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Antifragility, the Black Swan and Psychology

A psychological theory of adaptability in evolutionary socioeconomic systems

Brendan Markey-Towler

26 February 2018

Abstract

In this paper we develop a theory of the psychological preconditions for greater survival in complex evolving socioeconomic systems ordered by radically uncertain institutions. We introduce the notion of the antifragile personality, whose personal knowledge of how and why to act in the world grows in the presence of radical uncertainty. We make use of a new theory of the mind as a network structure within and upon which the psychological process operates to elaborate the psychological properties of the antifragile personality and discuss its consonance with aspects of Jungian psychology. We extend aspects of the Schumpeterian, Kirznerian and Lachmannian entrepreneurs, as well as Ulrich Witt's notions of the necessity of adaptability and imagination and Caroline Gerschlager's exegesis of "agents of change" by giving them greater foundation in psychology while unifying them by showing how they identify aspects of an underlying antifragile personality. We formulate definite predictions using our theory about the psychological factors in socioeconomic success which align well with existing data and investigate how our theory offers practical advice for strategy in evolutionary socioeconomies ordered by radically uncertain institutions.

Keywords: Antifragility, radical uncertainty, knowledge, psychology, evolution, institutions

JEL Classifications: D01, D83, D84, D90, D91, O30

1 Introduction: antifragility and psychology in evolutionary institutional economics

We know, and have known for some time in evolutionary and institutional economics, that greater survival in complex economic systems, the ability to acquire the resources necessary for life and its enjoyment is endowed by the ability to introduce novelty and adapt to radical uncertainty. The purpose of this paper is to develop a theory of the psychological attributes which endow the ability to succeed thusly in acquiring resources and "survive" in complex evolutionary economies organised by radically uncertain institutions by reference to Nassim Nicholas Taleb's notion of antifragility. An antifragile structure benefits and grows *because of* radical uncertainty, not in spite of it. In doing this we will seek to give evolutionary and institutional economics a deeper foundation in psychological theory, specifically personality and Jungian psychology.

In doing this we will make use of a new theory of the mind as a network structure within which and upon which the psychological process operates to identify the psychological properties of the antifragile personality. We will relate these properties to the "Big Five" personality traits and also discuss their consonance with aspects of Jungian psychology. We will discuss how the theory of the psychological properties of an antifragile personality extend and unify a number of perspectives on the predicates of success and survival in complex evolutionary socioeconomies organised by radically uncertain institutions. Specifically, our theory extends and unifies within it aspects of the Schumpeterian, Kirznerian and Lachmannian entrepreneurs, as well as Ulrich Witt's arguments about the necessity of adaptability and imagination, and Caroline Gerschlager's exegesis of "agents of change" in evolutionary socioeconomic systems. Our theory allows us to make definite predictions about the psychological factors which support survival in complex socioeconomic systems ordered by radically uncertain institutions and offers practical strategic advice.

We will proceed as follows. First, we will discuss the problem of uncertainty in economics and introduce Taleb's notion of antifragility as a property of some structure whereby it grows and develops *because of* radical uncertainty, not in spite of it, and discuss how this applies to the psychology of the individual with respect to the antifragility of their *personal knowledge*. Second, we will introduce a new theory of the mind as a network structure within and upon which the psychological process operates and use it to identify the properties of a personality which causes personal knowledge to be antifragile - the antifragile personality. We will here also relate this to the "Big Five" personality traits as well as the Jungian psychology of the hero archetype. Next, we will consider the role of the antifragile personality in complex evolutionary socioeconomic systems ordered by radically uncertain institutions and establish its necessity for success and survival in such systems. We will here discuss how our theory extends and unifies perspectives on evolutionary economics from Schumpeter, Kirzner, Lachmann, Witt and Gerschlager. Penultimately we derive definite predictions from our theory about the psychological properties which contribute to success and survival in evolutionary socioeconomic systems ordered by radically uncertain institutions as well as practical strategic advice. We conclude by considering what this theory gains for evolutionary and institutional economics.

2 Antifragility and the Black Swan: Shackle and Taleb on uncertainty

The singular contribution of George Shackle was to recognise the importance of radical uncertainty in human affairs (see Earl and Littleboy 2014). He provided what is arguably the most systematic study of the role of radical uncertainty and how it might be accounted for particularly in his succinct *Decision, Order and Time* (1969) and his magnum opus *Epistemics and Economics* (1979). It led him to develop his theory of surprise and focal points in human decision, which would form the intellectual basis for the practical method of scenario planning famously employed by Royal Dutch Shell Company.

How does one plan and act in a world where events might arise which one could not even be hitherto conceived, let alone assessed for likelihood? It is even somewhat misleading to call events "Black Swan" events, for we can conceive of Black Swans even if we find ourselves astounded to discover they actually exist in Western Australia (where they are the State emblem). What about events which we cannot even think of before they arise?

