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Population thinking vs. essentialism in biology and evolutionary economics

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Abstract

The standard perception of the dichotomy between population thinking and essentialism (typological thinking) in evolutionary economics descends from the golden age of the neo-Darwinian Synthesis. Over the last few decades the received view on population thinking has been seriously challenged in biology and its philosophy. First, the strong version of population thinking that banishes essentialism witnessed important tensions stemming from the ontological status of species. These tensions have been amplified by the demise of positivism and the rise of a new essentialism in philosophy of science. Second, the soft version that transforms the opposition between population thinking and essentialism to the dichotomy between ultimate and proximate causation has led to contradictory interpretations regarding the locus of ultimate causes. Taking stock of the previous discussion the paper addresses the limits to population thinking in the socio-economic realm. The upshot is that without denying the important achievements made by the application of population thinking in sub-disciplines like industrial dynamics and economic anthropology, the idea to generalize these applications into the whole socio-economic realm is problematic. The aforementioned achievements cannot come to grips with the structural aspects of capitalism, its different periods (e.g. the contemporary finance-led capitalism) and its geographical varieties. The resulting gap points to the importance of structural analysis (essentialism) and evolutionary political economy. The latter is distinguished from the rest of evolutionary economics by its project to go beyond the surface of economic phenomena and to critically analyze their underlying social structures.

Key words: Evolutionary Economics, Population Thinking, Essentialism, Political Economy

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1 Introduction

The approach in terms of population thinking is the cornerstone of Darwinian biology. As a matter of fact, modern evolutionary economics is based from the outset on population thinking. This has been done in an implicit way as in the case of Nelson and Winter (1982), who focus on the diversity of the firms without referring explicitly to population thinking. But this has also been done in an explicit way by the scholarship openly claiming the revolutionary implications of population thinking for life and social sciences (e.g. Metcalfe, 1989; Hodgson, 1993). Could population thinking be the Mecca of evolutionary economist and social scientist? I will argue throughout this chapter that things are far more complicated. Even in biology and in its philosophy the notion of population thinking led to important tensions that have been underplayed by evolutionary economists.

The canonical view of population thinking derives from a narrative that was dominant during the latter period of neo-Darwinian Synthesis. Roughly speaking, this was the synthesis between Darwinian natural selection and Mendelian genetics that dominated biology throughout a considerable part of the twentieth century. More specifically, in 1959 Ernest Mayr, a major proponent of the neo-Darwinian synthesis, claimed that 'Darwin introduced a new way of thinking into the scientific literature, "population thinking"' (Mayr, 1959/1976, p. 27). According to Mayr, the former scientific way was the typological thinking that had its roots in Plato's idealistic philosophy, where reality was the blurry reflection of perfect Ideas or Forms (types). Echoing Plato, modern 'typologists' focused their attention on ideal types or statistical means and considered variation an accidental phenomenon. On the contrary, 'populationists' privileged the diversity of individuals, 'or any kind of organic entities', within populations. In a nutshell: 'For the typologist, the type (eidos) is real and the variation an illusion, while for the populationist the type (average) is an abstraction and only variation is real' (p. 28)[1].

[1] Certainly, if you take the word 'real' à la lettre, then Ariew (2008, p. 65) is justified in speaking of 'silly metaphysics'. For example, the mean of a population is no less real than the individual values it represents. It seems however that what Mayr means here by 'real' is to dispose of explanatory power or 'causal efficacy' (Sober, 1980, p. 371).

Then in 1965 David Hull, who later became one of the most influential philosophers of biology, advanced a similar argument against Aristotelian essences. His intervention criticizing the static definitions of the species category was influenced by Karl Popper's attack on 'methodological essentialism'. In order to define essentialism Hull (1965) cited the following fragment from *The Open Society and Its Enemies*:

> I use the name methodological essentialism to characterize the view held by Plato and many of his followers, that it is the task of pure knowledge or 'science' to discover and to describe the true nature of things; i.e. their hidden reality or essence. It was Plato's peculiar belief that the essence of sensible things can be found in other more real things – in the primogenitors or Forms. Many of the later methodological essentialists, for instance Aristotle, did not altogether follow him in determining this; but they all agreed with him in determining the task of pure knowledge as the discovery of the hidden nature or Form or essence of things (Popper, 1950, p. 34).

The excessive approaching between Plato and Aristotle made by Popper proved very helpful for a synthesis between Mayr's and Hull's arguments. Some years later, Mayr (1969) used 'essentialism' and 'typological thinking' synonymously. From a philosophical point of view this does not make sense. Essentialists are typologists, but the opposite is not necessarily true. Humean empiricists and Lockean nominalists are both typologists, but they are not essentialists. Nevertheless, the opposition between population thinking and essentialism (typological thinking) has been repeated in Mayr's later publications and it became famous not only in biology but also in other disciplines like economics and anthropology.

