has to be used to decide what and how to produce. In short, we do not only have a division of labor but of knowledge too. To concentrate all scientific, local and tacit knowledge is impossible. In sum, effective production and the efficient satisfaction of consumer wants needs the coordination of billions of persons and their plans, expectations and knowledge. The complexity of an economy is related to the multiplicity of useful knowledge embedded in it.

Most importantly, and third, real choices are creative. We can come up with something new (Vanberg & Buchanan, 2001). Besides, at the moment of choice we can decide to choose A or B, an often unpredictable choice. To pose, as just said, all knowledge, though dispersed, exists and is available is already saying too much.

All the heterogeneous individuals interact with the result of an order, a market system, we do call complex. Too complex to operate through a central planning system. Complexity is also a different a more general way to look at the economy compared to as it is done in more traditional micro and macro economics. It relates to the evolved order inherent in the living world: it enriches our understanding of the relationships

between aggregate outcomes and individual decisions. We do try to understand certain aggregate features of environments which are characterized by many heterogeneous actors.

## **The Resulting Complex Order: the Power of Spontaneous Ordering Principles**

In a complex order an understanding of the system is not possible through a simple reduction to its component elements. Results are impossible to predict and control. Happily, however, the market organizes itself: the market is complex but self-ordering. This happens notwithstanding the non-linear dynamics in the economy because of various complex feedbacks and mutually self-reinforcing interactions. The recursive loop connects with complexity. Aggregate behavior cannot be understood without recognizing the deep interactions (networks) that occur between actors within an aggregate.

In complexity theory, at least as it is applicable to the field of economics, market activities are coordinated by prices. Prices, generated by voluntary decisions based on private property rights, transmit the relevant information to those who need to know. The result is an order without the need of a central planner or a known result. It is a spontaneous order: “the result of human action but not of human design” (Hayek, 1982). The market order can be compared with the order that arises if people do decide to go shopping. It cannot be compared with the order that arises as soldiers do march in a parade. For the latter there is a planner. In the first case, everyone is making his or her own choices. No central planner can know, who and in what shop someone will be at a certain moment in time. Someone can be delayed because he meets a friend or for whatever reason (Holcombe, 2014). In short, market order is the result of individuals observing certain abstract rules and adjusting to their specific situation. It is, however, a harmony too complicated for individual comprehension.

In sum, there is a fundamental lack of knowledge of all the specific facts that do lead to a market order but on the functioning off we do depend. “The curious task of economics is to demonstrate to men how little they really know about what they imagine they can design” (Hayek, 1988). Fortunately, a decentralized market makes it unnecessary for anyone to know everything about the entire system. The labor specialization on the market can exist because we do react on the simple impersonal price signals coordinating all our activities; we adapt to the many facts of which we do not know the existence (Hayek, 1978). Though it is not to be forgotten that markets do work, but only within limits: a framework of rules. As Smith (1776) (Cp. Buchanan, 1986) said:

“Every man, as long as he does not violate the laws of justice, is left free to pursue his own interests his own way, and to bring his industry and capital into competition with those of any other man, or order of men.”

## **Complexity Economics**

In the following I look at complexity from the Austrian economics point of view in general and Hayek’s in particular. Especially Hayek in his later work did concentrate on the evolution of self-maintaining complex structures (Hayek, 1982). The similarities between the Austrians and complexity economics can be listed by the acronym BRICE. It stands for **B**ounded rationality (the limits to knowledge due to logical and computational limits), **R**ule following (the way our mind and agents do operate in the economy), **I**nstitutions (as necessary parts of the evolution of social systems), **C**ognition (individuals must cognitively interpret the problems they do face/dispositions as rules of perception ) and **E**volution (evolution as a metaphor for complex systems) (Koppl, 2006, cp. Rosser, 2013). There are also similarities between Hayek and complexity theory in the use of uncertainty and the emergence of patterns without central intervention: no macroeconomic management is needed. Austrian economics can be summarized with the illuminating epithet: the-economics-of-time-and-ignorance (Koppl, 2006). The twin concepts of a spontaneous order and evolution are for Hayek the main tools for understanding and to cope with complexity (Hayek, 1982).

