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Adam Smith's Newtonianism

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ADAM SMITH'S NEWTONIANISM

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Abstract. Smith was certainly influenced by Newton's analytic-synthetic method, and by his notion of "principle". Nonetheless, in many fields of Smith's inquiry he introduced elements which led him far from the Newtonian perspective. The present essay analyzes how historical dimensions, contingencies, institutions and conflicting human inclinations intervene in Smith's discourse explaining economic systems. From this perspective, the intellectual Newtonian horizon seems to be profoundly modified. Finally, the paper focuses on how, in Smith's view, institutions determine "unintended outcomes", sometimes opposed to those of the market, when the reasons for their emergence have ceased but nevertheless persist over time. In this sense, the "invisible hand" is not only the result of the behaviour of myopic individuals trying to improve their condition, but also the outcome of the work of institutions which operate as structures autonomous with respect to individuals.

Keywords: Newtonianism, principles, analytic-synthetic method, history, institutions.

JEL Classification: B12, B25, B40, B41

Introduction

Smith was a Newtonian, and so were a number of Scottish scientists and philosophers of his age, for whom Newton's method constituted a paradigm especially as regards its application to human sciences. But what is meant by being a Newtonian. The literature has provided different answers, and this paper tries to make a further contribution, its purpose being to show that Smith drew on some of Newton's ideas.

The application of the great physicist's methodological concepts in the social and economic sciences gave shape to an original perspective compatible with certain concepts (such as, for example, those of self-organization, emergent properties, path dependency, unpredictability) usually considered distant from classical dynamics. Therefore the first aim of this paper is to show how Newton's method (and specifically the notion of "principle"), when incorporated in social and historical domains, assumed new functions.

In general terms, Newton represented nature as invariant, simplex, deterministic, with laws that are constant, and where time was reversible (Prigogine and Stengers, 1979).

By contrast, Smith puts forward a different view, although he adopted Newton's concept of "principle" to explain the variety of human (and social) phenomena by means of a unitary cause.

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Nature, when observed in the human realm, is multifaceted, ambivalent, and characterized by conflicting inclinations, which nonetheless in the long run are channelled within the general tendency to improve the human condition, conceived as the capacity to increase private and public wealth. Moreover, Smith says, the “natural course” of history has not followed this tendency linearly, and consequently it cannot be represented as a well-ordered process governed by laws comparable in their (deterministic) effects to Newton’s gravitation. In particular, the history of European society, from the decline of the Roman Empire to the late eighteenth century, was not marked by a “natural course of things”, but by an “unnatural and retrograde” one. The former, however “natural”, did not prevail, because contingencies and institutions impeded or slowed social and economic development, although, after centuries, re-equilibrating forces allowed the emergence of the market society. Moreover, institutions, even when harmful, exhibit both a distinctive autonomy with respect to individuals and an inertial dimension. They persist over time, and even when the reasons that may account for their origins cease to exist, they still strongly influence human and social relations. This kind of path dependency – which, for example, characterized certain feudal institutions – constitutes a version of the “heterogenesis of ends”, because individuals cannot foresee the future outcomes of their current actions, although a social and economic order will emerge in an indefinite future. More precisely, some institutions (which hampered the fulfilment of “perfect liberty”), as impersonal forces, have acted against other impersonal forces (those of the market, in the long run), although the latter are considered predominant. This implies that the “invisible hand” is characterized by different (sometimes contrasting) forces, whose interrelations yield an unintentional order, although in Smith’s view – I repeat – man’s endeavour to improve his condition is predominant, and promotes the emergence of the market order.

Given this premise, human nature and social domains are more complex than physical nature, where a simple principle (gravitation) in all times and places yields an unaltered order of the universe whose movements are essentially predictable and deterministic. By contrast, economic and social realms exhibit unpredictable configurations which change over time, and only a very general tendency can be detected. As a consequence, it seems important to deal with the question of how a non-Newtonian perspective arises from Smith’s Newtonianism or, more precisely, how some of Newton’s concepts, incorporated into Smith’s theoretical apparatus, determine non-Newtonian outcomes.

In short, the human universe (so irregular, history-dependent and unpredictable) seems radically to diverge from Newton’s physical universe (a-temporal, deterministic and foreseeable), although the latter vision profoundly influenced the former.

The arguments just outlined will be dealt with as follows.

After a brief discussion of Smith's Newtonianism (sect. 1), his *Considerations Concerning the First Formation of Languages* (1761, henceforth *Languages*) is examined as a distinctive view of the analytic-synthetic approach. The analytic and synthetic phases for Smith reflect both a human cognitive procedure, as a general strategy which confers a new configuration on the world, and a scientific method, owing to the role ascribed to "principles". General induction, conceived as "conjectural", leads to general terms by means of which concrete objects can be comprehended in their individuality. A concrete term, considered at the beginning of the cognitive process, is not the same as the one found at the end, when it finally acquires an appropriate definition. In this sense, reality is re-described (sects. 2 and 2.1). The same perspective is adopted in the *History of Astronomy* (henceforth HA), where the search for new "principles" able to connect "discordant phenomena" is a continuous effort whereby the world assumes a new structure for the observer. This gives rise to the circular relations between common sense and science where this circularity emphasises the role of empirical dimension in representing the world, and the co-adaptation of common sense and science (sect. 2.2). More in general, this perspective shows how – in Smith's political economy – history, contingencies, and empirical circumstances contribute to shaping the structures and changes of economic systems, even though their movements should be directed in general by some basic "principles". A fundamental fact is that Smith considers the "principles" within a *temporal framework*. On the one hand, this implies that analysis leads to "general conclusions" from which to deduce phenomena; on the other hand, it is part of an endless process whereby *new* "connecting principles" emerge and re-organise observational material in order to give it a *new* coherence. All this renders the *succession* of analysis and synthesis rather problematic because synthesis is provisional, and analysis is re-examined and re-arranged according to new paradigms (sect. 3).

