

February 2018

A Conceptual Model for Analytical Institutional Economics with Lessons for Comparative Economics and Policy Analysis

Pavel Pelikan

Department of Institutional, Environmental and Experimental Economics
University of Economics, Prague

JEL Classification: A10, D02, K10, O10, P50, Z10

Key Words: institutional frameworks, organizational networks, human behaviors, economic development, economic evolution

Abstract: Institutional Economics (IE) is an old, for a long time mostly ignored, but now rapidly expanding and growingly important field, with a subfield that this paper finds to be the future leader of entire economics – for parallel reasons for which the long time ignored genetics has become the leader of entire biology. Named ‘Analytical IE’ (AIE), this subfield is defined as specialized in analyzing the institutional factors of the performance and growth of economies. It overlaps with the neighboring fields of Law and Economics and Constitutional Economics, but leaves aside critical, methodological and philosophical narratives. This paper provides AIE with a conceptual model that defines for each economy an *Institutional Framework* (IF), meaning the list of all of the economy’s institutional rules, both formal and informal, which it interrelates with the economy’s *Organizational Network* (ON), defined as the network of all of the economy’s markets and organizations, both private and governmental. Termed the IF-ON model, it allows all of the AIE problems to be stated with conceptual precision, and offers several immediate lessons for comparative economics and policy analysis. Economists interested in interdisciplinary relationships will find it logically to correspond to the genotype-phenotype model of evolutionary biology.

Acknowledgements: This paper builds on several years of research, which makes it impossible to name all the colleagues, students and participants of seminars to whom I am grateful for helpful objections and suggestions. My addressed thanks are therefore limited to Niclas Berggren, Geoffrey Hodgson and Ulrich Witt, whose critical comments helped me most with the writing of the final text. I also thank the Grant Agency of the Czech Republic for support under grant GA ČR 16-25019S. The usual caveat applies.

1 – Introduction

Institutional Economics (IE) is an old, for a long time mostly ignored, but now rapidly expanding and growingly important field. More and more economists are recognizing that some of the most important factors of the performance and growth of economies are what may be referred to as ‘institutions.’ This paper identifies within IE a subfield that it finds to be the future leader of entire economics – for parallel reasons for which the long time ignored genetics is now the leader of entire biology. Named ‘Analytical IE’ (AIE), this subfield is defined as specialized in analyzing the institutional factors of the performance and growth of economies. It overlaps with the neighboring fields of Law and Economics and Constitutional Economics, but leaves aside critical, methodological and philosophical narratives. The adjective ‘analytical’ diplomatically avoids the ‘New IE’ vs. ‘Old IE’ controversy. While most of AIE turns out to be ‘New IE,’ it does not a priori exclude ‘Old IE,’ which some economists are now trying to rehabilitate. Any part of IE that can help analyze the institutional factors of the performance and growth of economies, whether ‘Old’ or ‘New,’ is welcome in AIE.

But defining AIE and identifying all of the institutional factors with conceptual clarity are no easy tasks. This paper helps with both by building a conceptual model of an economy that comprehends all of its main institutional features. They are divided into two interrelated concepts: the economy’s *Institutional Framework* (IF), defined as the list of all of its institutional rules, both formal and informal; and its *Organizational Network* (ON), defined as the set of all of its markets and organizations, both private and governmental, with their interconnections. The model is novel in how these two concepts are interrelated, but each of them has solid old roots: the IF in North (1990), and the ON in Williamson (1975).

*

That the model does not use the term ‘institutions’ deserves a comment: this term has been, and still is, used in many more or less different and only more or less clearly defined meanings, while its users do not always make it clear which of these meanings they have in mind. Fuzziness or even misunderstandings have been caused by the frequent use of this term to refer both to rules, such as laws and moral norms, and to organizations, such as banks and universities. As pointed out as recently as in Hodgson (2017), the problem of defining institutions and organizations has not yet been solved in a clear, generally accepted manner. Particularly important examples of confusing the two can be found in financial economics:

there the term ‘institution’ usually denotes a large bank or another financial *organization*. Yet no orderly analysis can be conducted if rules are not clearly distinguished from the entities that act according to them.

Instead of the term ‘institutions,’ the model uses the longer, but less ambiguous and more evocative term ‘institutional rules.’ Their definition is basically the same as the definition of ‘institutions’ by North (1990): humanly devised constraints that structure political, economic and social interactions, comparable to the rules of a game. They are also divided into informal (such as taboos, customs, and moral norms) and formal (such as constitutions, laws, property rights). The difference from organizations is obvious: rules may be parts of organizations, but cannot be organizations themselves.

As noted, institutional rules are what IFs are made of. The concept of IF is doubly central: both among the factors of the performance of economies, and among the questions for AIE. An economy’s performance will indeed be found – in agreement with a growing number of economists, including Rodrick et al. (2004), Shirley (2008) and Acemoglu and Robinson (2012) – to depend much more on its IF than on anything else, including its natural resources. The three central questions in AIE are also all about IFs: How do they influence the performance of economies? In what ways can they change? How can their changes be influenced by policy? While also important, the concept of ON is somewhat less central: as explained below, it is on the economy’s IF that the form and the development of its ON most fundamentally depends.

With the concept of IF in its center, the IF-ON model will prove helpful in several ways. Besides its help with the definition of AIE and the stating of all of AIE’s questions with conceptual clarity, it will immediately offer – from the well-known principle that a clearly stated question contains a half of the answer – several lessons for comparative economics and policy analysis. Moreover, economists interested in interdisciplinary relationships will find in it a clear logical correspondence to the genotype-phenotype model of evolutionary biology.

*

The rest of the paper is organized as follows. Section 2 surveys and clarifies the main concepts of the IF-ON model. Section 3 interrelates these concepts and puts the model together. Section 4 uses the model to decompose economic change into layers, and to correspondingly structure AIE into different static and dynamic analyses. Section 5 presents

some of the immediate lessons for comparative economics and policy analysis. Section 6 is reserved to economists interested in interdisciplinary relationships: it clarifies and discusses the above-mentioned correspondence to evolutionary biology. Section 7 concludes.

2 – The IF-ON model: the main ingredients

The basic units of the IF-ON model are individuals. All that an economy is and does must ultimately be due to some of them. It is also through their behaviors that institutional rules and frameworks can influence entire economies. For most of present purposes, it will suffice to describe their behaviors by two standard terms, but without the standard assumptions: (a) their *preferences*, or objectives, sometimes possible to express as an objective function; (b) their *rationality*, meaning their cognitive abilities for reasoning, computing and deciding about the uses of available resources for the pursuit of the preferences.

The non-standard assumption for (a) is that the preferences may be variable, modifiable by learning, and to a large extent pro-social. The assumption for (b) is doubly non-standard: human rationality, in the sense of cognitive abilities, is assumed not only bounded, as is now increasingly usual to do, but moreover unequally so: more for some individuals than for others. While learning may significantly improve everyone's rationality, it need not diminish rationality inequalities: more rational individuals are usually also better learners, so that more learning may even cause the inequalities to increase rather than decrease.

In a more detailed view, important for realizing the existence of hard constraints on possible human behaviors, all the behaviors of an individual are understood to be based on cognitive rules and programs encoded in his or her brain – as was done a little bit too early in Pelikan (1968), and more recently by a growing number of economists, including Holland et al (1986), and Vanberg (2002). Importantly, these programs must not be understood in the old-fashioned mechanistic and determinist way, but must be recognized also to use more or less random steps, and thus be more or less stochastic. Such steps are essential for trial-and-error searches and novelty creation.

All of the rules and programs are in part inborn and in part learnt from internal and external inputs, according to in part learnt and in part inborn learning programs, under the ultimate constraint of the inborn parts. This means that individual behaviors are in the short term ascribed to the individuals' actual brain, and in the long term are recognized constrained

by their genome – according to which the brain, with the help of *by it admitted and interpreted internal and external inputs*, forms and develops.