Complexity economics is, given the just-said, limited to give “explanations of the principle”, or pattern prediction, e.g., the systems principle of motion: the impersonal signals of prices and abstract rules, when dealing with complex social phenomena (Caldwell, 2000). Complexity economics (Arthur, 2013):

“sees the economy not as a system in equilibrium but as one in motion, perpetually ‘computing’ itself--perpetually constructing itself anew. Where equilibrium economics emphasizes order, determinacy, deduction, and stasis, this new framework emphasizes contingency, indeterminacy, sense-making, and openness to change”.

Equilibrium filters out exploration, creation, transitory phenomena, adaptation, innovation and structural change.

## ON THE HISTORY OF COMPLEX SYSTEMS

How has economic life developed itself? For Hayek it has advanced by an evolutionary process of successes and failures by aping successful adaptations. We have started from small tribes with a sort of central leadership (Hayek, 1982). Later on sovereign nations did develop. Whatever the form of the society, till the end of the eighteenth century there was not much progress. An English laborer from that time was not in a much better position than a Roman slave. The idea the situation for everyone could improve did not exist. At the most an elite could get a better life (Nasar 2011).

To leave this endless cycle of poverty behind the gradual rise of the market was necessary. The future is not the past: in a market economy the future depends on the creative, real choices of individuals who are being confronted with fundamental uncertainty. One of the most important characteristic of the market is that it is based on an extended specialization of the production process. The growth in labor productivity, that accompanies the specialization, is the cause of the increasing wealth. As Paul Krugman (1990) writes:

“Productivity isn’t everything, but in the long run it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker”.

The result is that everyone, because of specialization, has to exchange what is produced. The discovery of exchange is one of the most fruitful discoveries in human history (Hayek, 1982, II:109). For exchange to function properly the following “three fundamental laws of nature”, in the words of David Hume (1739) are essential: “the stability of possession, of its transference by consent, and of the performance of promises.” Besides, because wishes among humans do differ peaceful exchange, in which both parties of the trade do gain, is possible--we do not all want to have the same goods (Hayek, 1982). There is no fight of all against all for the scarce goods as Thomas Hobbes in the midst of the seventeenth century still thought necessary. Consequently Hobbes’ all powerful Leviathan is not needed to keep the peace. An order establishes itself in which everyone has the freedom to go for his or her personal goals. We, however, cannot understand that order because of its complexity: indeed, everything depends upon everything else. Of course we can pretend “as if” all but, e.g., two variables are constant. This is the standard practice in microeconomic analysis: Alfred Marshall’s well-known one-thing-at-a-time method. To explicate, however, what we take for constant, the all-else-being-equal, is so complicated that “after the statement of which [the *ceteris-paribus*] the theory would no longer be simple” (Hayek, 1967a).

To sum up, Smith’s discovery at the end of the eighteenth century of a self-organizing complex system, beyond our comprehension, has given way to our modern market economy. The market is

“neither natural in the sense of being genetically determined, nor artificial in the sense of being the product of intelligent design, but the result of a process of winnowing or sifting“ (Hayek, 1982, Epilogue: 155).

It was his insight that by specialization we can increase production and exchange the goods of which we do have too much---and it does not become a chaos; just the opposite: wealth increases (Skousen, 2007). People can live together in peace and serve each other in exchange without agreeing on the ends. In a society we do not have to make an agreed-on list of priorities. This is a great advantage since it gives everyone the freedom to choose his or her own goals. Smith's discovery has been called, by George Stigler, the "crown jewel of economics" and its only real substantive proposition (Stigler, 1976). Prices, in a system of competition, do coordinate the individual actions and result in an evolving complex spontaneous order.