Moreover, the reference to "principles" raises some questions in the economic domain. Part of the literature correctly considers the first two books of *Wealth of Nations* (henceforth WN) as being where "principles" explain and unify the variety of economic phenomena. In particular, the WN starts with the concept of the division of labour, in light of which a number of events, from the increase in wealth to the coordinated social division of activities, are explained. Yet this principle is neither "original" (it derives from other basic inclinations) nor universal (it does not always appear in human history), and its explanatory capacity exhibits some problems. In fact, the extent of competition and of markets depends on the – social – division of labour, but the extent of the division of labour depends on an empirical fact: the extent of the market. In addition, the division of labour (as a concrete event) engenders unpredictable configurations of the market (sect. 4). The distinction between real and nominal prices, and between natural and market prices, replicates a

situation in which the principles require consideration of their empirical counterparts (sect. 5). Finally, sects. 6 and 7 show how history, contingencies, and institutions contribute strongly to establishing a certain order of the market society in a way which cannot be directly deduced from principles (of human nature). These latter matter, but interpretation must also consider conflicting human inclinations, institutions, and historical accidents in order to understand the structure of the world. As a consequence, science is described as an “imaginary machine”, rather than – as Newton points out – being a body of sound knowledge able to describe how the world is, within the limits allowed to human beings by God.

1. Smith’s and Newton’s methods: essential points

Newtonianism largely influenced intellectual debates in the Scottish Enlightenment. On the one hand, it entailed criticism of both Aristotelianism (and “occult qualities” of scholastic tradition) and Descartes’ rationalism; on the other, its Humean version was very influential, and Condillac’s and D’Alembert’s interpretations, although elaborated by French philosophers, were part of a general context characterized by the effort to legitimate the use of Newton’s results (cf. Megill, 1975).¹ Moreover, the diffusion of Newtonianism in Scotland was linked with – among others – Scottish scholars such as James Gregory, a correspondent with Newton, his nephew David Gregory, and George Turnbull. Finally, Colin Maclaurin (a Scottish mathematician) was very influential with his *An Account of Sir Isaac Newton’s Philosophy* (1728), and John Keill, Henry Pemberton, and Jacob ‘s Gravesande contributed to introducing Newton in Britain and in Europe.

Smith’s Newtonianism took shape in this rich context, although it cannot be separated from other fundamental debates: for example, the critique of contractual theories, especially the Hobbesian one, and the wide acceptance in the Scottish cultural environment of Montesquieu’s teachings.

Smith maintained that “Philosophy is the science of the connecting principles of nature” (HA, II.12). Philosophy in Smith’s age was synonymous with scientific inquiry, and the reference to a search for basic and simple principles able to explain a number of (apparently different) phenomena was for Smith, as for his friend David Hume, an application of the Newtonian method to human sciences. As is well known, the *Rules of Reasoning in Philosophy* included in Newton’s *Principia* (1687) and the “Query 31”, which concludes the *Opticks* (1704), are very important sources for understanding Newton’s method.

¹ For a careful analysis of Newton’s influence in the Scottish Enlightenment see Cremaschi (1984, 1989).

In particular, as regards the analytic-synthetic method, as specified in the “Query 31”, Newton maintains:

“As in Mathematicks, so in Natural Philosophy, the Investigation of difficult Things by the Method of Analysis, ought ever to precede the Method of Composition. This Analysis consists in making *Experiments and Observations*, and in drawing *general Conclusions* from them by Induction, and admitting of no Objections against the Conclusions, but such as are taken from Experiments, or other *certain Truths*. For Hypotheses are not to be regarded in experimental Philosophy. And although the arguing from Experiments and Observations by Induction be no Demonstration of general Conclusions; yet it is the best way of arguing which the Nature of Things admits of, and may be looked upon as so much the stronger, by how much the Induction is more general. And if no Exception occur from Phænomena, the Conclusion may be pronounced generally. But if at any time afterwards any Exception shall occur from Experiments, it may then begin to be pronounced with such Exceptions as occur. By this way of Analysis we may proceed from Compounds to Ingredients, and from Motions to the Forces producing them; and in general, from Effects to their Causes, and from particular Causes to more general ones, till the Argument end in the most general. This is the Method of Analysis: And the Synthesis consists in assuming the *causes discover’d, and establish’d as Principles*, and by them explaining the Phænomena proceeding from them, and proving the Explanations.” (Newton, [1704] 1952, pp. 404-405; emphasis added).

The role of “principles” was widely accepted in the Scottish Enlightenment, and the analytic-synthetic method seems to be echoed in Hume’s words when he reminds us that human scientists proceed:

“from particular instances to general principles, they still push on their enquires to principles more general, and rest no satisfied till they arrive at those original principles, by which, in every science, all human curiosity must be bounded” (Hume, [1748] 1999, p. 88).

Although in the “science of human nature”, in Hume’s sense, it is rather difficult to find “experiments”, by contrast “observations” in the social realm were largely considered by the Scottish thinkers of the eighteenth century, and especially by Adam Smith, who discussed a number of empirical cases in each chapter of the WN. Yet observations are not “experiments” and, contrary to Newton, there was no room for mathematics in Smith’s approach.² This raises the question as to how – given the different subjects – the empirical approach had been translated from Newton’s physics to human and economic science, during which process it had undergone some unavoidable changes, although Newton himself affirmed that on pursuing his method “the Bounds of Moral Philosophy [would have been] enlarged” (Newton, [1704] 1952, p. 405). Moreover, Hume, in his

² On the role of mathematics in Newton’s *Principia*, related to the complex characteristics of his “style”, whereas Newton proceeds from simple to complex cases in an idealized form, see Cohen (1980). See also G.E. Smith (2002), and Guicciardini (2002).