Over the last years a revisionist history of biology has evolved that refutes the claim that taxonomists before Darwin were mired in Aristotle's or Plato's essentialism (Winsor 2006)[2]. It seems, however, that most of the above revisionist accounts do not dispute the pivotal role of population thinking in biology. What they do call into question is the narrative which presumes it was Darwin who put an end to 'two thousand years of stasis' (Hull, 1965) in Western science and philosophy. From a conceptual or methodological point of view what is more important is the advent of a new literature that re-evaluates the opposition between population thinking and essentialism. In plain words, population thinking is no longer considered the quintessence of the biological approach, and essentialism in biology becomes a subject of serious debate.

[2] This turn in the history and methodology of biology is aptly resumed by Wagner's (2007, p. 151) rhetorical question: 'Was everyone before Darwin an idiot?'.

Consequently, the first objective of the present chapter is to review the existent, disparate literature on the topic and as such inform the evolutionary economist as to the complications inherent in population thinking which have been inferred by the recent debates in biology and the philosophy of biology. Then the second objective is to show that the anomalies accumulated by population thinking within biology are very helpful to understand the limits to population thinking in the economic and social realm. The chapter is divided into five sections. The following (second) section discusses the tensions raised in the initial and strong version of population thinking implying a full blooded anti-essentialism. The third section examines a more reasonable version of population thinking that tries to find also a place for essentialism under the notion of 'proximate causes'. A fourth section is dedicated to the limits to population thinking in economics. After recognizing its successful application in the sub-disciplines of industrial dynamics and economic anthropology the case for an (essentialist) 'evolutionary political economy' is briefly made. Finally, section five provides concluding remarks.

2 Population thinking as strong anti-essentialism: Are species mere mental constructions?

The strong version of population thinking popularized by Mayr (1959) leads to explosive tensions regarding the ontological status of species. The initial question is rather simple: If population thinking is the opposite of essentialism, and the notions of 'type' and 'essence' must be banished from biology, how would species then be defined? Traditionally, the species were considered 'natural kinds', but this term has been subject to very different interpretations. The most fundamental opposition has been between the Aristotelian and Lockean conceptions of species (Ayer, 1981).

In the Aristotelian metaphysics, each species possesses its own specific nature or essence that provides the telos (ultimate goal) of its existence. For example, what distinguishes the human species from other animals is the faculty of speech (Logos), which includes what the Latin authors called later Ratio (Rationality). Certainly, human species can also be recognized and identified by superficial features or properties (featherless biped, etc). Nevertheless, for Aristotle only the knowledge of the specific essence of each species can provide its scientific definition.

In the third book of his Essay on Human Understanding, Locke (1690/1975) distinguished between the nominal and the real essence of kinds. The real essence was the underlying microstructure that explains the very nature of kinds. Still, according to Locke the human mind

cannot gain access to the hidden structure of particles forming the real essence of things. Our mind only has access to the superficial characteristics, that is, to the nominal essences of kinds. Such an empiricist view of the world leads directly to nominalism. If we are condemned to ignore real essences, then our classification schemes would necessarily be conventional or even arbitrary. Species therefore do not correspond to collections of entities with a reality beyond us, but are fabrications of the mind.

2.1 Mayr's endless troubles with the 'basic unit of biology'

We can now better localize the challenge facing the theorist of population thinking. Obviously, species are not eternal natural kinds. On this point, Darwinian evolutionism has undeniably been validated by modern science. But does the ubiquity of variation implied by population thinking mean that the 'basic unit of evolutionary biology' (Mayr, 1982, p. 296) is simply a matter of subjective classification? This seems counter-intuitive to our proper experience. We have been able to distinguish dogs from cats in different places and times since we were children. And, even if one argued that this folk biology is no more than a false impression, she might explain how is it then possible for primitive people to have roughly the same species classification as the 'Western university-trained scientists' (Gould, 1980, p. 207).

Mayr (1882, pp. 267-9) acknowledged that Darwin's Origins took a nominalist stance. And since the beginning of 20th century an important nominalist camp has existed within Darwinian scholarship. But Mayr never adhered to it. He always maintained that, whatever the difficulties in defining species may be, the latter correspond to real discontinuities in nature not simple constructions of the human mind. Ironically enough, his strong opposition to nominalist ideas sometimes compelled him to make curious essentialist declarations like the following: 'In spite of the variability caused by the genetic uniqueness of every individual, there is a species-specific unity to the genetic program (DNA) of nearly every species' (Mayr, 1982, p. 297). Such a hesitation between nominalism and essentialism hints to a very open-minded scientist, but it can hardly be considered proof of coherence.