Shackle posited that individuals might first build up a profile of "surprise" based on the impediments they imagined might prevent certain events from happening. They established that they would be somewhere between "astounded" and "not at all surprised" were certain events to arise. They then

acted guided by the so-called “ascendancy function” which reflected the attention-grabbing nature of events which would have both significant impacts and a certain level of surprise which commanded attention prior to the event (focal points). Shackle (especially in *Decision, Order and Time*) took pains to distinguish this inherently fluid and subjective process from the strict constraints and objectivity posited by expected utility theory. Earl and Littleboy (2014) suggest that in so doing, he discovered an early variant of Tversky and Kahneman’s prospect theory.

Taleb (2007), writing half a century later in *The Black Swan*, recognises Shackle as one of the few thinkers, and probably the only economist to grapple with radical uncertainty in any systematic fashion. The “unawareness” literature is more a modification of standard utility theory which seeks conditions under which new events might be inserted into a preference order – a “reverse Bayesianism” if you will (see Karni and Viero, 2013). But Taleb recognises that even Shackle’s approach to radical uncertainty is limited. Even Shackle tends to suggest the view that radical uncertainty, the Black Swan event, is something negative, a contingency to be planned for even when we do not know its form. A good planner might only make themselves *robust* to Black Swan events, they might be inoculated somewhat from its deleterious consequences and perhaps benefit if they are lucky.

Taleb’s own intellectual endeavour might be described as an exercise in thinking the unthinkable, asking what might seem at first a nonsensical question: what if one could consistently *benefit* from radical uncertainty? What would make radical uncertainty a *good* thing? He explains this idea at some length in *Antifragile* (2012). A whole class of phenomena hitherto unstudied by statisticians and economists (Taleb argues) are those which benefit and *grow* from disorder. Such phenomena are not merely robust – inoculated against radical uncertainty and *potentially* benefiting. They are *antifragile*, they benefit and grow *because of* radical uncertainty.

Taleb catalogues examples and explores the dynamics of antifragility in his characteristic manner, and proposes a heuristic (the “Skin in the Game” heuristic) which implements behavioural rules which are antifragile in their outcomes. Our contention here is that we might go further and study the deepest governing dynamics of antifragility in the mind of the individual.

An appropriate way to look at the individual is as an applier of personal knowledge (Polanyi, 1958) or their personal constructs (Kelly, 1963) of how and why to act in the world. Either consciously or (as is often more likely) non-consciously, the individual applies their mental “map” of the world (Hayek, 1952), or their “schema” of the world (Piaget, 1923), or their “image” (Boulding, 1961) of the relations between objects and events in the world to those which present themselves to the individual as they move about the world. The “model” which emerges from the cognitive process causes the individual to act as it contains personal knowledge not only of how, but also of *why* to act in the world. It reflects their personality as expressed in their system of personal constructs (Kelly, 1963). This schema which expresses personal knowledge of how and why to act in the world is constantly evolving, decaying in those parts which are no longer of regular use for guiding thinking and behaviour (Edelman 1978) and expanding as the individual integrates new knowledge of the relations of objects and events in the world (Piaget, 1923).

Our contention is that the fundamental condition for antifragility in the mind of the individual is the antifragility of personal knowledge, of their personality expressed in their personal constructs. An individual’s ability to act in the world grows with their personal knowledge of how and why to act in the world. The individual grows and evolves as their knowledge does – a reflection of the Socratic theorem that virtue is knowledge, knowledge of how and why to act in the world. An individual’s personal knowledge of the world, how and why to act in it, is antifragile if it grows in the presence of Black Swan events, and in the manifestation of radical uncertainty. Two questions now arise:

1. How is it possible for personal knowledge to be antifragile?
2. What constitutes the antifragile personality or, what makes personal knowledge antifragile?

What we will now show is that the theoretical answers to these questions may be derived by incorporating insights from psychology, in particular the contributions of Carl Jung, Joseph Campbell and Jordan Peterson.

3 The antifragile personality: Jung, Campbell, Peterson and the archetypal hero

We may draw on a theory of psychology (Markey-Towler, forthcoming) which has been provided elsewhere to frame our answers to the questions posited above. In this theory personal knowledge takes the form of a network structure contained within individual minds (encoded and reflected in neural networks) within which and upon which the psychological process of perception-analysis-decision operates. Nodes in this network reflect conceptual representations of the objects and events in the world, connections the relations the individual construes to exist between them. This network decays when it is not used to guide the cognitive process and behaviour, and it grows as new relations between objects and events in the world are incorporated into its connective structure.