*

That the basic units of the IF-ON model are individuals classifies it as methodologically individualist. But its individualism is special. In terms of Hodgson's (2007) distinction between (a) methodological individualism that considers individuals alone, and (b) the one that considers individuals plus relations between individuals, it is both: of type (b) in the short run, and of type (a) in the long run. In the short run, the model recognizes that the economy's outcomes depend not only on its individuals, but also on their interrelations, implied by the economy's ON and IF. Different IFs are recognized capable of leading the same individuals to form different ONs, operate these in different ways, and thus produce different outcomes. In the long run, however, all the relations between individuals are also ascribed to some individuals – thought not only to those actually present, but possibly, and even mostly, to members of past generations. Thus, much of the the actual ON may be due to past entrepreneurs, much of the formal IF to past legislators, and much of the informal IF to past sociocultural innovators.

Another specialty of this individualism is that it offers a well-defined room for what is usually called 'downward effects' (or 'downward causation'), meaning the effects that lead from properties of the society and its economy back (or 'down') to properties of the individuals. But this offer is limited in two ways. First, downward effects can only be secondary feedback loops that must be preceded by some primary upward actions, by which some initial individuals started to form a society, including some initial IF and ON of its economy. Only then can the society acquire properties that may have downward effects on its individuals. Some of these may subsequently help the ON further to develop and/or the IF further to evolve. This may generate new feedback loops, more or less modifying the preceding ones, which may, during the history of the society, be repeated many times.

Second, the downward effects depend on, and are limited by, the individuals' learning abilities. It is only to the extent that the members of a society are individually able to learn from experiences with it, and consequently modify their behaviors, that these effects can work. This is why they are mostly limited to human societies, and are only weak or entirely absent in the societies of other species. Like all human abilities, also the ones for this learning are in part inborn and in part learnt, under the ultimate constraint of the inborn part. This part is therefore bound to limit – even if we are still far from knowing exactly how – the variety of

forms of societies that humans might possibly form and to which they might lastingly adapt. But it does not fully determine any of them. The model thus rejects all forms of genetic determinism, but implies what may be termed ‘genomic limitism.’

*

To be effective, institutional rules must be adopted and included in the behavioral programs of individuals. This requires certain cognitive processes that must be based on, and constrained by, the actual cognitive rules and programs in each individual’s brain. No one is a ‘tabula rasa’! Adopting institutional rules may intuitively be compared to the downloading of a new software into a computer: this must also be based on, and is constrained by, the available hardware and the previously downloaded software. Institutional rules may therefore also be viewed as cognitive rules – as is done, for instance, by Greif and Mokyr (2017). To avoid confusion, however, it is necessary to make it clear that they are only part of an individual’s cognitive rules, the part that is shared with the other members of the same economy or society – as opposed to the idiosyncratic cognitive rules that are proper to each individual, on which all institutional rules must repose, but in which individuals may widely differ from each other.

But why do individuals adopt and respect institutional rules at all? The standard answer that the rules represent a Nash equilibrium from which no perfectly rational individuals wishes to depart may sometimes be admitted as a helpful ex post explanation, but institutional rules have deeper roots. Some of the roots may be found in religious beliefs, but the deepest ones are in the inborn social instincts encoded in the genomes of *Homo sapiens*, which endow humans with rule-making and rule-obeying abilities. That humans do make and obey rules while paying little attention to their cost-benefit analysis was indeed observed in the behaviors of very small children.

Assuming that certain institutional rules are adopted, the next question is: In what ways do they influence individual behaviors? These ways can be divided into two channels: (a) reducing everyone’s choice set to an institutionally permissible subset; (b) allowing everyone more precisely to predict what others will do. Thus, by limiting everyone’s freedom, the rules lower the risk and uncertainty of everyone’s decisionmaking, which increases everyone’s expected gains. But there is an important qualification: channel (b) strongly depends on the *trust* with which people may rely on others to obey it. The lower this trust, the more uncertain the predictions, and therefore the lower the expected gains. While studies of trust are often counted as parts of IE, a rarely addressed question is: why? This might be the best answer.

How an IF's influences on individuals are transformed into its influences on the entire economy can be understood as a process of instructed self-organizing (Pelikan 2011), which is a generalization of the forming of spontaneous orders (Hayek 1973). In this process, individual behaviors are divided into two dimensions – organizational and operational. The former leads them to form a certain ON, with certain markets and certain organizations, and the latter leads them to operate this ON by their production, transactions, and consumption. It is by influencing (instructing, shaping) both these behaviors that the IF influences the forming, the working, and the development of the economy's ON.

*

The concept of 'organization' is another key concept of the model. For this purpose, it suffices to define it as follows: *An organization is a network of interrelated individuals who are subject to the organization's IF and to a certain, by this IF defined and limited, central management.* Admittedly, this is a very broad and very simple definition that leaves aside many fine points that organizational theorists continue to debate. But it has all that is needed by the model.

Contrary to what is sometimes assumed, the individuals need not share any common purpose. Such sharing is limited to the special kind of organizations called 'teams.' In general, and in agreement with modern theories of the firm, the individuals fall into two *possibly overlapping* categories: the principals and the agents. Only the principals can be assumed, often only with qualifications, to share a common purpose. The organization with all of its agents, including its managers, is regarded as their tool. To the extent that the agents' own purposes (objectives, preferences) differ from those of the principals, these need to provide the agents with suitable incentives for bridging the differences. As considered in more detail below, creating such incentives, or making sure that such incentives will be created by the principals and/or the agents themselves, is one of the main tasks of the organization's IF. The less well the IF fulfills this task, the less effective the incentives, and the greater the agency losses from which the organization will suffer.

Examples of organizations are different forms of private firms, cooperative firms, government firms, and government policymaking agencies. Importantly, to be logically complete and internally consistent, the IF-ON model includes among organizations entire economies. An economy is consequently regarded as an organization of organizations. This organization may be very loose and its management (government) very limited, but it formally fits the definition.

For example, the economy of a democratic society is thus regarded as an organization of which most of the citizens are both its principals and its agents. Its manager is the executive branch of its democratically selected government. The powers of this branch are specified and limited by the economy's IF, the formal part of which is determined by the government's legislative branch. Important questions are: What policies should the IF allow the executive branch to conduct to help the economy, while preventing it from doing more harm than good? What should the legislative branch do about the formal IF – maintain or change? – to make the IF fulfil this task as well as possible? What common purpose may the citizens as principals share, and what incentives the citizens as agents may need to be given?

All this implies that the relationship between IFs and organizations is more intricate than usually considered. To compare it to the one between the rules of a game and its players, as in North (1990), may help intuition, but is incomplete. This leaves open two important questions: Who exactly are the players? What game, or games, may organizations be playing?

Full clarity requires what most economists appear to dislike: multilevel analysis. A simple logic suffices to reveal that each organization within an economy must involve IFs of at least two levels: the economy's IF imposed on it, and its internal IF imposed on its members. The economy's IF more or less constrains, but in general does not fully determine, the choice of the organizations' IF. For example, the corporate law constrains the permissible forms of the corporate governance of firms, but usually leaves many features of this governance free to choose by the firms' principals, or by them delegated agents.

The ultimate players are always individuals. They may be independent market participants and/or members of organizations. The former are only subject to the economy's IF, whereas the latter are subject to both this IF and the internal IF of their organization.