Treatise of Human Nature (1739-1740), criticized the inductive approach (from which Newton's method began), although in the above passage it seems to have been accepted as a movement from "particular" cases to "principles more general", until definition of "original principles" not further reducible to other ones.³

Smith certainly assumed the notion of principle, and he also had a distinctive vision of the analytic-synthetic approach – as many scholars maintain in different ways – although it is neither mentioned as such, nor theoretically defined. Bittermann (1940), probably influenced by his contemporary notion of empiricism, declares that Smith adopted an empirical methodology inspired by Newton and Hume, yet he did not carefully distinguish between inductive and deductive reasoning. Moscovici (1956, p. 8) pointed out the originality of Smith's perspective with respect to those of his Newtonian contemporaries, Pemberton, David Gregory and Maclaurin, since Smith did not believe (in contrast with the latter) that many philosophers of the past had prepared, as precursors, the Newtonian revolution. Thomson (1965, p. 226), states that in both *The Theory of Moral Sentiments* (henceforth TMS), and the WN, Smith "appears to have taken his main hypothesis, or his *analogy*, from the Newtonian principle of attraction". Campbell (1971, p. 54), considering the TMS from an essentially Popperian perspective,⁴ points out the importance of the Newtonian method of induction and of deduction. Skinner (1972, p. 315) stresses Smith's debt to Newton, and also emphasises that "the route to scientific knowledge in the eighteenth century" required the method of "experimental philosophy" based on analysis (for establishing basic principles by means of induction) and synthesis (for the clarification of phenomena by means of deduction). Similar statements are put forward in Raphael and Skinner (1980, p. 12) and Montes (2003, p. 725). Hetherington (1983, p. 504) finds "important similarities of structure" between Newton's *Principia* and the WN, and Cremaschi (1984) gives a detailed account of how Newton's work is a model for the WN. A partial exception is Freudenthal (1981), who maintains that Newton referred to the analytic-synthetic method, while Smith treated only the synthetic one, omitting "analysis" and interpreting Newton's method as "evident-synthetic". However, this perspective does not pay much attention to the role of "observations" in Smith's work. Finally, for other scholars it is more appropriate to consider Newton's influence as consisting merely in inspiration and orientation (Redman, 1993, p. 225; cf. Berry, 2006, p. 126), or even as a "rhetorical device" (Redman, 1993, p. 225). In my view, the influence of Newton's method on Smith's approach is undisputable, even in certain details (for example, the reference to the *Rules of Reasoning*).

³ In this regard, compare Newton's *Rules of Reasoning*.

⁴ The literature has found some similarities between Smith's method and the approaches of Kuhn, Popper, Lakatos, and Quine. Evidently, there is a risk of providing an anachronistic reading. Yet, on evaluating the textual evidence and the Scottish cultural context, it is possible to consider the relation between Smith's and Kuhn's perspectives (see sect. 3).

However, my focus is on how this theoretical structure partially changes when it is applied to economic, social, and other realms, engendering in some cases a perspective far from Newton's.

Given this premise, in the next section I try to show that Smith referred to the inductive approach in *Languages* more clearly than in other works (for which reason I start with this essay), while synthesis or deduction, in turn, is considered a fundamental step in re-describing the reality and conferring a new identity on singular events or objects.

2. *Languages*: a possible view of the analytic-synthetic approach

The analytic-synthetic approach is a method which should be applied by scientists. In *Languages*, this procedure is considered, at least partially, as if it were unintentionally followed over time by mankind in the real world. In fact, Smith states, the formation of languages was characterized by an inductive process which led to the definition of a few principles which simplified the functioning of language, and this simplification resembled the one realized by gravitation in the physical universe (as a force which governs a number of phenomena).⁵ Firstly this implies that Smith considered this process in concrete terms as a cognitive (real) procedure which defined the world by means of language, rather than as a (part of) scientific method. Secondly, the mechanism which produces simplification in languages (by means of a few principles) is the result of a historical process, while gravitation, as a principle showing the simplicity of nature, is an a-temporal force.

In particular, in Smith's reconstruction, in the beginning, "particular names" were "probably" assigned to "particular objects", and because some of them exhibited a close resemblance, "those words, which were originally the proper names of individuals, would each of them insensibly become the common name of a multitude" (*Languages*, 1, p. 204). In general, the process characterizing the generation of languages is conceived in terms of a continuous passage from the particular to the general, that is, as an increasing ability to produce abstractions in order to represent reality. Adjectives and prepositions appeared later (and in succession) with respect to nouns, in that they respectively represent qualities and relations among things, without reference to concrete objects, and this involves a certain capacity to produce "abstraction and generalization" (*Languages*, 12, pp. 209-210). The same reasoning is applied to other parts of speech like number,

⁵ In his first *rule of reasoning* Newton maintains that "Nature is pleased with simplicity, and [as gravitation shows] affects not the pomp of superfluous causes" (Newton, [1687] 1934, p. 398).

impersonal and personal verbs⁶, and personal pronouns. Finally, in modern languages – with respect to Latin and Greek – a “simplification” came about when “instead of a great variety of declensions, one universal declension, which is the same in every word, of whatever gender, number or termination” appeared (*Languages*, 33, p. 221).

This process is also interpreted in terms of an increasing capacity of languages to simplify their grammar structures, thus improving their performances, and becoming progressively better able to deal with external complexity. This perspective is represented by a famous passage in which changes in languages are compared to changes in machines, and where the reference to Newton’s concept of “principle” – considered in a new, dynamic, context – is clear.

“All machines are generally, when first invented, extremely complex in their principles, and there is often a particular principle of motion for every particular movement which it is intended they should perform. Succeeding improvers observe, that one principle may be so applied as to produce several of those movements; and thus the machine becomes gradually more and more simple, and produces its effects with fewer wheels, and fewer principles of motion” (*Languages*, 41, p. 223).

In short, cognitive (inductive) processes permit delineation of “fewer principles of motion” by means of which languages work in a simpler way. These principles *explain* the simplification of language, and the change of its structure. They can therefore be considered in their theoretical dimension, which is the same as adopted in HA to explain the “formation” of (physical and astronomical) theories (see sect. 2.2). As a consequence, a close relation emerges between real cognitive processes and the scientific method in assuming an analytic-synthetic procedure, where the definition of principles allows explanation of a given phenomenon: the change of languages over time.