Radical uncertainty manifest, Black Swan events, serve to present new apparent relations between the objects and events in the world which have not existed hitherto in personal knowledge. Such knowledge is both classificatory (what the Black Swan event *is* comprised of) and propositional (why it arose, what it means and how to respond to it). It is possible for personal knowledge to be antifragile. It will be antifragile if such knowledge as is presented to the mind by radical uncertainty is incorporated into the mind, causing personal knowledge about how and why to act in the world to grow, rather than rejected in favour of the *status quo*.

3.1 *The antifragile personality*

The likelihood that this will occur is subject to the government of certain psychological laws. An idea about a Black Swan event is more likely to be incorporated into personal knowledge the fewer connections it contains, the more connections within it which are already contained in the mind, the more noticeable are the objects and events which it is relating together, and the less connections within it would change ideas in personal knowledge at the “core” of personal knowledge and the less they contradict current mindsets (see Chapter 7 of Markey-Towler, forthcoming). The first two properties arise from simple logic, the third arises from the phenomenon of *salience* in perception, and the final two arise from the discoveries of personality psychology (Kelly, 1963) and cognitive dissonance psychology (Festinger, 1957) respectively. Now if we “invert” these conditions by asking what properties of the psyche will make them more likely to hold, we will discover the properties of the “antifragile personality”, the personality which gives rise to personal knowledge which is antifragile.

The antifragile personality is first and foremost one which concentrates, pays attention when faced by radical uncertainty. Attention lowers the threshold at which an individual will notice objects and events in their environment, making it more likely knowledge will be accumulated in the presence of radical uncertainty, in the presence of Black Swan events. The antifragile personality is also a knowledgeable and educated one. The more connections contained in personal knowledge the fewer *ceteris paribus* need to be incorporated for new ideas presented to the mind by a Black Swan event to be incorporated into the mind, and the more likely therefore it will be. The antifragile personality does

not have, at its core, what is known as a “fixed” mindset which would be dissonant with new knowledge being incorporated, it is a personality which at its core is oriented toward the accumulation of new and different knowledge – it is a “growth” mindset personality (Dweck, 2006). The antifragile personality seeks new ideas from uncertainty, it is almost, in the Popperian sense (Popper, 1934), a *scientific* personality, a personality which seeks to grow its schema of knowledge akin to a scientist seeking to grow their research program (Lakatos, 1968-1969).

But, further, our theory recognises an important reflexivity. Our actions may *cause* Black Swan events to present themselves to us. We may take actions for which we *know* the full range of outcomes might even be unknowable in any form before they come to pass. The basic form of such action is the questioning and playing of the child, which as Piaget (1923) recognised presents new ideas to them. More complex forms are those of the scientist experiment with a system of they know they do not fully understand, as Dewey (1910) recognised and Newell, Simon and Shaw (1958) theorised. In economics, the entrepreneurial innovation is the classic action by which Black Swan events are sought out by the individual (Schumpeter, 1911). Any personality is antifragile only if it causes the individual to place themselves in an environment where there is radical uncertainty for them to learn from. So the antifragile personality must be courageous, for it is very nearly the definition of courage to be willing to put oneself into an environment where there is radical uncertainty.

The antifragile personality is therefore one which urges the individual to pay attention, it is knowledgeable and well educated and not one reticent to develop new knowledge and in fact has the courage to put itself in situations it does not understand in order to seek new knowledge, it is almost a scientific personality. If we were to put it in terms of the Big Five personality traits (Goldberg, 1993), this personality is high in Openness, high in Conscientiousness, has a fair degree of Extraversion, a moderate degree of Agreeableness, and is low in Neuroticism.

3.2 The hero archetype

Now this allows us to incorporate potent insights from Jungian psychology into the theory of antifragility. Jungian psychology in particular is concerned with the nature of the personality which causes the individual to grow and flourish, or in Jungian terms “transform” from a “lower” to a “higher” state of being. The central object of Jungian psychology is the archetype (Jung, 1964; 1968), a complex of prelinguistic associations deep within the non-conscious mind and encoded deep in the brain which guides thinking about why certain behaviours ought to be engaged in and others not. Where archetypes guide behaviour which is oriented toward the growth of knowledge they are “symbols of transformation”. Being prelinguistic, they are potent but also can only be expressed symbolically (Polanyi, 1962 may have said they exist in the “tacit dimension”), and existing in the unconscious, the *collective* unconscious in fact as part of the shared mind-set of humanity, their symbolic representation rises to the conscious mind in dreams, where we interact with our non-conscious mind. Jung’s highly original theory was that the archetypes thus manifesting in dreams would be expressed “the morning after” in stories, and thus become manifest in mythology, any antecedent religions and art.