*

What remains to be clarified is the concept of ON. As noted, its roots are in Williamson (1975). An ON may contain different numbers and forms of markets, and different numbers and forms of organizations, which may be different forms of private firms, cooperative firms, government firms, and government policymaking agencies. The ON of an economy may be thought of as the economy's 'working body,' corresponding to what is often called 'resource-allocation mechanism,' that produces and distributes the economy's output. It is this working and this output that much of standard economics has been about. But the standard oversimplifying assumptions that the ON remains constant and the organizations in it are

perfect – such as efficiently organized and the best technologies using firms – cause the standard results to be of little use.

In contrast, the IF-ON model admits that an economy's ON may change within a wide range of sizes and forms, and that the organizations may be more or less imperfect. For a first idea about this range, it may help first to imagine a basic ON consisting only of markets, and then classify all the other forms according to the number, the sizes and the types of the organizations that have internalized different parts of different markets – including the extreme imaginary case, in which one enormous organization internalizes all of the markets, and thus becomes a full-fledged command economy.

Paying attention to individuals is here essential. Not to miss important effects of IFs, it is necessary to distinguish, within each ON, individuals and individual jobs (positions), both on markets and in organizations. This refers to three literatures: (1) on job-design, (2) on job-assignment, and (3) on competence-difficulty gaps. But for AIE, literatures (1) and (2) are not very useful. They only deal with either job-designing or job-assignment, but not with both simultaneously – and moreover make several idealizing assumptions. In contrast, the AIE needs to consider job-designing and job-assigning together as two intertwined sides of the same self-organizing process by which ONs form, reform, develop or decay – while every part of this process may suffer from important imperfections.

But the literature on competence-difficulty gaps (c-d gaps) following Heiner (1983) is most important. The IF-ON model draws on it with two modifications: the concept of differently high relevant competence is interpreted as differently bounded relevant rationality, and c-d gaps are admitted to be of both signs. Heiner only considers negative c-d gaps, in which individuals occupy more difficult jobs than what their competence, aka relevant rationality, allows them to handle without committing costly errors. The IF-ON model also includes positive c-d gaps, in which individuals of high relevant rationality (competence) occupy too easy jobs, or no jobs. Both these cases are socially wasteful – in other words, cause the ON to be inefficient. This allows each ON to be represented by a map where every individual and every job are marked by the sign and the value of their c-d gap. Such maps say much about the inefficiencies of different ONs. Ideally, in the map of an imaginary efficient ON, all these values, for both the individuals and the jobs, are zero.

As c-d gaps can rarely be objectively measured, the usefulness of such maps might be put in doubt. But for AIE, the absolute values of the gaps are not very important. What really matters is only their existence. The main question for AIE is: will the prevailing IF cause the

existing non-zero gaps to diminish, or will it allow them to last? For example, will it, or will it not, cause a negative c-d gap to be diminished by a simplification of the job and/or by the demotion of its holder? Or, in case of a positive c-d gap, will it, or will it not, allow the individuals of underemployed high rationality to find or create correspondingly highly difficult and socially highly valuable jobs?

3 – Putting the IF-ON model together

It is now time to interconnect all these concepts into the model. The main interconnections may be outlined in the form of a quasi-causal chain using arrows: the concept before an arrow is an important cause of the concept behind the arrow, but possibly not the only cause. In a first approximation, the chain may be described as follows:

An economy's IF → individual behaviors → the working and the development of the economy's ON → the size, the contents, and the distribution of the economy's output → the political support of the IF → the preservation or a change of the IF.

The causes are stronger for the first three arrows – that is, between the economy's IF and its output – than for the last two – between this output and the political choice of preserving or changing the IF. The reason is, as explained in more detail below, that IFs are by far the most important factors of the performance of economies, independently of the knowledge that people may have about them. In contrast, the political decisions strongly depend on this knowledge: if this is poor, a tolerably imperfect IF may unjustly lose political support and be changed into a far more imperfect one.

For a deeper analysis, especially for policy applications, this first approximation must be refined by distinguishing the private and the government sectors within both the IF and the ON. Within the ON, the distinction is between the part with private market participants, including private organizations, say ON_{mkt} , and the part that with government agents and government organizations, say ON_{gvt} . Within the IF, the distinction is between the rules for ON_{mkt} , say IF_{mkt} , and the rules for ON_{gvt} , say IF_{gvt} . The two types of rules partly overlap, as some of them concern the rights and/or the duties of the two parts of ON in relations with each other. For policy analysis, it is moreover necessary to distinguish, within the ON_{gvt} , the executive, say ON_{gvt-ex} , from the legislature, say ON_{gvt-lg} , and consequently also distinguish between the corresponding segments of IF_{gvt} : say IF_{gvt-ex} and IF_{gvt-lg} .

The IF_{gvt-ex} is in the centrum of policy analysis: it defines the agenda of the executive, including the policy instruments that the executive is allowed to use, together with the limits of their allowed uses. Most of the government vs. market controversies are about its contents. To determine these contents is the task of the ON_{gvt-lg} (the legislature) under the constrains of the IF_{gvt-lg} , which may be understood as the constitution. But this is a self-imposed constraint: the ON_{gvt-lg} . Under certain conditions specified by the IF_{gvt-lg} , the legislature has the right to change even the constitution. The refined quasi-causal chain may be described as follows:

The economy's $IF \rightarrow$ individual behaviors within ON_{mkt} and within $ON_{gvt} \rightarrow$ the working and the development of both the ON_{mkt} and the ON_{gvt} , including the economic policies conducted by the latter \rightarrow the size, the contents, and the distribution of the economy's output \rightarrow the political support of the $IF \rightarrow$ the preservation or a change of the formal IF by the ON_{gvt-lg} , and of the informal IF by anonymous sociocultural innovators from anywhere within the entire ON .

In this chain, the causality between the IF and the economy's output is weakened: the output also depends on the policies chosen by the executive, for which the IF only defines a more or less extensive choice set. Much then depends on the executive's actual policy choices. The larger this set, the more depends on the executive.

This makes the economy's output also depend on the executive's motivations and relevant rationality (competence). But the IF remains important. It may cause the economy to underperform in two ways: (a) by making the set too small, and thus hindering a competent and pro-socially motivated executive from conducting helpful policies; or (b) by making this set too large, and thus allowing a little competent and/or rent-seeking executive to harm the economy. The key questions then are: What properties can the executive be expected to have? What policies should the IF allow the executive to conduct, in function of this expectation?

*

The ways in which the IF of an economy influences its performance and growth deserve a closer attention. The usual explanation has been that the IF influences transaction costs and other incentives. But this explanation is insufficient in two ways: it is not entirely clear, and it neglects other important influences.

The influences on transaction costs are quite clear: different IF s differently facilitate or

hinder different transactions, and thus make them differently costly. But the influences on other incentives are less so. The problem is that most of these incentives are created by individuals, possibly through organizations, for individuals – and not directly by the IF. The IF may influence them only through individual behaviors, by more or less constraining the choice of the incentives that the individuals may create for each other.

The neglected influences are those on the development of ON, including the responses to non-zero c-d gaps. Transaction costs remain important, but are far from the only causes. To see the other influences, keep in mind that the world is full of risk and uncertainty, and that both the ON-development and the dealing with c-d gaps must therefore proceed by imperfectly informed trial-and-error searches. This brings to light the IFs' influences of two types: on the generation of the trials, and on the correction or elimination of the errors. Elementary examples are the extent of the freedom of enterprise; and the precision and the severity of the bankruptcy law.

*

In addition to helping AIE, the IF-ON model may help interconnect some of the most important, but so far largely separated contributions to the entire IE. Prominent examples are the seminal contributions by Williamson (1975), North (1990), and Acemoglu et al. (2005).