2.2 The 'Species as Individuals' thesis: anti-essentialism pushed to the absurd

The thesis of 'Species as Individuals' (thereafter S-a-I) developed by Gishelin (1974) and Hull (1976, 1978) attempted to get out the anti-essentialist camp from its impasses though a semantic innovation. It claims that the debate between essentialism and nominalism in biology is based on a false postulate. It presupposes that species are classes (or sets or natural kinds). Yet species are actually individuals and not classes. A class is defined by the common properties

(nominal and/or real essences) of its members. All members in the class of the element 'gold' bear the atomic number 79. With the organism as their paradigm, individuals do not have members but parts. California is a part of the U.S.A. in the same way that the heart, kidneys and lungs are vital parts of the same organism. Even though both classes and individuals are real, they are totally different in the following respects:

a. The different parts of the individual do not have common properties that can define them. Because it is impossible to list the properties that are necessary and sufficient to define their names, the latter are proper names (General Motors, U.S.A, Charles Darwin,…) provided by a simple act of baptism.
b. The class concept implies the existence of intrinsic properties in all places and at all times. Gold has its place on the periodic table regardless of the time and place of its formation. Individuals, on the contrary, are space- and history-bound. Just as all individuals undergo birth and death, and remain globally consistent for the duration of their lives in spite of continuous evolution, species are defined as 'spatiotemporally localized lineages' or 'particular chunks of the genealogical nexus'.
c. Given that individuals have no intrinsic properties and are spatiotemporally restricted (points 'a' and 'b'), they are not eligible for analysis by scientific laws. Explanations about the evolution of particular species have the status of 'historical narratives' concerning 'unique sequences of events' (Hull, 1976, p. 188). Still, evolutionary theory is a scientific one because it refers to the evolution of life in general and not to the evolution of a particular species or the transition from one species to another.

Subtle as the whole argument is, the identification of species with individuals still presents two main shortcomings.

Firstly, the crux of the argument is based on the postulate that '(t)he relation which an organ has to an organism is the same as the relation which an organism has to its species' (Hul, 1976, p. 181). This is far from convincing. General Motors is an individual because its parts are (hierarchically) structured and cooperate to realize a particular goal. A species is not like GM but like the automobile industry, where autonomous and quasi-similar individual firms are struggling for survival. Similarly, the relationships sustained between heart, kidneys and lungs within the same organism have little to do with the (direct or indirect) struggle for existence between members belonging to the same species. We have here a strange conflation of cooperation with natural selection. And as Ruse (1987, p. 235) so aptly put it: 'If you take Darwinian selection seriously, you must simply reject the S-a-I thesis'. Stated otherwise, from a Darwinian point of view you have to pay just too high a price to consider species as individuals.

Secondly, the effort to exorcise the essences from evolutionary biology through the class-individual opposition leads to curious, if not to say extreme, statements. If species are individuals then they cannot be studied by scientific laws. Hull (1978, pp. 357-8) is very clear on this point: 'Learning may be species specific, but if learning theory is to be a genuine scientific theory, it cannot be limited necessarily to a single species the way that Freud's and Piaget's theories are. As important as descriptions are in science, they are not theories'. Following the same logic one should include in humankind-specific narratives not only all the social sciences (Ruse, 1987, p. 237) but medicine as well! By the same token, given that the earth is an entity from the class of planets, geology should not be regarded as a genuine scientific theory. Underlying these odd assertions, we find the same controversial postulate, presuming a rigid opposition between scientific laws (classes) and historical narratives (individuals). Scientific laws address eternal natural kinds or 'timeless regularities in nature', whereas historical descriptions concern 'unique sequences of events'[3].

The major drawback of such a sticky opposition is that it excludes a priori the existence of time- and/or space-bound regularities and their intrinsic properties. However, the very fact that individuals are 'historical entities persisting while changing indefinitely through time' (Hull, 1978, p. 341) implies that the persisting features are spatiotemporally bound regularities. And these regularities could be explained by the corresponding theoretical mechanisms. I will return to this shortly, in the R.N. Boyd's redefinition of natural kinds.

2.3 Farewell to positivism: The consequences of the new essentialism for the philosophy of biology

Hull's rejection of essentialism in his 1965 paper had been informed by a wider positivistic consensus in the philosophy of science from that period. Real essences and their corollaries (causal powers, hidden structures, underlying mechanisms) were 'unobservables', and therefore metaphysical entities that should be banned from modern science. By the 1970s this positivistic consensus had disintegrated due among others to the seminal works of Kripke (1972/1980) and Putnam (1975).

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[3] We can find in this postulate the intellectual roots of D. Hull's later major works, like his strictly genealogical conception of scientific evolution (Hull, 1988) as well as his attempt to provide a general account of selection in biology, immunology and behavior (Hull, Langman and Glenn, 2001).