An especially prevalent archetype which Jung identified across world cultures manifests in the foundation myths of how the individual ought envision themselves and act in a rightful and good manner. This archetype is that of the *hero*, studied extensively in Joseph Campbell’s classic *Hero with a Thousand Faces*. The Hero is the quintessential representation of the right and good (we might even say “just”) human being, and their actions the manner in which the individual ought to act in the world. The Hero is characterised by willingly going out from the known world to face some great adversary, where they seek to overcome it for their good and the good of others. This archetype is the

quintessential symbol of transformation which works its way into all the great cultural myths, great religions, and even found expression in alchemical thought.

Jordan Peterson has developed the deep psychology of this archetype in *Maps of Meaning* in order to translate it into a contemporary and practical belief system which promotes wellbeing and flourishing. In Peterson's theory, the world embodies a particular logic, the *logos*, within which is contained a logic of right and proper action. The hero archetype, manifest in world myth, provides an urgency toward behaviour which our species over the evolutionary aeons has learned promotes our survival and flourishing. It urges us to discover the *logos* and live according to it.

To learn more of the *logos* which we do not currently know requires almost by definition that we *willingly* confront chaos. But in order to learn from our confrontation with chaos we must also pay attention to what is happening and seek the truth it reveals to us in our interactions with others and in our own thought. In doing this the individual will discover and manifest the *logos*.

This practical ethics is also reflected in the myth of the hero across cultures. The heroic individual is always endowed with unusual abilities to see (or to prophesy - to "see" the future). They willingly leave the ordered and structured domain of the Great Father (that part of the world with which we are familiar) to confront the violent and dangerous spirit of the Great Mother (that part of the world which we do *not* know and in which chaos reigns). Armed with unusual abilities of speech (like the ability to cast magic spells) or with other skills to use light or fire or weapons (symbols of illumination, discrimination and therefore "truth"), the overcomes the spirit of the Great Mother and in the aftermath of the struggle uses the "treasure" won thereby to build a better world.

The hero archetype is, in or language here, the anchor of the antifragile personality. The hero willingly confronts chaos – willingly exposes themselves to radical uncertainty and the Black Swan event. They are endowed with unusual abilities of sight – they pay attention in the presence of the Black Swan so as to be more likely to observe the events and objects which comprise it. The hero is endowed with skills of speech or harnessing light or fire to overwhelm chaos and make order out of it – they seek new knowledge of how and why to act in the world.

These are the attributes of both the antifragile personality *and* the core archetype of human civilisation. The hero is the antifragile personality which seeks and incorporates new knowledge they did not previously have so that their knowledge grows in the presence of radical uncertainty and the Black Swan. The antifragile personality is the hero, confronting chaos and wrestling with it to discover more of the *logos* and how to create order which is good.

4 Antifragility, adaptability and agents of change: living in a complex evolving socioeconomic system of radically uncertain institutions

The question of what constitutes the antifragile personality is of significant importance for evolutionary and institutional economics. We know that the institutions which order our socioeconomic systems are in constant, evolutionary flux. They are constantly being originated, diffused by their selection in the competition and evolution of ideas in the public sphere and retained as rules for guiding thought and behaviour across society (Dopfer, Foster, and Potts, 2004; Dopfer and Potts, 2008; Hodgson, 1998; 2004; 2010; Hodgson and Knudsen, 2010; Markey-Towler, 2018). They are, ultimately, born of creativity (of a sort) and the system which selects or deselects them is, as Hayek (1989) showed, unfathomably complex due to the sheer number of people who inhabit it all

with intricate, individuated and constantly evolving schema for interpreting and acting in the world. Hence we can establish certain tendencies in these systems (see Dopfer, Foster and Potts, 2004 on this) but there is a case to be made (see Samuel, 1993) that a degree of nihilism is inevitable due to the radically uncertain nature of our socioeconomic systems. *All* schemas for interpreting our socioeconomic systems and how best to act in them will inevitably fail to align with reality, which is really the whole point of George Shackle's and Nassim Taleb's work.

Nietzsche's (1901) great argument becomes relevant here. He railed against the collapse into full nihilism at the prospect of what we would now call radical uncertainty and argued that we must instead rise to meet the world on these terms as it were. We are meant to recognise our schema for interpreting the world and how to act in it are necessarily incomplete and seek to expand them in response to failure, knowing they must necessarily fail eventually and we will have to repeat the process. We are meant to construct new ways of looking at the world and how to act in it even while we are faced with their inevitable eventual failure. This is the will to *power*, power being the ability to master one's world by acquiring knowledge of how to interpret it and how to act in it.