Although for a long time it was not very clear what the contribution by North and the one by Williamson have to do with each other – despite their presidency of the same organization of institutional economists – the model makes their interconnection easy to see. It clearly appears after three steps from either side. From the North side: (1) start with the IF of an economy; (2) concentrate on those of its rules that concern the forms and the sizes of economic organizations, such as the corporate law and the competition law; and (3) consider the consequences of these laws for the performance of firms. From the Williamson side: (1) start with the forms of corporate governance and the sizes of firms; (2) distinguish them from the laws by which these forms and these sizes are constrained; and (3) consider these laws in the context of the entire IF with their influences on the working and the development of the entire economy.

To see how North and Williamson could be interconnected with Acemoglu et al. is more difficult. The latter focuses on a substantially different kind of institutional rules: those for the political processes that select the government. At first sight, these rules might appear easy to add to the IFs for economic processes. As explained above, the IF of an economy

contains well-defined roles for the government in the form of $IF_{\text{gvt-ex}}$ and $IF_{\text{gvt-lg}}$, where the politically selected government may appear easy to fit. But, as long as the aim of analysis is the far reaching deduction from the political institutional rules all the way to the economy's output and growth – which is what Acemoglu et al. have been trying to do – there is a snag.

The snag is due to the following definition: “Economic institutions ... are social decisions, chosen for their consequences.” (Acemoglu et al. 2005: abstract). This definition reposes on two unrealistic assumptions: (a) that the consequences of different economic institutions (institutional rules) are known, and (b) that they may be chosen by a social decision process. In addition to being grossly unrealistic, these assumptions are moreover difficult to accommodate in the IE of North and Williamson. If they were true, they would imply that this IE is useless: all that this IE is laboriously trying to find out would, according to them, be already widely known.

To avoid this snag, Acemoglu et al. would have to recognize (a) that the consequences of different IFs are not yet well known and that different governments may be differently ignorant about them; and (b) that IFs are outcomes of a complex socioeconomic evolution that any social decisions may influence only partially. That the consequences of different IFs are indeed far from known is easy to illustrate by the many governments, both democratic and dictatorial, that out of ignorance helped implement an IF with by them undesired consequences. But this recognition would seriously undermine the search for the long deduction by Acemoglu et al. It would make it necessary to recognize that the economy's output depends not only on the political institutional rules for selecting the government, but also, among other things, on what the government selected knows about the consequences of different IFs. It would then also be necessary to recognize that the correlation between political democracy and economic growth cannot be very strong. Many democratically elected governments have indeed seriously damaged the economy, while some authoritarian rulers have helped it.

4 – Layers of economic change and a classification of institutional analyses

Economic change has been attracting growing attention from the increasing numbers of economists who have become tired of the standard static equilibrium analysis. Within IE, one of the most important attempts to understand it is in North (2005). But economic change is a complex phenomenon. It consists of several layers of processes that have not yet been clearly

ordered and interrelated. There are still disagreements about their names and their definitions – including the frequently discussed but seldom clearly distinguished concepts of ‘economic evolution’ and ‘economic development.’

The IF-ON model suggests a clear and intuitively appealing way of stratifying economic change into three layers:

L1: Resource-allocation – including production, transactions and consumption – within a given ON, guided and constrained by a given IF.

L2: The development of ON – including entry, growth, reorganizations, or exit of firms, adopting or rejecting technological innovations, opening or closing of markets, and expansion or slimming of government administrations – all this guided and constrained by a given IF.

L3: The evolution of IF – consisting in part of changes of formal institutional rules by legislators or judges, and in part of changes of informal institutional rules by socio-cultural innovators and imitators – all this constrained by the factually still little known, but inevitably existing inborn talents of Homo sapiens to form and adapt to different forms of societies, including different forms of their IF.

How the three layers are interrelated follows rather directly from the above-described quasi-causal chains of the IF-ON model. But the concepts of ‘economic development’ and ‘economic evolution’ deserve a special note: the model makes it logical to reserve the term ‘development’ for changes of ONs, and the one of ‘evolution’ for changes of IFs. It clearly interrelates them by showing that ON-development is shaped and constrained by the prevailing IF, and that IF-evolution significantly depend on the performance of the ON.

A problem may be that this stratification disagrees with the many followers of J.A. Schumpeter who call themselves ‘evolutionary.’ As their focus is on the development of markets, technologies and industries within a given IF of a standard capitalist type, the stratification implies that they are not ‘evolutionary’ but ‘developmental.’ But this renaming may in fact bring them closer to Schumpeter, who was not dealing with evolution, but called his most important work ‘The theory of economic development’ (Schumpeter 1912/1934).

What may obscure the difference between ON-development and IF-evolution is that both are run by boundedly rational individuals facing an imperfectly known future. Both must therefore proceed by trial-and-error searches – that is, tentatively generate a variety of more or less random (imperfectly informed) trials and select from them a possibly small minority of successes. To see the difference, it is necessary to realize that the developmental

trials tentatively change the markets and/or the organizations and/or the technologies within the economy's ON under the guidance and constraints of the prevailing IF, whereas the evolutionary trials tentatively change the IF.

*

This stratification of economic change makes it possible to structure AIE into types of statics and dynamics. Each layer has its variant of both: there is allocational statics and dynamics, organizational statics and dynamics, and institutional statics and dynamics.

Institutional statics deals with the effects of given, assumedly constant IFs on resource-allocation and ON-development. Institutional dynamics deals with institutional change, or, in other words, with IF-evolution.

Organizational statics deals with the effects of given, assumedly constant ONs on resource-allocation. Organizational dynamics deals with ON-development. This is, roughly, what Schumpeterian economics is about. To be manageable, organizational dynamics must be institutionally static.

Allocational statics deals with equilibria of resource-allocation. Allocational dynamics deal with the processes of resource-allocation – such as the cobweb search for an equilibrium price. To be manageable, resource-allocation dynamics must be both institutionally and organizationally static.

It is essential to keep in mind that the statics of one layer includes the dynamics of the lower layer(s). A particularly important example is institutional statics, which includes the effects of given IFs on the dynamics of both resource-allocation and ON-development.

All this has an interesting implication for the old conflict between pro-equilibrium and anti-equilibrium economists. The IF-ON model makes it clear that this is a false conflict, stemming from misunderstandings of the relations between processes and equilibria. Namely, each process with negative feedback must have at least one equilibrium, even if this is never actually attained, but all the time only pursued. Each of the layers must therefore be seen to contain both processes and equilibria, possibly interpreted as attractors.

5 – Some lessons for comparative economics and policy analysis

In general, the task of conceptual models is only to identify problems for analysis, and not to solve them. But the IF-ON model can do a little more: as follows from its above description,

it leads to certain elementary, but so far little noted but for analysis important findings, which can help solve several problems – even if mainly by pointing to errors in existing wrong solutions and only roughly indicating the right solutions. These findings may be summarized as follows:

Finding 1: The performance and growth of economies depend more strongly on their IF than on any other factors, including natural resources.

Finding 2: The IFs' effects on ON-development, including the states of the c-d gaps, are substantially more important than their effects on current resource-allocation, including transactions costs.

Finding 3: The need of ON-development for imperfectly informed trial-and-error searches make two kinds of institutional rules crucial: those allowing or constraining the trials, and those forcing corrections or tolerating the errors.

Finding 4: The ultimate success criterion in economic evolution is the sustainability of IFs, which requires certain minima, more or less high in different societies, of three properties of their economies: static efficiency; adaptive efficiency; and the political approval of the size and the distribution of the economic outcomes.

Most of the problems that these findings can help solve belong to comparative economics and policy analysis. This section describes some of this help by means of a few simple lessons.

*

The main lesson for comparative economics concerns the problem that has for a long time been in its center: the comparison of central planning with markets as alternative resource-allocation mechanisms. In both cases the ONs have been idealized and assumed constant: all the production organizations have been assumed perfect, efficiently organized and technologically most advanced. The well-known results have been formal proofs that certain forms of central planning – in particular the informationally decentralized and incentive-compatible ones – could coordinate such perfect organizations at least as efficiently as the best markets. This has appeared definitely to refute the old argument by von Mises (1920) that in socialism no efficient economic calculus was possible.