## **THE ROLE OF STATISTICS**

Why cannot we explain complexity in the market order with the help of statistics as is done in traditional macro economic models? The reason is that in statistics we refrain from all for the market process relevant factors and relations between them (Hayek, 1967a): the central elements of complex phenomena are overlooked. In those models for instance we do look at the general price level, but that figure has no influence on the market process. Suppose we do have a situation of deflation. That does not mean all prices go down in like manner. Some prices go up and others go down and prices react to each other. However, those are precisely the things that do influence the market process. A change in the price level per se tells us nothing about a change in these things. Above all, entrepreneurs do not take prices as data. Instead they do try to sell their products at more favored prices. "[T]he idea of a price that does not reflect and express entrepreneurial judgment and hunch is virtually a contradiction in terms" (Kirzner 1988). This is also the reason prices emergent from the interactions within the market order can not be duplicated by central planning. For our knowledge of the market process just the number of entrepreneurs is also irrelevant. For the last the internal structure is of relevance: some producers compete with each other with substitutes others, however, do produce complementary goods. This is all very different than to measure the latest total number of entrepreneurs.

In economics we do measure without the possibility to predict (Koppl, 2010). As opposed to the natural sciences where we can measure in order to predict and control. As Hayek (1967a) said:

"No economist has yet succeeded in making a fortune by buying or selling commodities on the basis of his scientific prediction of future prices (even though some may have done so by selling such predictions)".

In other words, in the relative simple natural sciences, two or three variables are often enough to explain a phenomenon and to make predictions and control possible. For the complex social world, however, this method is impossible: there are simple too many variables (Hayek, 1967a). Besides, the character of the elements' interactions and the resulting patterns are fundamental (Gaus, 2006). In short, statistics is "not a technique for dealing with the interplay of a large number of significantly independent variables as the individuals in a social order" (Hayek, 1967b: 3).

What we can do, however, is to describe the evolutionary process. We can give an explanation of the principle: generate pattern predictions telling us that in certain general conditions a pattern (structure or order) of a certain kind will appear. This however suffices to tell us what the government and entrepreneur can and cannot do. Since, of course, there is nothing contradictory about a mix of knowledge of principle and fundamental ignorance of what an optimal policy is.

## **WHAT SHOULD POLICYMAKERS KNOW ABOUT ECONOMIC COMPLEXITY?**

In this section we do state how to cope with our ignorance and its policy implications. In the market unintended consequences are paramount. Individuals looking after their own goals cannot know what will be the combined result of their actions. Order is created in a evolutionary process of competition and success decides who the winner is. Decentralized decision-making has the result we do use more knowledge than a central planner can ever do; the market exploits knowledge the best. The market is not only based on a division of labor but most importantly also on a division of knowledge. The division of labor into markets is what allows the knowledge held by few to reach many, making us collectively wiser. The market process is a “dynamic entrepreneurial-competitive discovery process” (Kirzner, 1988). What drives the market is entrepreneurship; what characterizes it is competition; and the several steps in the process are discoveries. So what are the roles of the government and the entrepreneur in the market process and should hence guide government policy?

## The Government

An economy can be described by the structure, the rules within which individuals do choose. If we are not satisfied with the results we should focus primarily at the structure of the economy. Attempts to change the results of the market do depend on the fundamental misconception we do understand the complex economic world. In this the Austrians are diametrically opposed to conclusions, e.g., of lock-in models, of complexity theory (cp. Barbieri, 2013). “Policy conclusions identified by complexity theorists as emerging form their insights are primarily interventionist” (Montgomery, 1999). If people do say the market, capitalism, fails we do not have to change the process of free exchanges within a given structure but the structure within we do has to be changed. The rule of law, several property, competition and a stable currency are the most important rules and institutions that has brought us wealth, individual freedom and peace (Buchanan, 2001).

Besides, the results based on government planning are dismal. Planning based on our present knowledge, as possessed by the government, does not bring us much farther than we already know. In general the creativity in government policy is---more-of-the-same.