Nietzsche is coming from moral philosophy at a truth we have known for some time in evolutionary and institutional economics. The ability to acquire the necessary resources for life and its enjoyment, the ability to "survive" in complex evolving systems ordered by radically uncertain institutions is endowed by the ability to use the faculty of imagination to *adapt* to changing environments (Witt, 1986; 1988; Metcalfe, 2014) and be an *agent of change* (Gerschlager, 2013) originating new institutions for interpreting and acting in the world. The reason why is relatively straightforward.

The institutions which order our society express themselves in our mental schema. Institutions serve to interpret our world and how to act in it by providing rules which guide our thinking (Markey-Towler, 2018, Hodgson and Knudsen, 2010; Hodgson, 2010; 1998). Complex evolving systems are subject to the origination of variegated institutions, their diffusion through the process of selection of them in the public sphere (Markey-Towler, 2018) and the selection of any outputs produced by behaviour guided by them in the economic system (Nelson and Winter, 1982; Metcalfe, 1998; Dopfer, Foster, and Potts, 2004; Dopfer and Potts, 2008; Markey-Towler, 2017). One's ability to acquire the material resources necessary for life and its enjoyment, to "survive" in such a system requires that one be able to produce outputs which are valuable for others given the existing institutional structure, which is subject to radical uncertainty and is constantly evolving. That therefore requires any given individual to be willing to introduce novel institutions and their products into the economic system, becoming an agent of change, and to be able imagine how one might adapt those institutions as the economy evolves, reflecting the evolution of the institutional structure which orders it.

In order to introduce novel institutions and adapt, the personal knowledge of the individual about how and why to act in the world must not merely be passive in response to radical uncertainty, it must *grow* when this uncertainty manifests itself. Since this is what endows the ability to survive and acquire the material resources necessary for life and its enjoyment therefore, the institutions of society which manifest in the individual's mental schema must therefore manifest personal knowledge of the world which is antifragile, which manifests an antifragile personality. In order to survive and thrive in complex evolving socioeconomic systems ordered by radically uncertain institutions then, the institutional structure of society itself must create individuals who have antifragile personalities and antifragile personal knowledge, individuals whose schema for understanding the world and how to act in it *grow* in response to radical uncertainty.

We can see now how evolutionary and institutional economics may be extended and given greater foundation in psychology by our theory here of the antifragile personality. Our theory provides us with an extended psychology of what creates the ability to succeed by becoming an agent of change

and having the ability to adapt in evolutionary socioeconomic systems ordered by institutions by providing a theory of antifragility. So it provides a theory of the attributes of the individual which contribute to their greater “survival” in complex economic systems ordered by radically uncertain institutions.

Those individuals and groups will succeed and survive at greater rates in complex evolving socioeconomies ordered by radically uncertain institutions which adopt and encourage the antifragile personality, which urges the individual to pay attention, is knowledgeable and well educated and not one reticent to develop new knowledge and has the courage to put itself in situations it does not understand in order to seek new knowledge. Those individuals and groups will succeed which adopt and encourage what is an almost scientific personality, which is high in Openness, high in Conscientiousness, has a fair degree of Extraversion, a moderate degree of Agreeableness, and is low in Neuroticism. Those individuals and groups will succeed which adopt and encourage the archetype of the hero. We can see now how our theory provides a new, deeper basis, an extension and unification of prior thought on the evolution of socioeconomic systems brought about by institutional change.

4.1 Unifying aspects of the Schumpeterian, Kirznerian and Lachmannian entrepreneurs

It is no accident Joseph Schumpeter (1911) invites the view of the entrepreneur as a hero and laments the rise of “managerial” innovation in his later (1950) text. The archetype which urges the individual to introduce great change into the institutional structure of our societies and to constantly adapt to the changes introduced by others, *is* the archetype of the hero. The archetypal manager (an accountant) is almost the antithesis of heroic, and this is why they clash so often with the innovator (Earl and Potts, 2013). The manager shies away from, let alone seeks chaos, and seeks to live in a world which they can control. This is why the manager struggles to create or adapt to change, and why massive companies, which cannot but be the province of managers due to transaction costs (Williamson, 1975; 1979; 1985; Earl and Potts, 2013), struggle to adapt and often therefore fail when radical uncertainty manifests itself in the economy (on this see Gans, 2016). Schumpeter recognised that what was necessary for greater survival in complex evolving economies ordered by radically uncertain institutions was the courage to put oneself in situations one does not fully understand to seek new knowledge, and to be willing to incorporate new knowledge thereby gained.