The new essentialism advocated by Kripke (1980) and Putnam (1975) can be summarized in two points. The first point is that the major task of science is not to discover correlations at the level of observable phenomena but to find the essential properties or the hidden structures that explain the observed correlations. In other words, the progress made by modern science rejected Locke's fear that there is no access to the true essences of things. The second point of the new essentialism is that the classification of our world is not arbitrary. The possibility of knowing real essences implies that the objects inhabiting our world constitute natural kinds. Thus, reality exists independently of us. Furthermore, even if we don't know the essence of a thing, we can anticipate its existence from the observable features or the manifest properties of this thing. And this is enough to ensure that the meaning of a term remains constant over the centuries. For example, what we call 'gold' today in English is no different from the 'χρυσός' of the Ancient Greeks. And according to Putnam: 'when Archimedes asserted that something was gold (χρυσός) he was not saying that it had the superficial characteristics of gold (…); he was saying that it had the same general hidden structure (the same "essence", so to speak) as any normal piece of gold' (Putnam, 1975, p. 235).

It should be noted however that the ascent of modern essentialist philosophy is far from just a simple revival of Aristotle's essentialism. The Aristotelian science starts from the approximate knowledge of common sense (doxa) and proceeds speculatively, through rhetoric, dialectics and logic, to discover the real nature of things. Modern science is experimental. Essences can be anticipated from their empirical manifestations but their existence must be assessed experimentally. Therefore, the definitions of natural kinds are a posteriori categories. Besides, their adoption by the scientific community does not imply that they cease to be subject to epistemic doubt. As Putnam (1975, p. 225) points out 'future investigation might reverse even the most "certain" example'.

In the continuity of the road opened by Kripke and Putnam, the most decisive contribution for reconciling biology with essentialism comes from the philosopher Richard N. Boyd (1991, 1999). Boyd's general project is to elaborate a more sophisticated version of realism and a more flexible notion of natural kinds that would be appropriate for both biology and social sciences. Especially for biology, he suggests that the rejection of the idea that species have essential properties relies on an outdated notion about natural kinds. Such a notion implies at least three sine qua non conditions for natural kinds:

- They are defined by the necessary and sufficient properties shared by all their members

- They are universal in the sense that their essential properties are not historically restricted
- They can be explained by universal laws

According to Boyd the above received wisdom about natural kinds has its roots not in Aristotle but primarily in modern empiricism and secondarily in 'physics envy'. Therefore, examples such as 'water = H_2O', used by Kripke, Putnam and their followers, 'misleads us about what is essential to the essentialist critique of Lockean nominalism about kinds'.

> What is essential is that the kinds of successful scientific (and everyday) practice cannot be defined by purely conventional a priori "nominal essences". Instead, they must be understood as defined a posteriori real essences that reflect the necessity of our deferring, in our classificatory practices, to facts about causal structures of the world (Boyd, 1999, p. 146).

Thus, Boyd's notion of Homeostatic Property Clusters (HPC) Kinds violates the empiricist conditions prescribed for natural kinds while respecting what he regards as essential to essentialism[4]. From this perspective, biological species are the paradigmatic HPC Kinds. At the surface, a species is presented to us as a cluster of concurring similarities. These similarities are too vague to be sine qua non conditions, but stable enough to allow us to distinguish one species from another. For example, whatever the differences in the external appearance of dogs, no one could mistake a dog for a cat. Such a coexistence of phenotypic properties is caused by homeostatic mechanisms (gene exchange through interbreeding, developmental constraints, niches, etc.). The latter 'act to establish the patterns of evolutionary stasis that we recognize as manifestations of biological species' (Boyd, 1999, p. 165). Certainly, the 'evolutionary stasis'[5] cannot pertain indefinitely, but this only means that species are 'historically delimited natural kinds'. Most importantly, similar remarks apply for the social realm. No one can say exactly when feudalism finished or when capitalism started, but it would be quite difficult to contest the existence of capitalism and feudalism as historically-bound kinds (Boyd, 1999, p. 155).

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[4] Regarding the argumentation of the Darwinian orthodoxy against the new biological essentialism, see mainly Ereshefsky (2010).

[5] Boyd's notions of 'evolutionary stasis' and 'homeostatic mechanisms' have already been used by punctuated equilibria theorists (Eldredge and Gould, 1972). Obviously, the evolutionary theory that corresponds perfectly to the rehabilitation of essentialism in evolutionary biology is the 'punctuated equilibria' approach.

3 Population thinking as soft anti-essentialism: The opposition between ultimate and proximate causes

An important precision about the place of population thinking in biology has been provided by Mayr (1961) himself in another seminal paper arguing for the specificity and the independence of biology vis-à-vis physics and chemistry. In a nutshell, Mayr's thesis implies that essentialism is a dead issue in evolutionary biology, but a legitimate, even though 'simplistic' approach (p. 1502), in structural biology.