What about the role of the government of creating social justice? The ethics of the market has little to do with solidarity as it is practiced in small societies, e.g., a tribe. We no longer live in a world in which everyone knows everyone else personally and also knows the wants of everybody else. On the impersonal market we do behave ethically if we have acted according to the, as just said, rules of the market: the stability of possession, the transference of consent and the performance of promises (Hume, 1739). We cannot know and go after the wants and needs of all other people. Our inevitable ignorance would without fixed rules have the result that men,

“would conduct themselves, on most occasions by particular judgment, and would take into consideration the characters and circumstances of the persons as well as the general nature of the question. But it is easy to observe that this would produce an infinite confusion in human society” (Hume, 1739, II: 298).

In short, the government has to set the rules of the complex market order and provide for the referee. Otherwise there will be no order but infinite confusion because of the particular judgment without rules of the government. These tasks of the government are no easy tasks. For James Buchanan, e.g., the crisis of 2008 is mainly the result of the government’s lack in stating the rules for the use of new financial products.

Why is the role of the government essential in stating the market rules and playing the role of referee? Can the market not create its own rules? The reason is the rules do have the characteristics of a collective good. The market, instead, gives us individual goods. Goods that can be bought and sold; people can be excluded from consumption if they do not pay for them. In principle, buyers and sellers are confronted with all the advantages and disadvantages of the exchange. This is not the case, however, for collective goods. The rules of the market order are for everyone and they do profit of them. People cannot be excluded from consumption. No producer, also, sees any profit in producing them since consumers cannot be excluded (Vanberg, 1981). No doubt free

riders will be there (Buchanan, 2011). To make the rules of the market order, or what Hayek (1982) calls the catallaxy, we do need the government.

## The Entrepreneur

For the Austrian Israel Kirzner one of the failures of traditional neoclassical (equilibrium) analysis is it assumes equilibrium is actually brought about. The market economy, as said, as an aggregation, neither maximizes nor minimizes anything. It simply allows participants to pursue that which they value, “subject to the preferences and endowments of others, and within the constraints of general ‘rules of the game’ that allow, and provide incentive for, individuals to try out new ways of doing things” (Buchanan & Vanberg, 1991). The real problem for modern Austrians, and the way to appreciate the power of spontaneous ordering principles, is to describe the possible realization of a never to be attained equilibrium as the result of “the systematic way in which plan revisions are made as a consequence of the disappointment of earlier plans” (Kirzner, 1962).

The question becomes: how to encourage the elimination of true error in the individual decentralized decisions (Kirzner, 1988)? Ludwig von Mises, the founder of modern Austrian economics, described the individual decision unit not only as maximizing but also as finding out the relevant ends-means relationship. This implies that known uncertainty of “given” means and ends is to be distinguished from fundamental uncertainty as far as what are the means and ends in the first place. Fundamental ignorance and hence an ultimate error stands against a situation of given alternatives involving risk (of which we do know the probability distribution of incomes attached to each alternative). For the Austrian, entrepreneurship is defined as the very perception of the end-means framework within which allocation and economizing is to take place (Kirzner, 1973). For the neoclassical, on the other hand, it is defined as combining individual-specific ability with an up-front investment to generate an uncertain return (Gentry and Hubbard, 2000).

The Austrians opened the way for incorporating learning into our understanding of the market process. The logic of choice must be complimented with an examination of how learning takes place within alternative institutional settings (Boettke, 2002). Hayek described the market process as one of learning by discovery--and emphatically not as the result of rational planning. Endogenous change in the ends-means relationship, says Kirzner (1973), is possible with the entrepreneurial element in each individual market participant: alertness. Alertness is the “propensity [...] toward the fresh goals and the discovery of hitherto unknown resources”. A disequilibrium situation points to market ignorance. From it emerge profitable opportunities exploited by alertness. Alertness gives a more realistic image of human action (and hence real choice) and makes possible the description of the market as a unified discovery process. “The genuine novelty [...] attribute[d] to the entrepreneur consists in his spontaneous discovery of the opportunities marked out by earlier market conditions (or by future market conditions as they would be in the absence of his own actions” (Kirzner, 1985). In short, choice is neither the fully expected result of deliberate plans, nor the fortuitous expression of pure luck (Kirzner, 1989); entrepreneurial activity undoubtedly involves uncertainty and the bearing of risk.