Nonetheless, it is evident that the formation of languages is conceived in terms of “conjectural history”, i.e. a theoretical and “a priori” history elaborated on the basis of “principles” of human nature to which we resort when there is no “direct evidence” of real facts (Stewart, ([1793] 1980), 46, p. 293). Although “conjectures” should take shape from principles derived from observed facts (Skinner, 1972, p. 308; cf. Evensky, 2007), *Languages* refers to *neither experiments nor observations* as required by Newton’s method. However, for the time being, we shall focus on how Smith points out a distinctive circularity between concreteness and abstractness, and between common sense and science, showing some possible consequences.

⁶ Verbs were coeval with the first attempt to form language, but the impersonal verbs were generated later, since they were more abstract and “more general in [their] signification” (*Languages*, 27-29, pp. 215-217).

2.1 From analysis (induction) to synthesis as a process of individualization

Smith's conjectural reconstruction shows that general induction governs the formation of languages. The literature generally recognizes that, in Smith's essay, language takes shape by moving from concrete to abstract, from simple to complex (cf. Becker, 1961, p. 15), where the more it is abstract, the more it is able to deal with complexity. Yet a close examination shows that this is only the first part of the process. The passage from a proper to a common noun is an inductive generalization whereby particular objects like "cave, tree, fountain" became common nouns indicating a whole class of objects because of their close similarity. The second part of the process, generally neglected, is the one when common nouns were created to denominate classes of similar objects, "it was impossible that the greater part of that almost infinite number of individuals, comprehended under each particular assortment or species, could have any peculiar or proper names of their own, distinct from the general name of the species" (*Languages*, 2, p. 205). It was necessary to distinguish each particular entity collected under the same collective noun by referring to its qualities and its spatial relations with other objects.

In short, objects can be identified *only when a process of abstraction and of (inductive) generalization has been performed*. For this purpose, it is necessary to move from abstract to concrete, since this process makes it possible to connote an element in its individuality. So to speak, the object viewed by an observer at the end of this process *is not the same* as the one seen at the beginning. The concrete, original, object, whose name was used to define (by analogy) a general class, is not the same object that we recognize when a common noun is available. The specific object can be defined and identified as singular only if we have a general (abstract) class which subsequently permits us to identify it as an individual element with its own properties, qualities, and relations with other ones. The difference is between a concrete, unrelated, term and a concrete object definable in its individuality, precisely because we start from an abstract term. Therefore *the complete process is from (unrelated) concrete to abstract entities, and subsequently from abstract to concrete objects* (related to others reconstructed, re-defined, and recognizable in their identity). In turn, this entails re-describing reality and assigning identities to its objects.

Similarly, "The word *I* [...] is a general word, capable of being predicated [...] of an infinite variety of objects". This pronoun is only apparently the more concrete; by contrast, it is "abstract and metaphysical", and this fact constitutes the condition for identifying a particular person, attributing him with many qualifications (*Languages*, 32, p. 219).

The idea that abstract notions are fundamental steps in explaining and unifying a variety of phenomena, however derived from concrete objects or events, first appeared in HA, which adopts a perspective similar to that outlined in *Languages* as regards the relation between abstract and concrete terms. Our attention must therefore focus on HA.

2.2 The circular relation between common sense and science (and between concreteness and abstractness)

The aim of science is to overcome “wonder”. One kind of wonder arises when our imagination is unable to include an object within the usual classificatory systems. Another kind arises

“from an unusual succession of things. The stop which is thereby given to the career of the imagination, the difficulty which it finds in passing along such disjointed objects, and the feeling of something like a gap or interval betwixt them, constitute the whole essence of this emotion. Upon the clear discovery of a connecting chain of intermediate events, it vanishes altogether. What obstructed the movement of the imagination is then removed.” (HA, II.9).

As a consequence, the role of science is to discover this “connecting chain of intermediate events”, and “Philosophy is the science of connecting principles of nature” (HA, II.12). Like Newton, Smith conceived science as founded on principles able to explain the variety of (natural) phenomena, but he introduced certain elements which conferred originality on his view. This can be clarified by examining some connections between *Languages* and HA.

1) The discomfort of the imagination on observing an unexpected “gap” among objects/events whose succession is “unusual” is shared by common people and scientists. These classes of persons do not necessarily have the same perceptions. In fact, scientists “often look for a chain of invisible objects to join together two events that occur *in an order familiar to all the world*” (HA, II.11, emphasis added). The new “connecting principle” able to “join together two events” makes it possible to re-describe reality and to define new reference criteria, whereas this connection was not perceived by common sense, and only later was it observed by scientists. Therefore, *as in language, the more abstract dimension (provided by science) allows the redefinition of real objects (and of their succession)*, attributing them a new mental configuration.

2) The relation between common sense and the scientific perspective is circular, and “familiarity” is a basic condition for the evaluation of theoretical systems. On the one hand, “no system, how well soever in other respects supported, has ever been able to gain any general credit

on the world, whose connecting principles were no such as were familiar to all mankind” (HA, II.12). Chemistry, for example, advanced slowly because its principles lacked familiarity for the most part of mankind (HA, II.12). From this perspective, science depends on the general acceptance of common sense, and on the notion of familiarity.

On the other hand, scientists intervene to fill gaps in the imagination, even where common sense does not perceive any need to search for a “bridge” which connects a certain sequence of events. Consequently, it may happen that science introduces a new “familiarity” which will be subsequently apprehended by common sense. In short, the latter will change its perception of the world, accepting the new vision proposed by science, where the most important case is the Newtonian law of gravity (HA, IV.76) (cf. Campbell, 1971, p. 36).⁷

This point of view implies a circular relation between concrete and abstract terms. The concreteness of the empirical world assumes a new and different dimension when philosophers introduce *new* “connecting principles” accepted by the generality of people so that a new “familiarity” emerges as regards the facts of the world: the earth revolves around the sun, and not vice-versa. As for languages, the original perception of concreteness has been modified by an abstract notion (a new “connecting principle”) which re-describes concrete events.