Israel Kirzner’s view of the entrepreneur seems a little more “prosaic”, but is nonetheless very important for its recognition of the vital importance of paying attention, having knowledge of the world, and being willing to incorporate new knowledge. Israel Kirzner’s entrepreneur (see Kirzner, 1997) is of someone who pays attention to the world closely to discover opportunities for profit within the existing institutional structure. This requires the individual to also to be knowledgeable about the world, for without some *a priori* and fairly extensive knowledge of the existing institutional structure in society the entrepreneur cannot hope to be able to recognise these opportunities for what they are. When such opportunities present themselves the individual must not be averse to incorporating that knowledge so discovered into their worldview. Kirzner recognised therefore that what was necessary for greater survival in complex evolving economies ordered by radically uncertain institutions was the ability to pay attention to one’s environment and to be knowledgeable about the world, and the willingness to incorporate new insights into that knowledge.

Endres and Harper (2013) survey the corpus of Lachmann’s work to characterise his view of the entrepreneur as one who has an unusual insight into their economic environment and “spot gaps in the capital structure” by “wresting meaning from the market”. Ludwig Lachmann’s entrepreneur is

someone who is able to “see” further than others when observing their environment. They can abstract further than others from the market, know how the current state of the market relates to the existing institutional structure of society and can therein discover gaps in the capital structure. This requires them to be well educated (not necessarily formally) and knowledgeable about the institutional structure of society and economy, and also how these might be related to existing states of the economy. Their knowledge allows them to see what the data in their environment *mean*. Lachmann therefore recognised that what was necessary for greater survival in complex evolving economies ordered by radically uncertain institutions was to be well educated and knowledgeable about the state of the economy and the structure of the institutions which order it and to be willing to incorporate any new knowledge about incongruities between the two which might indicate gaps they could fill.

All three views of the entrepreneur here are unified, extended and given a greater grounding in psychology by our theory of the psychology of the antifragile personality. Not just the entrepreneur, but *any* individual who wishes to succeed in acquiring material resources necessary for life and its enjoyment must adopt something of the hero archetype. Their personal knowledge of the world and how to act in it must grow in response to the radical uncertainty which manifests in their world. They must have the courage to put themselves in situations they do not fully understand to seek new knowledge, they must pay attention to their environment, they must be knowledgeable and well educated, and they must not be reticent to discover new knowledge.

4.2 Extending Witt’s notions of adaptability and imagination and Gerschlager’s aspects of the agent of change

Ulrich Witt, recognising in early papers (see Witt 1986; 1988) that simple analogy to the Darwinian three-step model of variation, selection and retention (Page and Nowak, 2002; Price, 1970; 1972a,b) was a limited way to view economic systems, began to argue for the importance of human agency in the ability to survive and acquire resources within them. Specifically, he argued that the ability to *adapt* to changing environments and the ability to *imagine* how one might understand the manifestations of radical uncertainty and how to respond to them were critical for survival and the acquiring of material resources necessary for life and its enjoyment. We could summarise Witt as arguing (although this exact language would not develop for another decade) that in a complex evolving economy organised by radically uncertain institutions, unless one’s personal knowledge of the institutions governing the structure of the economy and how and why to act within that structure grow in response to the manifestation of radical uncertainty within it, one cannot continue to acquire the material resources for life and its enjoyment. In other words, Witt is arguing that one cannot survive in a complex evolving economy ordered by radically uncertain systems without an antifragile personality.

Similarly, recognising that the core insights of Schumpeter and evolutionary economics require more than the simple Darwinian view can obtain (Hodgson, 1997), Caroline Gerschlager (2013) has similarly argued for the importance of human agency in understanding economic evolution, and what endows an ability to survive and acquire resources necessary for life and its enjoyment. She argues that a deep reading of Adam Smith and Joseph Schumpeter reveals the importance of *agents of change* within an economic system, and the attributes of their personality. The agent of change is the individual (often, of course, in a group) who applies some new personal knowledge about how and why to act in the world which will, along with any outputs thereof, become integrated as a new institution ordering the economy and causing it to evolve. The agent of change is the source of radical uncertainty in the economy, but also must respond to the radical uncertainty they create as they act on some new knowledge of how and why to act in the world, for no human being can possibly know all the potential outcomes of their actions let alone their likelihoods (Hayek, 1989; Shackle; 1972). The

agent of change then is a very particular kind of person, they are not afraid to put themselves in a situation of radical uncertainty by their own actions of introducing novelty into the economic system, and they are not averse to breaking with established knowledge by developing new knowledge of how and why to act in the world. They are an agent of change not only in their actions but in their very personality. In other words, they have the courage to face radical uncertainty, and are willing to incorporate and act on new knowledge about the world in doing so. It is this personality which, in introducing new institutions for thought and behaviour into the economic system, cause it to evolve by the incorporation of that institution within the overall institutional structure, and which thereby supports the acquiring of material resources as the process advances.