3.1 From Mayr's 'backward-looking' ultimate causation…

Mayr (1961) distinguishes between two large biological fields, structural ('functional' in the text) and evolutionary biology. The former category lumps together three different biological sub-disciplines (Ariew, 2003, p. 556; Laland et al. 2011, p. 1512):

- Physiology or anatomy
- Developmental biology (the study of organic development from the embryo to the adult)
- Molecular biology (the study of the genetic material of different species and higher taxa)

These biological sub-disciplines deal with the structural elements of representative entities, ranging from cells to whole organisms. And their typological thinking is essentially the same as the experimental methods of physicists and chemists. Evolutionary biology, on the contrary, addresses the enormous diversity and the continuous change in the organic world.

From the definition of the two biological fields, Mayr hastens to minimize the status of structural biology. He insists that structural biology answers the question of 'How?', whereas the fundamental question in evolutionary biology is 'Why?'. In other terms, the structural biologist provides the 'proximate causes' of biological phenomena, while the evolutionary biologist uncovers their 'ultimate causes'. The distinction between 'How?' (proximate causes) and 'Why?' (ultimate causes) sounds more or less artificial. Is it plausible, for example, to suggest that the scientists trying to decode the DNA structure don't pose the question 'Why'? On the other hand, Mayr himself explains that when evolutionary biologists ask the question 'Why?' what they really mean is 'How come?'. Such an artificial distinction was hard to swallow, at least for philosophers informed by the new essentialism.

In his plea for realistic pluralism in biology Kitcher (1984) argued against Mayr's distinction between proximate and ultimate causes. He proposed instead to distinguish between structural

and historical explanations: 'There are indeed two kinds of biological investigation that can be carried out relatively independently of one another, neither of which has priority over the other. These kinds of investigation demand different concepts of species' (p. 320). According to Kitcher what unifies the two types of investigations is a common scientific methodology presupposing different levels of reality. Both approaches start from surface patterns in the morphology and physiology of organisms and seek to unveil the deeper causes of these patterns. The historical investigation focuses on the genealogy of species, while the structural approach concentrates on their underlying structures and mechanisms.

Devitt (2008, 2010) further developed and substantially updated Kitcher's distinction between structural and historical explanations. He argues that all biological generalizations – say for example the fact that Indian and African rhinoceroses don't have the same number of horns – require two distinct explanations. The historical one addresses the question of the 'evolutionary history that led to the generalization being true' (Devitt, 2008, p. 352) while the structural one seeks to explain 'what makes the generalization true': 'Regardless of the history of its coming to be true, in virtue of what is it now true?' (ibid.).

Finally, regarding the motives behind Mayr's 'disciplinary chauvinism' (Dewsbury, 1999), they range from philosophical to purely materialistic. As he reports in his correspondence, he saw in developmental biologists the followers of Plato under whose influence he had suffered throughout his school and college career (Amundson, 2005, pp. 207-8). On the other side, the upsurge of molecular biology was perceived by him as a major threat that 'required constant vigilance to prevent that all financial resources and new positions would be given to this new field' (Mayr, reported in Beatty 1994, p. 348). Still, whatever the Mayr's motives, his underestimation of developmental and molecular biology is today out of momentum. Molecular biology succeeded inter alia to decoding the entire human genome and then advanced to comparisons between the genomes of Homo sapiens, her relatives (e.g. Neanderthal) and chimpanzees. Such comparisons provide groundbreaking information about the genealogical evolution of humankind. On the other hand, the rising 'evolutionary developmental biology', known also as 'evo-devo', effectuated a paradigmatic shift that challenges the monopoly of the Darwinian paradigm in explaining biological evolution (Amundson, 2005)[6].

3.2 … to population genetics' 'forward-looking' ultimate causation

Ex post we can say that Mayr has lost all the big battles he gave. Not only molecular and developmental biology have triumphed during the last decades, but also the ahistorical vision of population genetics, his interior enemy (Amundson, 2005, p. 203), marginalized his own historical or backward-looking conception of ultimate causation.

A first, albeit indirect, questioning of Mayr's dichotomy came from Tinbergen's (1963) alternative classification in terms of four questions, namely:

1. Causation (mechanisms analyzing the adult organisms)
2. Ontogeny (developmental mechanisms)
3. Survival value (present and future evolution)
4. (Past) Evolution

Tinbergen never regrouped his four equally important questions into a hierarchy between ultimate and proximate causes. Most importantly, he was clear that the survival value of a trait in the present is logically independent from its evolution in the past. Both questions have in common the explanatory primacy of natural selection, but only survival value, because of focusing on the present, is able to study selective processes experimentally. Nevertheless, most of neo-Darwinians felt enough self-confident to regroup 'causation' and 'ontogeny' to proximate causes and 'survival value' and 'evolution' to ultimate causes.