3. Principles, and dynamic machines

In Smith’s perspective, the fundamental role of (connecting) principles is considered in a dynamic context. The aim is not just, as for Newton, to provide increasingly rigorous observations (and experiments, for the great physicist) in order to corroborate “general conclusions”;⁸ it is also to explain how observed anomalies can lead to a change of paradigm. In particular, in a well-known passage similar to that in *Languages*, Smith maintains:

“Systems in many respects resemble machines. A machine is a little system, created to perform, as well as to connect together, in reality, those different movements and effects which the artist has occasion for. A system is an imaginary machine invented to connect together in the fancy those different movements and effects which are already in reality performed. The machines that are first invented to perform any particular movement are always the most complex, and succeeding artists generally discover that, with fewer wheels, with fewer principles of motion, than had originally been employed, the same effects may be more easily produced. The first systems, in the same manner, are

⁷ For a treatment of Smith’s concepts of the re-description of reality and of circularity between common sense and theories see also Cremaschi (1984).

⁸ In this regard see Newton’s fourth *rule of reasoning*, and “Query 31”. For a general view, see Koyré (1965, chap. 7).

always the most complex, and a particular connecting chain, or principle, is generally thought necessary to unite every two seemingly disjointed appearances: but it often happens, that one great connecting principle is afterwards found to be sufficient to bind together all the discordant phaenomena that occur in a whole species of things” (HA, IV. 19)

It has been remarked that this scheme is similar to Kuhn’s (Skinner 1972, p. 312; Lindgren, 1973, p. 18; Raphael and Skinner, 1980, p. 15; Cremaschi, 1984, p. 59; Schliesser, 2005, p. 704) because Smith describes how a paradigm changes. Yet for our purposes here it is sufficient to point out that, from this perspective, the relation between analysis and synthesis is more complex than the version (generally attributed to Newton) in which they are two successive phases of the same process. More precisely, induction leads to “general conclusions” which are provisional in that more accurate observations subsequently evidence a number of anomalies. Initially, the reaction to incoherent events induces a proliferation of “wheels”, creating a cumbersome theoretical mechanism. Only later does there emerge a *new* principle which permits a simpler and more efficient operation of the machine. The consequence is that a *new mental chain*, which connects “discordant phenomena”, does not derive from the original analysis-synthesis process, which has produced an inefficient machine-theory. By contrast, the new synthesis (realized by a new connecting principle) re-organizes the material of the previous analytic and observational activity. Consequently, it is not the logical extension of the previous process, but a new one, which makes it possible to deduce new properties of the observed world. Science is thus characterized by a sequence of analytic and synthetic processes which can exhibit strong divergences as regards their results.

All this leads to interpretation of Newton’s method, in light of the fourth *rule of reasoning*, as a process of “successive approximations” by means of which laws (including the law of gravity) are continuously refined (cfr. G.E. Smith, 2002). According to Montes (2008), with reference to Schliesser (2005), Smith’s Newtonianism adopts this “open-ended” method. Yet this process seems conceived more to provide successive improvements of the theory (as in Newton’s case) than to adopt radically divergent paradigms. By contrast, the emergence of different “principles” is what characterizes HA. Schliesser (2005, p. 706), assuming Kuhn’s perspective (in general, and with respect to Smith’s “Ancient Logics”), stresses this point by referring to the notion of “incommensurability”, which hampers finding “a common measure between two competing theories”.

Finally, it is precisely the Newtonian logic, translated to a temporal dimension, which introduces a certain innovative perspective. This latter, when applied to theories, shows a capacity to unify and explain an increasing variety of phenomena by means of progressively simpler connecting

principles.⁹ The complexity of the explanatory “machine” corresponds to the complexity of the world, whereas the “machine” reflecting epistemological complexity is opposed to the “machine” reflecting intricateness (and a poor explanatory capacity).

In this way, by means of the metaphor of a machine which changes and improves over time,¹⁰ two domains, theories and languages, are linked together. A third one is political economy, although the search for “principles” traversed Smith’s entire work, from the TMS (VII.ii.2) to *Lectures on Jurisprudence* (henceforth, LJ (A) and LJ(B)),¹¹

Some additional remarks, however, should be made in order to clarify Smith’s vision in connection with Newton’s influence. In particular:

1) theories are “imaginary machines”.¹² The relation between them and external reality is not based on the discovery of final truth but on a distinctive dynamic between our perception of reality and the world *out there*. Newton’s certainty concerning the capacity of his theory to describe outer reality in linear manner (as far as is possible to man)¹³ is not to be found in this perspective;

2) In the HA, Smith reconstructs his “history” on the basis of Newton’s notion of “principle”, and he shows that, from antiquity to his age, what great philosophers had in common was the search for principles, which was conducted with different degrees of success. Conversely, Newton cannot be seen as the inventor of the approach based on “principles” in that – with many imperfections – it had been used by a number of his predecessors. Rather, his theory is the best example of the application of this method.

3) Although largely influenced by Newton, Smith wrote both a history of languages and a history of astronomy (to which the histories of “ancient physics” and of “ancient logics and metaphysics” should be added), and history played a special role in his political economy as well. But history is

⁹ Newtonian method “gives us a pleasure to see the phaenomena which we reckoned the most unaccountable all *deduced* from some principle (commonly a wellknown one) and all united in one chain” (LRBL, ii.134, p. 146; emphasis added).

¹⁰ This makes the difference with respect to images of a machine conceived in the static sense. The most famous was probably that of a clock used to represent the universe as an idealization of a perfect, divine, mechanism. For a detailed historical analysis see Mayr (1986).