Our theory extends and unifies these views as aspects of the personality required to survive and thrive in complex evolving systems ordered by radically uncertain institutions and gives them a further grounding in psychological theory. Witt identifies the necessity of the antifragile personality for survival in the complex evolving system that is the economy ordered by radically uncertain institutions. Gerschlager essentially identifies the necessity of the hero archetype for the introduction of change into the institutional structure which orders the socioeconomic system. We know these from our above theory to be reflections of the same underlying conditions in an individual's personality. The antifragile personality must have the courage to put themselves in situations they do not fully understand to seek new knowledge, they must pay attention to their environment, they must be knowledgeable and well educated, and they must not be reticent to discover new knowledge. The personality which has these attributes will develop new knowledge when radical uncertainty manifests, and therefore be able to adapt to the environment by the use of imagination. The antifragile personality is also the manifestation of the hero archetype, which willingly confronting radical uncertainty and wrestles with it to discover more of the *logos* and how to create order which is good. The personality which does this will develop new knowledge and introduce novelty into the institutional structure, thus the economic system it organises, and acquire material resources for life and its enjoyment as that novelty is integrated into the economic system.

5 Predictions and practical considerations

Theory is cheap unless it makes prediction which rule certain courses of events out of the realm of possibility (Popper, 1934). It is therefore necessary, before concluding, to derive definite predictions from our theory. We will also find in so doing that our theory aligns well with existing findings, and also has great practical insight for individuals living within a complex evolving socioeconomic system ordered by radically uncertain institutions.

Our theory suggests that those individuals and groups will succeed in acquiring material resources for life and its enjoyment which adopt and encourage the antifragile personality. The antifragile personality finds expression in schema for understanding how and why to act in the world which urge the individual to pay attention, which manifest a knowledgeable and well-educated person, which is not one reticent to develop new knowledge and which has the courage to put itself in situations it does not understand in order to seek new knowledge. If we want to put this in terms of the Big Five personality traits, those individuals and groups will succeed in acquiring material resources which adopt and encourage a personality which is high in Openness, high in Conscientiousness, has a fair degree of Extraversion, a moderate degree of Agreeableness, and is low in Neuroticism. To put it in Jungian archetypal language, those individuals and groups will succeed which adopt and encourage the archetype of the hero. Or to put it in relatively more prosaic language, those individuals and groups will succeed in acquiring resources which encourage the adoption of a scientific outlook, a scientific personality.

At the level of the individual, this theory aligns well with the decades of research summarised by Carol Dweck in *Mindset* (2006). Dweck has for decades studied the dichotomy between "fixed" and "growth" mindsets and found that the latter is correlated with metrics of success across a variety of human systems, including the economy and the acquisition of material resources. A "growth" mindset such as Dweck studies could roughly be that which dominates a "scientific" personality. It is a mindset which urges the individual to develop new knowledge, to seek regularly to grow their schema for interpreting the world and how to act in it, and which is not averse but actually seeking to incorporate new knowledge. The "growth" mindset, so characterised, is a core part of our theory of the antifragile personality, it is essential for the antifragile personality to be exposing itself to new knowledge which it is willing to incorporate into its schema for interpreting the world and how to act in it.

This theory accords fairly well also with the findings of Joshua Gans (2016) in *The Disruption Dilemma*, at the level of organisations. In a series of case studies, what is found to be vital for organisational survival in the presence of disruption of the economic system by radical change in its underlying institutional structure is the ability to adapt and imagine new ways of acting in the economy – which is no surprise for an evolutionary economist. But what Gans suggests is that the necessity goes deeper than merely changing prices in the presence of radical uncertainty, but the ability to redesign a company wholesale. If radical uncertainty is manifesting in industry disruption, the company needs to change its product, its organisational structure, its technology, and reimagine its very strategy. In other words, the very *knowledge* structure of the company must change and grow in response to radical uncertainty manifesting in institutional structures and disrupting industries ordered by them. Those companies, in other words, which cultivate antifragile personal knowledge, and encourage antifragile personalities across their organisation which grow new knowledge in the presence of radical uncertainty are more successful than those companies which do not.

Our theory, furthermore, aligns well with the findings of Joel Mokyr at the level of entire societies over the course of his long research program into the drivers of economic growth culminating in *A Culture of Growth* (2016). Mokyr's argument is that the history of the industrial revolution in Europe relative to Asia suggests that Europe and specifically the United Kingdom of Great Britain grew because of its encouragement of and ultimate toleration of *useful knowledge* and its application in commercial enterprise. The Republic of Letters between persons of a scientific personality was essential for the growth of useful knowledge and was comprised of persons of a scientific persuasion, being willing to face situations in which events they might not have understood would arise to present new knowledge to them, and who were willing to pay attention and to incorporate that new knowledge into an already substantial body of existing knowledge. When this knowledge came to be applied in commercial enterprise the same courage to face uncertain situations, to pay attention and be willing to incorporate new knowledge of how and why to act in the world was required. At the level of societies therefore, what is required for success and the acquisition and of the material resources necessary for life and its enjoyment is an antifragile personality which will grow in the presence of uncertainty.