The lesson of the IF-ON model devalues this analysis as organizationally static, based on a grossly unrealistic assumption about the qualities of socialist production organizations, and therefore irrelevant. Finding 2 implies that relevant results may only be obtained by

comparing socialist IFs with capitalist IFs for their effects on ON-development. Finding 3 concentrates this comparison to two types of institutional rules, which makes it easy to deduce that all socialist IFs are doubly inferior to at least some capitalist IF. As by definition, all forms socialism – both state and cooperative – exclude private and tradable ownership of capital, then even the best of them is bound to suffer from both fewer entrepreneurial trials and more of uncorrected errors than at least some capitalist IF. All socialist ONs are therefore doomed to contain, in average (a few little probable exceptions are always possible), less well organized and less technologically advanced production organizations, and suffer from larger and more lasting c-d gaps, than the ONs developed within at least some capitalist IF. Finding 4 then implies that this double inferiority is bound to make all forms of socialist IFs evolutionarily unsustainable. (Allow me to note that this negative result about socialism, first outlined in Pelikan [1988, 1992], was nothing I was looking for: my long search that started in 1967 in Prague was for the very opposite: a sustainable form of ‘socialism with human face.’)

This result was given a compelling empirical support by the unification of East and West German economies in the beginning of the 1990's. Ironically, many comparative economists were until the last minute naïvely regarding East Germany as a socialist industrial powerhouse. The evidence that ridiculed this regard and supported this result was that the East German firms, formed and developed during some 40 years within the East German socialist IF, turned out to be pathologically overgrown and far less efficient than their West German counterparts – in average several hundred employees against less than 20, and only about 25% of the latter's productivity. Correspondingly, it also turned out to be much easier to replace planning by markets – this could be done practically overnight – than to conjure up well organized and technologically advanced firms.

Emphatically, however, the inevitable evolutionary failure of all socialist IFs in no way implies the evolutionary success of any capitalist IF. While no socialist IF can obtain the evolutionarily needed minimum of adaptive efficiency, many capitalist IFs may fail to obtain the evolutionarily needed minimum of political support. The main cause appears to be socio-culturally unacceptable inequalities in the distribution of their economic outcomes. Moreover, many capitalist IFs may even fail to obtain and maintain the needed minimum of adaptive efficiency. Which capitalist IF can be and remain to be both adaptively efficient and politically acceptable is still an open question. It is only clear that any evolutionarily successful IF, if it exists at all, must allow private and tradable ownership of capital, and must therefore be of a broadly defined capitalist type. But the search for its other features – such as

the form and the extent of social security and the contents of government economic agenda – is still far from over. This search is one of the most important tasks of policy analysis.

*

The main lesson for macroeconomic policy analysis is simply Finding 1. It is because of insufficient attention to IFs that this analysis has so often been inconclusive or even plainly wrong. For instance, much of the recent austerity vs. quantitative easing (QE) controversy was conducted in purely quantitative macroeconomic terms, without properly recognizing the strong dependence of the answer on the IF of the economy concerned. Yet QE is bound to have entirely different effects if it is forced by the IF to go to productive investment and entrepreneurship than if it is allowed to be spent on overgrown government administrations and pensions. To be sure, international financial organizations are now wise enough to condition loans to chronically indebted states by requiring reforms of their faulty IFs, but these reforms have often been contested as ideologically biased, while no solid analytical defense for them has been available. The lesson makes it clear that it is only AIE, starting with Finding 1 – and not any of the many disagreeing schools of macroeconomics – that can provide this defense.

Findings 2 and 3 imply lessons for several microeconomic policies. Particularly instructive is the lesson for selective industrial policies. These policies have often been advocated by pointing to the great wastes of resources due to the slowness with which the selection by product markets can promote the growth of future winners and force the exit of future losers. According to their advocates, such policies could substantially accelerate both and thus greatly diminish the wastes. Undoubtedly, such acceleration is desirable. But the crucial and not properly addressed question is: who may realize it?

The main alternatives are: politically selected state bureaucrats; or by financial markets selected private investors. Independently of their motivations, the key criterion is their relevant rationality (competence). The problem is that distinguishing, among firms and industries, future winners from future losers is a highly difficult task. Without high relevant rationality, even the most pro-socially motivated individuals assigned to this task are bound to cause enormously wasteful c-d gaps. In business practice, it has been widely recognized that the relevant rationality of private investors is, in average, significantly superior to that of government bureaucrats. But this has been difficult to show in theory. This problem cannot indeed be properly grasped by any theory that assumes everyone's rationality equally perfect, as in standard economics, or equally bounded, as in most of existing behavioral economics.

It is for this problem that the recognition of rationality inequalities included in the IF-ON model is essential. A simple mathematical analysis of their impact on the government economic agenda is in Pelikan (2007: appendix) and a verbal presentation in Pelikan (2010). Slightly reformulated, the two main results may be summarized as follows.

Result 1: In the long run, market selection – provided that the economy's IF will keep it going and relevantly orientated – will tend (a) to select for the jobs of top investors some of the relevantly most rational individuals, (b) to protect these job from being lastingly assigned to insufficiently rational individuals, and (c) to prevent these jobs from lastingly becoming more difficult than what the individuals assigned to them can successfully handle. This result may be seen as an extension of the old arguments by Alchian (1950), Friedmand (1953), and Winter (1971) about the merits of market competition and selection. An important difference is that the the winners are not assumed to maximize any simplistic objective function, such as profit-maximization. The choice of objectives belongs to the problems that each competitor has to solve with the help of her or his rationality, and for which she or he will also be judged in a priori not fully known ways by the market selection.

Result 2: Political selection can relatively fast find expert policymakers whose relevant rationality is well above the average – for instance, they may have to have certain formal education, possibly including prestigious university diplomas. Interestingly, In average, however, this rationality will be, and remain to be, far from the highest, as true talents for entrepreneurship and investment appear only weakly correlated with university diplomas, democratic voting, or judgments by government committees. This result was first obtained by a logical analysis of how unequally rational voters vote for unequally rational candidates under the plausible assumption that they recognize, and therefore do not vote for, less rational candidates than themselves. An interesting empirical corroboration of the above-the-average competence of democratically elected politicians is in Dal Bó et al. (2017).

All this makes it possible to summarize the main lesson for government industrial policymaking in three points: (1) do not select industrial investments; (2) do not select industrial investors; but (3) strive to keep the market competition and selection of both the investments and the investors both going and relevantly orientated.

A parable may help intuition. Imagine how government policymakers could help select the national team for an international chess olympiad. The best help can be summarized in analogous three points: (1) do not go there as chess players; (2) do not select the chess players yourselves; but (3) help organize chess tournaments that would allow the

best chess players to be found and selected. The logic is obviously the same, but the results may be intuitively clearer for chess-playing than for industrial policymaking.

*

That market competition and selection, to produce all these nice results, must both keep going and be relevantly orientated, implies two more lessons. One concerns the sizes of economic organizations, both production firms and investment banks. In a first approximation, the lesson only need to repeat what many said before: no such organization should be allowed to grow ‘too big to fail.’ It is an old truth that large economic organizations may importantly hinder both market competition and selection.

However, this lesson conflicts with the IE following Williamson (1975, 1986), in which large organizations have been defended because of their savings on transaction costs. The lesson admits that such organizations may indeed be socially efficient, but only in the short run. In the long run, there is a risk that they will lose this efficiency: they may become unable to adapt to changing environments and/or to correct their growing internal c-d gaps. If they are ‘too big to fail,’ their efficiency losses become public bads – as was indeed the case of many ‘too big’ banks during the last financial crisis.