¹¹ According to Campbell (1971, p. 31), in the TMS, Smith applies the Newtonian method based on the “principle” of sympathy. Also to be noted is that the first statement of LJ(B) is: “Jurisprudence is that science which inquires into the general principles which ought to be the foundation of the laws of all nations.” (I, p. 397). Finally, HA and *History of Ancient Physics* are included in *The Principles which Lead and Direct Philosophical Enquires*.

¹² Smith declares that theories are “imaginary machines”, that is, *mental constructs* able to connect phenomena and which according to Lindgren (1973) are influenced by habit and custom. This perspective has been labelled the “anti-realistic” approach in the literature (cf. Berry 2006, p. 122), and it reminds us that, according to Smith, philosophy (i.e., science) “may be regarded as one of those arts which address themselves to the imagination”. He therefore examines the history of “systems of nature” “without regarding their absurdity or probability, their agreement or inconsistency with truth and reality”, and considering only how they were “fitted to sooth the imagination” in order to render the “theatre of nature” coherent (HA, II.12).

¹³ Only God knows everything, so that in “General Scholium” Newton points out: “Hitherto we have explained the phenomena of the heavens and of our sea by the power of gravity, but have not yet assigned the cause of this power [...] I have not been able to discover the cause of those properties of gravity from phenomena, and I frame no hypotheses” (Newton, [1687] 1934, pp. 546-547). See also “Query 31”.

precisely what was lacking from Newton's view. Of course, history was not Newton's concern; and precisely this fact directs attention to the use of Newton's view within a historical dimension, observing the consequences of this theoretical operation.¹⁴

Moreover, it should be pointed out that Smith followed Newton in considering principles to be instruments which introduce simplicity into explanation. But he also delineated the process which progressively produces simpler principles over time. As a consequence, principles are history-dependent, and their simplicity emerges at two levels: the one concerns their simplification in the course of time, the other concerns the capacity of principles as such to simplify explanation.

Therefore, in the next section, I shall try to clarify how political economy is a science in which both Newtonian and non-Newtonian arguments are used, and how this gives rise to a distinctive vision of the social world.

4. Principles and human nature in the realm of political economy: the division of labour

Smith described principles as tools able to explain a variety of empirical phenomena in his political economy as well, and especially (but not uniquely) in the two first books of the WN. His reference to these theoretical devices is often joined to both observations, by means of which he shows how principles work, and their historical dimension. This perspective introduces some novelties in regard to Newton's method, because observations are not experiments, mathematics is not used, and the historical dimension does not characterize Newton's approach, given that nature and its laws are a-temporal, and the future is generally predictable.

Analysis of the division of labour enables examination of this perspective.

1) The division of labour, to which the first chapter of the WN is devoted, is the cause of increased labour productivity. Indeed, the division of labour is not an original human inclination, in that it derives from a deeper "principle" (LJ(B), p. 492): "a certain propensity in human nature [...] to truck, barter, and exchange", which in turn is probably "the necessary consequence of the faculties of reason and speech" (WN, I.ii.1; cf. LJ(A), p. 352). In short, we must refer to the division of labour as a *derived* principle, rather than as the original one, in order to understand certain *fundamental characteristics* of an economic system. This modifies the Newtonian assumption that one must as far possible start from *no further reducible principia* when explaining phenomena. More precisely, the propensity to "truck, barter, and exchange" (or, more profoundly, the faculties of reason and speech) is comparable to the law of gravity. Both in Newton and in

¹⁴ It is not possible to treat in this article, given the space available, how certain intellectual traditions and the related debates allowed Smith to refer to Newton's approach in these terms.

Smith, these latter are not the ultimate principles of reality (see note 13, and Cremaschi, 1989, p. 84); nonetheless, the law of gravity is the main “cause” (or “general conclusion”) from which we deduce a number of phenomena within the limits of our knowledge, and a similar role should be ascribed to the propensity to truck and barter. By contrast, not this latter propensity but the division of labour is assumed as the basic category for economic discourse.

This procedure can be generally viewed as a normal adaptation of Newtonian concepts into forms useful for economics (see Cohen, 1993, p. 99; Redman, 1993, p. 221) which if observed more in detail can reveal important details of Smith’s method.

2) Although the division of labour arises from basic elements of human nature, it does not connote the entire history of mankind, and its appearance takes different historical forms. In fact, the initial phases of the “rude state of society” involved no division of labour (WN, II, Intr. 1), and when it was introduced, it contributed to determining diverse configurations of societies. It was limitedly present in a “tribe of hunters or shepherds” (WN, I.ii.3), and increased progressively in agriculture and commerce (WN, V.i.1-15), although, Smith says, agriculture does not admit a large division of labour. In addition, as book III of the WN shows, in modern Western history from the fall of the Roman Empire to Smith’s age, specific institutions had modified the “natural” division of labour between town and country (WN, III.i.), while the history of the North American colonies was completely different because they constituted the best approximation to that natural (ideal) order (WN, III.iv.19; IV.vii.b).

Moreover, the accumulation of capital precedes the division of labour (WN, II. Intr.). Since accumulation is a historical event, neither the division of labour nor the original principle from which it derives (the propensity to exchange) occur as a simple manifestation of human nature in “all times and places”, but in consequence of specific (empirical-historical) conditions which permit (or do not permit) their emergence.

In short, the manifestation of the division of labour is history-dependent; it assumes a number of forms depending on contingencies; and in certain circumstances it cannot be realized.