More direct tests of our theory are, of course, possible. While it accords well with extant data, it would be worthwhile to study the degree to which the Big Five personality profile we have suggested is indeed correlated with greater survival in evolutionary socioeconomies organised by radically uncertain institutions. It would be worthwhile, and interesting especially in modern times, to see if the prevalence of the Hero archetype in popular culture and society (which is possible, if difficult, to measure) is correlated with greater or lesser success. Were this found to be the case, we would know that the theory we have offered of the psychological foundations of antifragility has validity as a theory of the basis of adaptability and greater survival in evolutionary socioeconomies ordered by radically uncertain institutions.

Once again, if we invert our analysis we can develop good practical advice from our theory, and advice which is immediately actionable. If one wishes to acquire material resources for life and its enjoyment in a complex evolving socioeconomic system ordered by radically uncertain institutions, one must develop an antifragile personality in which personal knowledge, personal schema for interpreting the world and how to act in it, will grow in response to radical uncertainty. That requires the development of a personality of significant courage, of attentiveness, of knowledgeability and education, and of a basic willingness to incorporate new knowledge. In terms of the Big Five traits, it requires the cultivation of a personality high in Openness, high in Conscientiousness, has a fair degree of Extraversion, a moderate degree of Agreeableness, and is low in Neuroticism. In more analogical terms, it requires the cultivation of a personality which resembles that of a scientist seeking to develop knowledge of the world, or of the direction given to behaviour by the Hero archetype within the unconscious.

Our theory suggests that individuals who cultivate these aspects of their personality will survive and accrue material resources necessary for life and its enjoyment at a greater rate in evolutionary socioeconomic systems organised by radically uncertain institutions. It suggests that organisations which not only tolerate but encourage such personalities will survive and thrive in evolutionary socioeconomic systems. It suggests that societies which tolerate and encourage the formation of such personality traits will survive and thrive at greater rates. These personality traits endow these entities with the aspect of antifragility – they grow new knowledge of how and why to act in response to radical uncertainty manifest in the world.

6 Conclusion: what gain for evolutionary and institutional economics?

In this paper we have developed a theory of the psychological preconditions for greater survival in complex evolving socioeconomic systems ordered by radically uncertain institutions by reference to Nassim Taleb's concept of antifragility – of a structure which grows *because of* radical uncertainty. We introduced the notion of the antifragile personality, whose personal knowledge of how and why to act in the world grows in the presence of radical uncertainty and argued that the psychological attributes of this personality are necessary for greater survival and success in complex evolutionary socioeconomic systems organised by radically uncertain institutions because it allows the individual to adapt and introduce novelty into the institutional structure of society. We showed that this unifies and extends insights from evolutionary economics on the problem from Schumpeter, Kirzner, Lachmann, Witt and Gerschlager.

Using a new theory of the mind as a network structure within which and upon which the psychological process we developed a theory of the antifragile personality, whose personal knowledge of the world grows because of radical uncertainty. We discovered that the antifragile personality is one which the individual to pay attention, is knowledgeable and well educated and not one reticent to develop new knowledge, in fact, it has the courage to put itself in situations it does not understand in order to seek new knowledge. It is almost a scientific personality. In terms of the Big Five personality traits, this personality is high in Openness, high in Conscientiousness, has a fair degree of Extraversion, a moderate degree of Agreeableness, and is low in Neuroticism. We also discovered the symmetry between this and the archetypal personality of the Hero studied at length by Carl Jung, Joseph Campbell and Jordan Peterson. The Hero archetype, as revealed in myth, urges the individual to confront chaos and wrestle with it to discover more of the *logos* and how to create order which is good by paying attention and speaking truth - it is an expression of the antifragile personality.

This gives evolutionary economics a greater basis in psychological science and strengthens its nexus therewith, particularly with personality and Jungian psychology. We have deepened the psychological basis of theories in evolutionary economics of what supports greater survival and success in complex evolutionary socioeconomic systems ordered by radically uncertain institutions. Specifically, we have extended and unified the insights of Schumpeter, Kirzner and Lachmann on the entrepreneurial personality, the arguments of Ulrich Witt about the necessity of imagination and adaptability, and Caroline Gerschlager's exegesis of agents of change. We have increased the depth of explanations evolutionary and institutional economics may offer for success and greater survival in socioeconomic systems, expanded the set of predictions it makes about this (finding them to align well with existing data), and expanded the strategic advice we may offer as evolutionary and institutional economists.

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