If alertness is of the utmost importance of the market process, taxing businesses has unknown consequences. The first effect of all corporate income taxes is not its effect on the relative preferability for the decision-maker of already-perceived alternative courses of action (Kirzner, 1985). The effect we have to take into account is, first and foremost, the possibility that the tax may have significant impact upon the very perception by the prospective taxpayer of what array of opportunities are available for his choice. An error (utter ignorance) unveils itself by showing up as an opportunity for monetary profit. Taxation, however, lowers prospective profits: the way an error reveals itself and that provides the incentive that inspires entrepreneurial discovery of unnoticed opportunities. In sum, alertly noting hitherto unnoticed opportunities depend on the possibility of the emergence of pure profit. Hence taxing pure profit should be looked at with suspicion at the least. If there should be taxation, taxing consumers without changing relative prices seems to be the least intrusive way to collect taxes in the competitive-entrepreneurial discovery process of the market. If the distortions of taxation, that is the impact on the discovery process should be minimized, taxes should not be

levied on the entrepreneur. The entrepreneur is the first, the *conditio sine qua non*, to come up with something new (correcting an error) in the causal market process. His role is crucial in the development of a social order.

## CONCLUSION

Because of the market's complexity, as the result of the division of labor as the source of wealth, planning is impossible. Nobody possesses all the present and future knowledge. Besides, what would be left of real human choices? Complexity theory explains how a complex order spontaneously emerges from the interaction of simple elements. A lack of knowledge about specific results is to be treated as an inherent feature of the market and not as a temporary problem of a lack of knowledge. However, some ideas look so respectable they can fail nine out of ten and still be used the tenth time. Other ideas look so improbably that though they do succeed nine times after each other still the tenth time are not trusted (Sowell, 2004). Government policy to steer the economy obviously belongs to the first class of ideas and the impersonal market process to the second. In short, as far as government policy goes we must distinguish between what sounds good and what works.

Also, why is the government chosen nine out of ten to stir the economy? Is it our fatal conceit: we pretend to know everything (Hayek, 1988)? In other words, is it our belief that just as in the natural sciences in the social sciences, at least in the future, we will succeed to predict and control. All we do need are better macro models and more powerful computers to collect all the necessary information. The market order, however, is far too complex to be understood and stirred. At the center of the market process are the evolutionary forces of spontaneous order. Hayek (1967a) speaks about "the twin ideas of evolution and spontaneous order" (cp. Gaus, 2006). The social sciences are opposed to the relatively simple world of the natural sciences. Human beings are no stones who without purpose roll down a hill, or, as Smith said, as pieces on a chessboard:

"[I]n the great chess-board of human society, every single piece has a principle of motion of its own, altogether different from that which the legislature might chose to impress upon it. If those two principles coincide and act in the same direction, the game of human society will go on easily and harmoniously, and is very likely to be happy and successful. If they are opposite or different, the game will go on miserably, and the society must be at all times in the highest degree of disorder" (Smith, 1759).

In short, even a politician who without prejudice serves the general interest and possesses all the knowledge in the world has less creativity than we all together possess. The only government policy that works is to give everyone, and the entrepreneur in particular as the driver of the market process, his or her freedom. If we really want to know how society works we have to study the characteristics of our ignorance and its limits. The great problem of economics is how we can profit of knowledge that only exists in a dispersed form as the, sometimes even conflicting, ideas of all participants (Hayek, 1960). Complexity theory hints at the important role of entrepreneurship in driving the spontaneous evolutionary process of the economy.

In short, public policy has its domain in stating, or better said, to improve piecemeal on the evolutionary grown entrepreneurial rules of the complex market order but should not stifle the alertness of entrepreneurs by taxation of the spontaneous market order. It is our fatal conceit that men can shape the world according to wish.

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