But the worst was still to come. For Mayr, as well as for Darwin, evolutionary biology was a historical science. Mayr (1961) argued that evolutionary biology, at the opposite extreme of classical mechanics, deals with unique phenomena that are characterized by a high degree of indeterminacy, complexity and unpredictability. Nonetheless, the success of population genetics promulgated an ahistorical conception of the mechanisms at work in natural selection. The domination of population genetics within neo-Darwinism transformed the latter to a probabilistic science that, contrary to Mayr, aims to supply reliable predictions (e.g. Endler and McLellan, 1988; Ariew, 2003; Griffiths, 2009). Thus, in searching to predict the 'survival value' of a trait in the future, its past history is more or less irrelevant. Nowadays, as the evo-devo

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[6] Regarding the revolutionary implications of evo-devo for evolutionary economics see Martin and Sunley (2015) and Liagouras (2016). See also Wagner (2001) and Amundson (2005) on the close relationship between evo-devo and Boyd's essentialism.

researcher G. Wagner (2007, p. 147) nicely put it, 'one can be a successful population geneticist without knowing much of life's history on earth'. To be sure, neo-Darwinians still addressing historical material, but they do it in the same way that New Economic History addresses history. The debate on 'adaptationism' that opened with Gould and Lewontin (1978) and still flourishing today is the major symptom of this anti-historical tendency.

In the end, it is not sure that the forward-looking version of ultimate causation provided a better argument than Mayr's initial thesis. On the contrary, the final outcome has been a far more confusing use of the terms ultimate and proximate. Most of biologists seem to follow the forward-looking version. Still, even in this case the simultaneous reference to Tinbergen and Mayr makes the notion fuzzy. Certainly, it remains that Mayr and population genetics have in common the underestimation of structural or essentialist biology. But, this does not constitute a sufficient ground for conflating the naturalists' historical perspective with the geneticists' probabilistic point of view[7].

4 Population thinking and anti-essentialism in economics: Who's afraid of 'Evolutionary Political Economy'?

Having analyzed the major anomalies accumulated by population thinking in biology we can now turn our attention to its adoption by evolutionary economics.

4.1 The first wave of population thinking in economics: Neo-Schumpeterian industrial dynamics

The first wave of population thinking in economics refers to the literature on market processes and innovation that followed the breakthrough realized by Nelson and Winter (1982). In the important literature accumulated on these topics the evil of essentialism or typological thinking is represented by the neoclassical representative firm. Hence the metaphorical use of population thinking from biology enabled evolutionary economists to model and study competition as an evolving process based upon the ever-rejuvenated variety of firms.

[7] To the best of my knowledge, D. Haig (2013) is the only scholar who insists on the fuzziness implied by the notion of the ultimate causation. Note that this problem is distinct from the question of the blurring frontiers between ultimate and proximate causation (e.g. Vromen, 2009; Laland et al., 2011).

The achievements of the neo-Schumpeterian literature are now so well-established and recognized that they don't need further presentation. The question is if this form of evolutionary analysis can pretend to cover the whole subject-matter of economics. Even though the major reference from biology is the population genetics' version of population thinking, the distinction between ultimate and proximate causes is not used at all. Therefore, we are in face of a strong version of population thinking that wants to ban every form of typological thinking, even the non-essentialist ones.

Such an imperialistic attitude is not convincing even at the micro level which constitutes the predilection of neo-Schumpeterian economics. The Marshallian representative firm provides the most problematic version of essentialism. You cannot use it as a straw man to beat Adam Smith's manufacture of pins in the 18th century, Marx's big industry in the 19th century, Berle and Means' modern corporation or Alfred Chandler's multiunit corporation in the 20th century, and Lazonick and O'Sullivan's 'maximizing shareholder value' corporation in contemporary finance-led capitalism. Obviously, the aforementioned authors recognize the enormous variety of firms in the different periods of capitalism they study. But behind the impressive variety of firms they see a dominant form and its deep structures. Firms here correspond to Boyd's conception of species as Homeostatic Property Clusters (HPC) Kinds. A consistent population thinker should reject these important works as typological or essentialist because they are based on representative corporations. But in this case we would have lost precious knowledge about the (time- and space- bound) organizational species operating above the competitive game between the individual firms of each industry.