3) The division of labour is not “the effect of any human wisdom, which foresees and intends that general opulence to which it gives occasion” (WN, I.ii.1). This is – in the WN – the first important statement relative to the view that behaviours, even when performed by wise and far-seeking human beings, produce unintended outcomes, i.e. they engender “invisible hand” effects. If this is so, the unintended consequences of the division of labour cannot be *deduced* from the original “inclination” to truck; instead, they depend on a number of circumstances which involve contingencies, history, and complex relations between human institutions and human natural inclinations (see below). In a Newtonian universe, by contrast, if the initial state of a system is

known, all its possible evolutions are determined¹⁵ (Prigogine and Stengers, 1979). Given these premises, economic science *is not stricto sensu a predictive science* (like Newton's physics). It assumes that some natural inclinations influence the course of human affairs, but the former do not determine the latter, step by step, because they are often contrasted by other forces. Human myopia and contingencies (the general propensity to better human conditions notwithstanding) introduce "invisible hand" effects and complexity in the market society, and both reduce confidence in a predictive science. Science can enunciate a general rule to explain how the market self-organizes itself, but it is unable to provide precise predictions.

4) The division of labour (and not the natural principle from which it derives) assumes the role of a "connecting principle" explaining the increased productivity (and wealth) both in the factory (technical division of labour) and in the market (social division of labour among professions). Yet the technical division of labour depends on the plans of capital owners, while the coordinated extension of the social division of labour in the market is unplanned, and unforeseeable. Thus, competition appears as a fundamental part of the self-organizing properties of the market.

5) Smith maintains that the extent of the division of labour depends on "the power of exchanging that gives occasion to the division of labour". He therefore seems to identify "the power of exchanging" with the original propensity to truck, and to view it as the source of a hypothetical limit on exchanges, since the "extent of this division must always be limited by the extent of that power" (WN, I.iii.1). Nonetheless, he immediately adds that this limitation refers to "the extent of the market" (WN, I.iii.1). The problem is a rather subtle one, since the latter sentence seems to reverse the causal relation implied by the former: is it the power of truck and exchanging that determines the diffusion of the division of labour, progressively enlarging the market, or is it the extent of the market which determines the diffusion of the division of labour? Yet Smith's thought is clear: the original principles do not explain the phenomenon analyzed; by contrast, it is the empirical event (the extent of the market) which explains how the division of labour is more or less extensive. This is evident when he states: "When the market is very small, no person can have any encouragement to dedicate himself entirely to one employment" (WN, I.iii.1). As a consequence, *the extent of the market is the cause which determines the limited extent of the division of labour, and not vice-versa*. Once again (see point 2, *supra*), empirical circumstances seem fundamental, with respect to an original principle, in explaining certain market phenomena.

6) the division of labour evokes, in a certain sense, the characteristics of the changing machines described in HA and in *Languages*: over time, the more societies grow complex, the more we need connecting principles able to explain such complexity. In particular, market societies become

¹⁵ As well known, while the problem of two bodies (for example, the motion of the earth and sun, subject to the force of gravity) was resolved by Newton, Poincaré showed that the "three-body" problem was unsolvable.

progressively complex because the number of interdependent activities increases in consequence of the division of labour (although the functions of workers grow progressively simpler) (WN, V.i.f.51, see Rosenberg, 1965, p. 135). This entails analysis of how market societies realize their coordination as self-organized mechanisms, and it involves the concept of competition among workers and among capital owners as a re-equilibrating force.

In conclusion, on the one hand Smith adopts the Newtonian method based on principles; on the other hand, he attributes principles with a new function. In the case in point, the “original principle” of truck, *which could be compared to the law of gravity*, is not used to *directly deduce* and *unify* a number of (economic) phenomena. This task is instead left to the notion of the division of labour, which is not an original principle and requires further concepts to explain self-organization in the market. In some cases, Smith even considers certain empirical and historical events (the extent of the market, for example) to be the causes of the diffusion of the division of labour, and he marginalizes the role of natural inclinations. Whereas in physics gravity makes it possible to *deduce* the motion of planets, comets, and bodies on the earth, in economics, when explaining the motion of societies, we do not necessarily refer to gravity’s counterpart (the propensity to truck and barter); rather, we consider notions such as the division of labour and competition. Nonetheless, principles are necessary to explain some general tendencies and to establish certain causal relations.

5. Prices and principles

Principles are heuristic devices in many other important fields of Smith’s economic inquiry, and, before dealing with prices, Smith delineated his project “to investigate the *principles* which regulate the exchangeable value of commodities” in order to explain i) the “real measure” of value, ii) the different composition of price, and iii) the differences between market and natural prices (WN, I. iv, 14-17; emphasis added).

As is well-known, labour is the “real measure” of value, or the “real price” of goods. It is related to the “toil and trouble” of obtaining a commodity, and refers to a bodily state of the labourer, in a sense, considered as objective on the following conditions: “Equal quantities of labour, at all times and places, may be said to be of equal value to the labourer”, given “his ordinary state of health, strength, and spirits”, and his ordinary degree of “skill and dexterity” (WN, I.v.7). Yet goods are exchanged by means of money, which is used to estimate their value (nominal price). Nonetheless, it is necessary to refer to a “principle” (labour) to explain the real price in order to understand phenomena perceived in terms of nominal price.

The relation between the real and nominal price represents a situation similar to that described in HA between common sense and the scientist's "imagination", where the latter introduces a new "connecting principle" to fill a gap which is not perceived by people. In this case, common sense estimates the value of a commodity in terms of money (nominal price), rather than in terms of (quantity of) labour (i.e. real price). Common sense does not perceive any gap among certain events, and from its perspective money is an adequate instrument with which to establish the value of goods, instead of labour (i.e. the hidden principle which regulates exchanges). As a consequence, contrary to the concept of gravity, economic science does not seem to have imposed a new "familiarity" in this domain. As happens for both theories, and the formation of languages, this implies that a concrete event is differently perceived if deduced from a general (scientific) principle or from common sense. An example is provided by the monetary illusion that occurs when one attributes a change to the labour price (which as the real price is invariant), while this change depends on the prices of the goods (which are variant) that a wage can buy (WN, I.v.8).