The main policy implication is a severe antitrust that substantially limits mergers and acquisitions, and cuts into smaller parts any ‘too-big-to fail’ organization. The frequent objection that no antitrust policymakers can do so optimally is admitted as true, but of little relevance. Although suboptimal antitrust policies may cause relatively large losses of static efficiency, these losses are worth accepting if they are necessary for keeping market competition and selection going, and thus preventing much larger losses of adaptive efficiency.

The second lesson concerns the orientation of market competition and selection. The problem is that this orientation may deviate from a socially efficient target, especially on financial markets (Pelikan 2013, 2014). There, this target may be described as finding and selecting the investors that are the relatively most competent (of relatively least bounded rationality) for recognizing, among firms and industries, future winners from future losers. In usual terms, such investors may be denoted as ‘fundamentalists’ and distinguished from ‘chartists,’ who only observe and try to extrapolate trends in the development of asset prices. The chartists have to a large extent a competition of their own, of which most is now concentrated in high frequency trading (HFT). The best chartists who can outsmart other

chartists may win there very high rewards. The orientation of the selection by financial markets will deviate from social efficiency if these rewards are higher than the time-discounted rewards to the best fundamentalists – as it now appears to be the case. Investors will therefore have stronger incentives to become chartists than the socially more valuable fundamentalists. This situation can be understood as the classical collective goods problem: a divergence between individual incentives and social efficiency.

The policy implication is a very small financial transaction tax (FTT, ‘Tobin tax’). This can indeed reduce this divergence: the socially valuable fundamentalist investors, who rarely change their portfolios, would not be affected, while the incentives for the chartists who seek gains from frequent portfolio changes would substantially deteriorate. The participants in HFT would have to pay the very small tax thousands of times per second. As summarized by the title given by Financial Times to Pelikan (2013), this argument supports FTT not as a charity for helping the poor, but as a tranquilizer for calming the rich. Admittedly, however, several aspects of financial markets still remain to be clarified before this argument can fully be accepted – in particular the possible usefulness of HFT for the market for shares in firms, and the difficulties of marrying a flexible supply of liquidity with solid ownership foundations of firms (Pelikan 2014).

*

Finding 4 implies the ultimate sanctions for disobeying any of the above lessons. If an economy fails to obtain, for whatever reason it might be, any of the three necessary minima – of static efficiency; of adaptive efficiency; and of the political approval of its outcomes – its IF becomes unsustainable. Such a failure will sooner or later result in a more or less deep socio-economic crisis that will cause the IF – peacefully or violently – to be changed by a partial reform or a radical transformation.

This finding moreover implies a constraint on the choice of policy objectives, which it thus turns into a matter for analysis. This differs from the usual view that analysis is limited to the efficiency of policy means, while policy objectives can be chosen freely, according to political or ideological preferences and values. But Finding 4 brings to light that the pursuit of different policy objectives may have different effects on the evolutionary sustainability of the economy’s IF: the pursuit of some objectives may strengthen it while the pursuit of other objectives may undermine it. Suitable adjectives appear to be ‘wise’ for the former objectives, and ‘unwise’ for the latter. The couple ‘policy means; policy objectives’ has thus four different sets of states: (1) ‘efficient means; wise objectives’; (2) ‘inefficient means; wise

objectives’; (3) ‘efficient means; unwise objectives’; and (4) ‘inefficient means; unwise objectives’. Case (1) is obviously the best, but may not be fully realizable. Case (3) is likely the worst, although case (2), depending on how inefficient the means are, may come close to it. For example, socialist economies are still seen by many as Case (2), capitalist economies are often criticized as Case (3), and all real-world economies appear scourged by more or less extensive doses of Case (4).

Importantly, the political approval needed for the maintenance of an IF involves the very knowledge that is the task of AIE to produce. Whether an IF is maintained or reformed or rejected is decided by certain political actors – such as a democratically elected government or a self-appointed dictator – in function of their satisfaction or dissatisfaction with the economy’s output. What these actors need to know, to avoid harming themselves, is how the output depends on the IF. Without this knowledge, they risk to commit two errors: (A) maintain an IF that is responsible for the output they dislike, while mistakenly blaming much less relevant circumstances; (B) reject the actual IF that makes them only moderately dissatisfied, and could be improved by a partial reform, and replace it with an IF that will soon make them much more dissatisfied.

*

The temptation to commit error (B) appears now to grow in many Western capitalist economies. Their IFs appear to be losing political approval with various anti-capitalist arguments gaining popularity. These arguments usually repose on the claim that two inseparable belongings of capitalist economies have become intolerably big and continue to grow: the financial sector, and economic inequalities. The problem is that this claim is not entirely wrong and cannot be rejected out of hand. But its validity is limited by three facts that follow from the above policy lessons.

First, a modern economy, to keep adapted to changing environments, needs an uninterrupted stream of technological and organizational innovations, and therefore needs private and tradable ownership of capital – in other words, an IF of the capitalist type.

Second, a modern complex economy needs a big financial sector for realizing the famous macroeconomic equation $S = I$. While macroeconomists appear to believe it realized by some supernatural powers, its actual realization is a difficult task that must be performed by human decisionmakers. The primary problem is that savers usually do not know where and how to invest, while business investors often ignore where to find all the needed capital.

Several layers of intermediate investors may be necessary for interconnecting the two, while allowing as little as possible of the savings to be lost in failed investment projects. The more complex the economy, the more layers of investors and therefore the bigger financial sector this may require.

But there is also an important secondary problem, to which most of the anticapitalist arguments limit attention: the financial sector has its own ON-development, that, unless tamed by the economy's IF, can make it *too* big. The sector may then develop various inefficiencies – such as banks that are too big to fail, exaggerated HFT, or even pure Ponzi schemes. It is entirely legitimate to criticize such an inefficient overgrowth and to seek policies for shrinking it. But it would be disastrous to commit Error (B) and reject the capitalist financial sector altogether. Detering examples can be found in the history of possible alternatives, such as the Gosplan in the USSR and the MITI in Japan. For a limited time they were both naïvely admired for an impressive macroeconomic growth, before they crashed when the longtime hidden enormous wastes of their microeconomic mismanagement came finally to light.

Third, a modern complex economy needs large economic inequalities. But it is important to distinguish (a) the wealth needed for organizing and managing productive processes from (b) the wealth for personal consumption. Putting the two in the same bag, as has become popular to do, is a highly incompetent and potentially misleading way of dealing with this problem. Ingemar Kamprad, the founder of the initially Swedish enterprise IKEA, offers a clear examples of the difference: he was multibillionaire in wealth (a), which he was using for expanding the enterprise, creating jobs, and allowing an increasing number of low-income households to buy relatively decent furniture, while he was a very modest user of wealth (b). It is only inequalities in wealth (b) that may, if they exceed a certain socio-culturally given tolerance limit, become legitimate causes of dissatisfaction with the capitalist IFs that allow them. To try to equalize the distribution of wealth (a) would seriously damage the ON of any complex economy, and cause it to lose much of its production potential and adaptive efficiency.

In sum, it is possible to accept the claim that today's capitalist economies are suffering from *too* big financial sectors and *too* big economic inequalities, but with the crucial qualification that they nevertheless do need both big financial sectors and big economic inequalities. The problem is then reduced to the fine differences between *necessarily* big and *too* big. To search for a capitalist IF that would allow the two to be necessarily big, while

preventing them from growing too big, appears to be one of the most interesting and socially most important task for AIE.

6 – The IF-ON model and evolutionary biology: additional notes for interested readers

Economists with interests limited to economics should skip this section and go directly to concluding comments. But their more inquisitive colleagues, who at least occasionally like to look beyond the borders of their discipline, may like to consider the logical correspondence between the IF-ON model and evolutionary biology, and perhaps be inspired by it.