At the macro level, the imperialistic claims of population thinking are even more problematic. In the beginning (Nelson and Winter, 1982) the neo-Schumpeterian project betted that the evolutionary approach will provide the right microfoundations for macroeconomics. Today we can conclude that this is far to be the case. Neo-Schumpeterian approaches have been concentrated to the micro-meso level. And the sporadic efforts to combine macroeconomics with population thinking have reached deadlock (Liagouras, 2016). The final outcome is hardly surprising. Genuine macroeconomic analysis from Ricardo and Marx to Keynes, Schumpeter and Minsky tries to analyze the deep structures (essences) explaining the stylized facts or 'semi-regularities' (Lawson, 1997) of a capitalist economy. If population thinking could provide microfoundations for macroeconomic analysis then all the heterodox macroeconomic thought would have very little explanatory value.

4.2 The second wave of population thinking: Economic anthropology or foraging economics

A second wave of research inspired by Darwinian population thinking seeks to explain the human capacity to cooperate and to follow moral rules (e.g. Bowles and Gintis, 2011; Hodgson, 2013; Pagano, 2013; Witt and Schwessinger, 2013). The study of the making of the cooperative and moral species we call humankind is valuable per se, as a question of economic anthropology. But what is at stake here is far more important. For most of the economists participating in this stream of research, the study on the origins of the human nature is expected to provide a realistic alternative to the overwhelming domination of homo economicus in the dismal science. The central hypothesis, first launched by the evolutionary psychology, is that all types of human societies and institutions are contingent on the hardwired elements of human nature. The latter have been formed in the long process of hominisation, mainly during the Pleistocene and Holocene periods.

This hypothesis openly contradicts the traditional social theory (e.g. Marx, Sombart, Weber, Schumpeter, …), which explicitly or implicitly postulates that human nature is too flexible to provide an account for social evolution. But is also goes against more circumspect Darwinian biologists who argue about the inadequacy of Darwinian paradigm to comprehend human history. As remarked by Gould (1980, p. 83-4): 'Darwinian evolution continues in Homo Sapiens, but at rates so slow that it no longer has impact on our history. This crux in the earth's history has been reached because Lamarckian processes have finally been unleashed upon it. Human cultural evolution, in strong opposition to our biological history, is Lamarckian in character'. Given the trade-off between Darwinian and Lamarckian processes, a possible way to defend the adequacy of Darwinian paradigm for social sciences is to stick to the hominisation process and claim that the resulting human nature (instincts, proclivities and so on) provides the ultimate cause for the analysis of human societies.

The recent adoption of the ultimate/proximate distinction (Wilson and Gowdy, 2013), enable evolutionary economists to sustain a more convincing position than the simple rejection of structural explanations. Structural or synchronic analysis is tolerated as proximate cause. What is less clear is the meaning of ultimate cause in evolutionary economics. Sometimes the conflation between Mayr's backward-looking perspective, Tinbergen's non-hierarchical set of 4 questions, and population genetics' forward-looking causation is more pronounced than in biological literature. But, by the use made of the ultimate/proximate distinction we can infer that what the majority of evolutionary economists has in mind is a very specific version of

Mayr's backward-looking ultimate causation. In accordance with Mayr, they assert that the evolutionary history of human cooperation or morality address the 'Why?' (ultimate cause) of economic and social organization, whilst the workings of specific socio-economic systems inform us about the 'How? (proximate cause). But then they part company with Mayr and the other neo-Darwinians scholars (e.g. Dobzhansky, Hull, Sober) whom conception of species imply that there is not such a thing as a human nature.

The major question is however, if the progress made in foraging economics can help us to understand the capitalist society we live in, or (for the historians) the civilized societies of the past. This could be the case only if human mind had the limited plasticity of other animals. Or, even the eusocial animals have never witnessed a so tremendous evolution in social organization going from tribal to modern societies[8]. It is quite probable that in the same way that Chomsky found out a universal grammar common to all human languages, social scientists will explore one day a universal moral grammar. Nevertheless, in like manner Chomsky's universal grammar is of little help in understanding the grammatical and syntactical differences between Ancient Greek and Modern English, the hardwired elements of human nature are of little help in understanding the economic and political differences between ancient Athens and modern America. If we adopt Mayr's terminology, this means that the so-called proximate causes are far more important than the 'ultimate' ones. Incidentally, the 'ultimate' lesson we learn from some versions of the bourgeoning literature on foraging economics is that humans are both self-interested and moral beings, and/or that all social systems combine in different degrees competition with cooperation. These lessons have a great value against the unidimensional notions of homo economicus and economic efficiency promoted by mainstream economics. But from an analytical point of view, they seem too general to be relevant.