That important links between economics and biology exist has been suggested many times, perhaps most famously by Alfred Marshall in his statement that ‘the Mecca of the economists lies in economic biology’ (Marshall 1890). But these links have not yet been identified with precision: no economic biology has been properly established. Why Marshall did not do it, but on the contrary became an important pioneer of ‘economic mechanics,’ is simply that in his time neither biology nor economics were ready. Both were then missing the fields that the links, to be full-fledged, require: AIE and genomics.

However, the first partial links started to be established earlier, when biology was enriched by neo-Darwinism and economics by evolutionary theories. These links were often presented as generalizations of Darwinism, building on the principles of replication and natural selection that could be seen at work in both biological and economic evolutions. An important contribution, to which most of the social scientists seeking to generalize Darwinism still refer is Campbell (1965). He found in both these evolutions processes that may be described by the triplet ‘variation-selection-retention’ – meaning that they both (i) generate partly or entirely uninformed variations of the evolving entities, (ii) submit these variations to certain selection tests, and (iii) retain the possibly very few that succeed. With references to this triplet, principles of a generalized Darwinism that could be seen to work in both evolutions were identified by several authors – of whom Dawkins (1976, 1982), Hull (1980), and Hodgson and Knudsen (2006, 2010) are particularly important examples.

It should be noted, however, that generalizations of Darwinism also raised controversy. They have been opposed by several evolutionary economists, most notably by Witt (2004) and Cordes (2006). For these economists, Darwinism was strictly limited to

biology, where it could explain the origin of human brains with their cognitive abilities on which socioeconomic evolution could build. But they denied the presence of any form of Darwinism in this evolution. An important fact that made their opposition difficult to reject is that replication, on which these generalizations were based, is far less important in economics than in biology: virtually no economies and only very few economic organizations can be said to have offspring.

The present author entered this controversy in Pelikan (2011, 2012) to oppose this opposition and defend the idea that Darwinism can fruitfully be generalized for socioeconomic applications. The condition was the shift of the focus from replicating to instructing. These are indeed the two main functions of genes and genomes, but until recently, virtually all attention was paid to replicating: the instructing functions of genes were little known, and it was politically incorrect to consider them important. The “correct” view was that most properties of organisms, and especially humans, were due to environments and not to genes.

But once the instructing functions of genes and genomes are understood, it becomes easy to identify similarly instructing parts of economies – namely, institutional rules and frameworks. It is then possible to establish a clear link based on the logical similarity of between the two types of the instructing: both may be said to instruct, guide and constrain, with the help of by them admitted inputs from environments, the forming, the operating, and the development of corresponding entities – organisms, respective economic organizations, including entire economies. The IF-ON model makes it possible to anatomize this link into four main branches: (1) between genomes with their genes and IFs with their institutional rules; (2) between an organism’s phenotype and an economy’s ON; (3) between ontogeny and the development of ONs; and (4) between phylogeny and the evolution of IFs.

That this correspondence is only logical, while its two sides may, and indeed do, differ in many quantitative parameters, is important to realize. One important quantitative difference is in the relative time scales: the evolution of genomes (phylogeny) is much slower than the development of organisms (ontogeny), whereas the evolution of an economy’s IF may sometimes proceed as fast as, and occasionally even faster than, the development of its ON. Another important difference is in the relevant information for guiding the variations of the instructions. In biological evolution the variations are entirely uninformed (random), whereas the evolution of IFs may be helped by human knowledge. This makes the variations of IF – such as various economic reforms and system transformations – somewhat less

random. But, as this knowledge has so far been incomplete and to a large extent even wrong (even when large majorities most strongly believed it to be right), also these variations must be seen as at least partly random. Note that producing this knowledge, and thus diminishing this socially costly randomness, is one of the most important tasks of AIE.

All this brings to light two roles of Darwinism in IF-evolution: (i) as admitted by Witt and Cordes, this evolution continues the Darwinian biological evolution by building on the biologically evolved cognitive abilities of *Homo sapiens*; (ii) what Witt and Cordes did not see is that IF-evolution repeats the same logical scheme of variation, selection and retention: it tentatively tries variations of IFs, which shape and constrain the development of ONs, while the performance of these ONs determines the retention or the rejection of the responsible IFs.

*

This logical link between genes and institutional rules deserves more attention: it rebuts the well-known link between genes and memes suggested by Dawkins (1976, 1982). Otherwise, the IF-ON model to a large extent agrees with his replicators-vehicles model. The rules of IF replicate across the individuals of an economy, and may thus, like the genes of an organism, be seen as replicators, while both the ON of an economy and the body of an organism may be seen as the vehicles by which their respective replicators are carried and protected. But the IF-ON model implies that Dawkins commits an error: he does not properly take into account that genes not only replicate, but moreover instruct, and thus help determine how their vehicles will form, develop and operate.

With only replicating in mind, what Dawkins claims to correspond to genes is too much. Coining for it the nicely rhyming term ‘memes,’ he includes in it all of the cultural ideas, symbols and practices whose only significant feature is that they replicate by mind-to-mind transmissions. In contrast, when the instructing role of genes is properly taken into account, and when it is realized that genes form only a small part of the replicating DNA, it becomes clear that the genes-memes correspondence is faulty. Memes correspond not only to genes, but also to all of the non-genic DNA! To get the correspondence right, it is necessary to narrow attention to the subset of memes that both replicate and instruct – which is precisely what institutional rules are defined to do.

*

All this implies that the IF-ON model in economics is as central as the genotype-phenotype model in biology. Emphatically, this implication is not based on any superficial biological

analogy. The IF-ON model was built entirely within economics. Its links to biology were noted ex post, after most of it was built, while biology played no role in its building – with the exception of the informal inspiration found in it by the author. It is depending on their interests, their knowledge of natural sciences, and their breadth of mind, that some economists may find the links to biology interesting and inspiring, while others may find them confusing and entirely useless. Definitely, at least for the time being, no economists are obliged to understand biology, if they prefer to remain narrow specialists in purely economic models.

7 – Concluding comments

Three kinds of concluding comments are in order: on the results obtained; on the tasks for further research; and on the future status of AIE within economics. The main result is the IF-ON conceptual model that provides AIE with terminological precision and a clear overall organization. The model makes it possible clearly to state all the important questions that AIE may be asked to address, and moreover can indicate parts of the answers. Many of these parts disclose crucial omissions in standard economic analysis, and rebut many standard policy implications. The model also contains two theoretical novelties: (i) its neat splitting of economic change into the development of ON and the evolution of IF; and (ii) its extended view of the effects of IFs on economies from the usually studied transaction costs and incentives to the trial-and-error development of ON, including the allocation of unequally bounded rationality to different jobs.

One of the most important tasks for further research is to elaborate the analysis of the AIE questions in more detail, and thus refine their answers – possibly, but not necessarily, with the help of mathematics. Importantly, mathematics should be limited to uses that do not require oversimplifications of the questions analyzed that would leave out, ‘for analytical convenience,’ some of their significant aspects. Otherwise the answers might be most precise, but basically wrong. This limitation may appear obvious, yet in economics it is worth repeating. There, the maxim that it is better to be roughly right than precisely wrong, despite Keynes’s efforts to propagate it, has often been forgotten. This is also why so many precise results of modern mathematical economists have led to the wrong policy implications.

Concerning the future status of AIE within economics, the IF-ON model implies a highly positive prediction: from its actual status of a heterodox field limited to interested specialists, AIE will become the leader of the entire profession that no economist will be

allowed to ignore. This prediction corroborates and makes more precise the argument of Acemoglu and Robinson (2012) expressed in their chapter ‘Institutions, institutions, institutions!’, but with the qualification that evolutionary processes and individual behaviors also matter, more than these authors admitted.