4.3 Is something missing? The case for 'Evolutionary Political Economy'

In their effort to apply Darwinian population thinking in the economic realm the two aforementioned strands of evolutionary economics put aside the structural analysis of

[8] Veblen (1914) was the first big author who reconstructed the human history by departing from a bundle of instincts. In order to fulfil his project he postulated that under exogenous conditions an instinct can be transformed to its contrary. Such a tautological strategy can ex post accommodate all possible change, but it is poorly informative. Witt and Schwessinger (2013) provide a more consistent and convincing account on the same subject-matter. Still, as they correctly remark, what remained in capitalism from the initial cooperative endowment is just 'footprints'.

capitalism, its eras (e.g. finance-led capitalism) and its geographical varieties. The neo-Schumpeterian branch avoids the structural analysis by focusing on the micro-meso level and the short-run evolution. The resulting vacuum regarding the long run evolution (Witt, 2008) has been recently completed by the ascending current of foraging economics, which makes the analysis of modern capitalism a byproduct of investigations about the the hominisation process that took place long times ago.

This tendency to exorcise structural analysis is exemplified at the philosophical level by the silence of evolutionary economists regarding the species problem in biology[9]. Such a gap seems very strange for heterodox economists that militate in favour of a history-friendly approach in the discipline. The reason is that, given their concentrations, both strands of evolutionary economics don't need to address the fundamental questions about history and theory underlying the species debate. But the exorcising of structural analysis has above all important practical consequences. The 2008 crisis of modern finance-led capitalism provides an excellent test for assessing the relevance of modern evolutionary economics. Not surprisingly, evolutionary scholars have had a lot to say about the mainstream assumptions adopted by policy-makers, but too little about the crisis itself and the structures that were 'responsible' for it. Shedding light on the causes of the crisis presupposes to discern the stylized facts of finance-led capitalism (typological thinking) and to explore the deep-seated structures - and their contradictions - that underlie the persistence of those stylized facts (essentialism). But all this is beyond the scope of population thinking.

On the contrary, this is the predilection domain of evolutionary political economy. The latter is evolutionary in a totally different way than the approaches in terms of population thinking. Its objects of study are what Hull and Ghiselin wrongly called individuals, and R.N. Boyd designated as historically-bound kinds. Unavoidably, its epistemological background is not the obsolete 'logical empiricism' adopted by Hull and his followers but the new essentialism which vindicates the methodological stance of the heterodox economists working with representative entities.

At the same time, the focus on the structural analysis does not mean that evolutionary political economy is dismissive of history and origins questions. It simply addresses these questions through a radically different methodology. As I explained elsewhere (Liagouras, 2015),

[9] Pagano (2011) provides an outstanding exception to the above trend.

Darwinian analogies could explain the survival of certain institutions, or technologies opposed to others in a fictitious stateless world. But, they cannot apprehend the creation of complementarities and synergies between different institutions and technologies to form a system (Freeman, 1991; Crouch et al., 2005), that is, an internally related whole. The issue here is not the selection of one institution (or a technology) against its quasi-similar competitors, but the creation of a division of labour between interrelated institutions/technologies. That's why, social systems change mainly from within (Schumpeter), through the interplay of their internal relationships and contradictions.

Finally, evolutionary political economy is political in the sense that it does not limit itself to restating in a sophisticated manner - through the biological jargon of natural selection and struggle of existence – the managers' vision of the economic world. It seeks instead to go beyond the 'surface' of capitalist phenomena and to critically analyze their underlying social structures and power relationships[10].

5 Concluding remarks

In guise of conclusion let me make two sketchy comments. First, it becomes more and more clear that the promoters of biological imperialism in social sciences try to create a complex of inferiority to their colleagues. According to their intimidating strategy, evolutionary theory in biology stands far beyond social sciences, and the latter should precipitate to cover their lag if they want to make progress. The discussion of the insurmountable contradictions created by the population thinking within biology showed that this position is not warranted. On the contrary, in many issues concerning history and theory, biology would have many things to learn from social sciences. As the developmental biologists Depew and Weber (1995, p. 495) argued long before: 'Perhaps it is not too much to say that what we need is an evolutionary theory worthy of the best social theory, not a social theory trimmed to fit a rapidly receding, overly simplistic evolutionary theory'.

Second, it must be also clear that there is no problem with applying population thinking in economics. On the contrary, population thinking led to a scientific revolution at the micro-meso level, and very probably it will do the same in economic anthropology. The problem is rather

[10] For elaborated accounts on the relationship between political economy and evolutionary economics see MacKinnon et al. (2009) and Martin and Sunley (2015).

the imperialistic claims pretending to apply population thinking to the totality of economic or social phenomena. Are these claims taken seriously, a large part of economic, social and psychological thought of the two or three last centuries would be either wrong or redundant. Are we in face of a so radical breakthrough in modern thought? Waiting for a definitive answer, it is not without importance to note that Darwinian imperialism in social sciences takes place at the same time that neo-Darwinian Synthesis loses momentum within evolutionary biology.

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