The economists interested in biology may see an extra support for this prediction. They may see the above-discussed link between the IFs of economies and the genomes of organisms to hint that the career of AIE within economics will resemble the career of genomics within biology. Like IE, genomics was also for a long time largely ignored – biologists knew even less about DNA than economists about institutional rules. Yet now, genomics is recognized as the leader of entire biology, dealing with the ultimate causes of all biological processes in different kinds of organisms. This is indeed a good hint that AIE will similarly become the leader of economics, dealing with the ultimate causes of all economic processes in different types of economies.

References

- Acemoglu, D. and J.A. Robinson (2012), *Why Nations Fail: The Origins of Power, Prosperity and Poverty*, Crown Publishers, Random House: New York.
- Acemoglu, D., S. Johnson and J.A. Robinson (2005), “Institutions as a fundamental cause of long-run growth,” in P. Aghion and S.N. Durlauf, eds., *Handbook of Economic Growth*, Elsevier B.V.: Amsterdam.
- Alchian, A.A. (1950), ‘Uncertainty, evolution, and economic theory’, *Journal of Political Economy* 58, 211-222.
- Campbell, D.T. (1965), “Variation, selection and retention in sociocultural evolution,” in H.R. Barringer, G.I. Blanksten, R.W. Mack, eds., *Social Change in Developing Areas: a Reinterpretation of Evolutionary Theory*, Schenkman: Cambridge, Massachusetts. Reprinted 1969 in *General Systems* 14: 69–85.
- Cordes, C. (2006), “Darwinism in Economics: From Analogy to Continuity,” *Journal of Evolutionary Economics* 16: 529-541.
- Dal Bó, E., F. Finan, O. Folke, T. Persson and J. Rickne (2017), “Who becomes a politician?” *The Quarterly Journal of Economics* 132: 1877-1914.
- Dawkins, R. (1976), *The Selfish Gene*, Paladin: London.

- Dawkins, R. (1982), *The Extended Phenotype: The Gene as the Unit of Selection*, W.H. Freeman and Company: Oxford and San Francisco.
- Friedman, M. (1953), *Essays in Positive Economics*, University of Chicago Press: Chicago.
- Greif, A. and J. Mokyr (2017), "Cognitive rules, institutions and economic growth: Douglass North and beyond," *Journal of Institutional Economics* 13: 25-52.
- Hayek, F.A. (1973), *Law, Legislation and Liberty, Volume I: Rules and Order*, Routledge & Kegan Paul: London.
- Heiner, R. (1983), 'The origins of predictable behavior,' *American Economic Review* 73: 560-95.
- Hodgson G. (2007), "Meanings of methodological individualism," *Journal of Economic Methodology* 14: 211-226.
- Hodgson, G. (2016), "On Fuzzy Frontiers and Fragmented Foundations: Some Reflections on the Original and New Institutional Economics," *Journal of Institutional Economics* 12: 591-611.
- Hodgson G. and T. Knudsen (2010), *Darwin's Conjecture: The Search for General Principles of Social and Economic Evolution*, University of Chicago Press: Chicago.
- Holland, J.H., K.G. Holyoak, R.E. Nisbett and P.R. Thagard (1986), *Induction: Processes of Inference, Learning, and Discovery*, The MIT Press: Cambridge (Mass.).
- Hull, D.L. (1980), "The units of evolution: a metaphysical essay," in U.J. Jensen and R. Harré (eds.), *Studies in the Concept of Evolution*, Harvester Press: Brighton.
- Kahneman, Daniel and Amos Tversky, eds. (2000). *Choice, Values, and Frames*. Cambridge, U.K. and New York: Cambridge University Press.
- Marshall, A. (1890), *Principles of Economics*, Macmillan & Co: London.
- von Mises, L. (1920/1935), "Economic Calculation In The Socialist Commonwealth," in F.A. Hayek, ed., *Collectivist Economic Planning*, Routledge & Sons: London.
- Nelson, R.R. (2002), "Bringing institutions into evolutionary growth theory," *Journal of Evolutionary Economics* 12: 17-28.
- Nelson, R.R. and S. Winter (1982), *An Evolutionary Theory of Economic Change*, Harvard University Press: Cambridge, Mass.

- North, D.C. (1990), *Institutions, Institutional Change, and Economic Performance*, Cambridge University Press: Cambridge and New York.
- North, D.C. (2005), *Understanding the Process of Economic Change*, Princeton University Press: Princeton and Oxford.
- Pelikan, P. (1968) 'Programmes for human decision-making,' in K. Borch and J. Mossin, eds., *Risk and Uncertainty*, MacMillan: London, Melbourne and Toronto, and St. Martin's Press: New York.
- Pelikan, P. (1988), 'Can the imperfect innovation system of capitalism be outperformed,' in G. Dosi et al., eds., *Technical Change and Economic Theory*, Pinter Publishers: London and New York.
- Pelikan, P. (1992), 'The dynamics of economic systems, or how to transform a failed socialist economy', *Journal of Evolutionary Economics* 2, 39-63; reprinted in H.J. Wagener, ed., *On the Theory and Policy of Systemic Change*, Physica-Verlag: Heidelberg, and Springer-Verlag: New York.
- Pelikan, P. (2003), "Bringing institutions into evolutionary economics: another view with links to changes in physical and social technologies," *Journal of Evolutionary Economics* 13: 237-258.
- Pelikan, P. (2007), 'Allocation of scarce resources when rationality is one of them: some consequences of cognitive inequalities for theory and policy', http://mpra.ub.uni-muenchen.de/3657/1/MPRA_paper_3657.pdf, Munich Personal RePEc Archive: Munich.
- Pelikan, P. (2010), 'The government economic agenda in a society of unequally rational individuals,' *Kyklos* 63: 231-255.
- Pelikan, P. (2011), 'Evolutionary developmental economics: how to generalize Darwinism fruitfully to help comprehend economic change,' *Journal of Evolutionary Economics* 21: 341-366.
- Pelikan, P. (2012), 'Agreeing on generalized Darwinism: a response to Geoffrey Hodgson and Thorbjørn Knudsen,' *Journal of Evolutionary Economics* 22: 1-8.
- Pelikan, P. (2013), 'FTT's main task is to calm the rich, not help the poor,' *Letters, Financial Times*, June 14: London

- Pelikan, P. (2014), 'Financial regulations for minimizing economic and social crises: an evolutionary-developmental analysis reckoning with unequally rational individuals,' in L. Mamica and P. Tridico, eds., *Economic Policy and the Financial Crisis*, Routledge: London.
- Rodrik, D., A. Subramanian och F. Trebbi (2004), "Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development", *Journal of Economic Growth*, vol 9, s 131–165.
- Schumpeter, J.A. (1912/1934), *The Theory of Economic Development*, Harvard University Press: Cambridge, Massachusetts.
- Shirley, M.M. (2008), *Institutions and Development*, Edward Elgar: Cheltenham and Northampton.
- Vanberg, J.V. (2002), "Rationality choice vs. program-based behavior," *Rationality and Society* 14: 7-54.
- Williamson. O.E. (1975), *Markets and Hierarchies: Analysis and Antitrust Implications*, The Free Press: New York
- Williamson, O.E. (1986), *The Economic Institutions of Capitalism*, The Free Press: New York, and Collier Macmillan Publishers: London.
- Winter, S. (1971), "Satisficing, selection and the innovative remnant," *Quarterly Journal of Economics* 85: 237-261.
- Witt, U. (2004), "On the Proper Interpretation of 'Evolution' in Economics and its Implications for Production Theory," *Journal of Economic Methodology* 11: 125-146.