Also the difference between natural and market prices shows a distinctive use of Newton's concept of "principle". It is well-known that, according to Smith, the natural price "is, as it were, the central price, to which the prices of all commodities are continually gravitating"; it is the "center of repose and continuance" to which market prices "constantly" tend (WN, I.vii.15). Bernard Cohen (1993, p. 99) remarked that economics is not a clone of physics, and that Smith correctly adapted Newtonian concepts to the economic realm. Otherwise a close application of the law of gravity would have implied that, just as every physical body must gravitate towards *all* the bodies of a system, so the natural price should gravitate towards all the other prices (of all goods).

Given these considerations, two points ensue.

a) It is at the level of market prices that "competition" comes about (WN, I.vii.1-15). This involves a peculiar dynamic of the market society which renders its future configurations unforeseeable. Some scholars maintain that Smith's approach describes a disequilibrium prices system (for example, Foley, 2003, p. 4), in that market prices proceed towards natural prices, but never coincide with them. In turn, natural prices change over time (see point b) below); consequently, there is more a move towards equilibrium than a stable one. Also competition is an endless process: it gives shape to market society, whose order can be observed *ex post* but never defined in advance; hence only general tendencies can be described.

b) Although natural prices are conceived as "center[s] of repose", they change in the course of time according to "their advancing, stationary, or declining condition" (WN, I.vii.1). History necessarily enters the scene; and this is probably the most important condition for understanding

why Smith's political economy involves a certain view of complexity which cannot be ascribed to Newton's influence.

Finally, "principles" are fundamental for determining the real origin of revenue, and for identifying the corresponding "orders" of society: "Wages, profit, and rent are the three *original sources* of all revenue as well as of all exchangeable value. All other revenue is ultimately derived from some one or other of these" (WN, I.vi.17; emphasis added).

Moreover, history matters because in the "early and rude state of society" goods were exchanged according to the rule of the labour time necessary to produce each of them; therefore only labour is the source of income (WN, I.vi.1-5). When capital accumulation and the private ownership of land appeared, the components of price became three. Although the historical account is very general and "conjectural", the basic idea is that the fundamental (and not reducible) principles which determine every income *change* from the "rude" to the "advanced" state of society.

Another example is the notion of the "interest of money", which is never an autonomous income because it is "always a derivative revenue, which, if it is not paid from the profit which is made by the use of the money, must be paid from some other sources of revenue" (WN, I.vi.18). Empirical considerations somehow re-emerge, in that political economy cannot duplicate the perfect mechanism of Newton's physics to find a unique, universal, principle. Hence, in modern societies, we find not just one but three sources of income, which are not reducible to each other. In fact, profits and wages "are regulated by quite different principles" (WN, I.vi.), and rent is "the price paid for the use of the land", which "enters into the composition of the price of commodities in a different way from wages and profit. High or low wages and profit, are the causes of high or low price; high or low rent is the effect of it" (WN, I.xi.1-8).

6. History matters

Smith points out that two "principles" of human nature are opposed: one is "the passion for present enjoyment", the other is "the desire of bettering our condition", and they respectively prompt us to consume and to save (WN, II.iii.28). This produces the contrast between prodigality (which dissipates wealth) and parsimony (or frugality) which is essential for understanding economic growth, since "Parsimony, and not industry, is the immediate cause of the increase of capital" (WN, II.iii.16), and it seems largely to predominate in the greater part of men (WN, II.iii.28). The prevalence of this inclination¹⁶ enables public and private wealth to increase, and it

¹⁶ In TMS (IV.2.6-8), this propensity has its counterpart in "prudent" behaviour.

“is frequently powerful enough to maintain the natural progress of things toward improvement, in spite both the extravagance of government, and of the greatest errors of administration” (WN, II.iii.31). Given this situation, we can infer that:

1) human nature is not the precise counterpart of physical nature: both of them exhibit coherent, uniform, and constant principles, but in the former, with respect to the latter, these principles are sometimes conflictual;¹⁷

2) man’s propensity to “better his condition” prevails over prodigality, and explains the general tendency to move towards “the natural progress of things” (since it yields capital for productive investments); yet, as the history of Western societies shows, this happens in complex ways. Therefore, we can only delineate a general framework of the future world.

Book III of the WN is a good example of how real history matters in determining unpredictable configurations of the market society, sometimes reversing the “natural order of things” despite the natural (prevalent) inclination to improve mankind’s condition.

The relation between town and country, from the decline of the Roman Empire to Smith’s age, confirms this view. The “natural course” implies that, firstly, “the greater part of the capital of every growing society is, first, directed to agriculture, afterwards to manufactures, and last of all to foreign commerce” (WN, III.i.8), and secondly that the development of the countryside constitutes an incentive for the growth of towns. By contrast, in Western history, the development of the countryside was discouraged because the need for protection in “those disorderly times” following the fall of the Roman Empire induced the use of land as the means to acquire “power and protection” (instead of a means to acquire “subsistence”), where a “great landlord was a sort of petty prince” who provided protection to people, and his “tenants were his subjects” (WN, III.ii.3). The “law of primogeniture” and “entails”, as institutions allowing to maintain land undivided, reinforced the use of land as a means of power instead of a productive resource, and influenced European societies for centuries. By contrast, the inhabitants of the towns soon achieved economic development and “arrived at liberty and independency much earlier than the occupiers of land in the country” (WN, III.iii.3). Over time, they acquired “important privileges” as regards the payment of taxes. Moreover, the constitution of corporations, the alliance with the king against the lords, and a number of other historical and political events determined the progressive independence of towns. As a consequence: “Order and good government, and along with them the liberty and security of individuals, were in this manner established in cities at a time when the occupiers of land in the country were exposed to every sort of violence” (WN, III.iii.12). Wealth was accumulated in the towns, and it increased the demand for “conveniencies and elegancies of life”. In short, foreign

¹⁷ Although fundamental, it is not possible here to examine how these topics are treated in the TMS.

trade developed in an anomalous way, inverting the “natural order of things” according to which this kind of commerce would have been the last sector to increase after agriculture and manufacture, and in consequence of their exchange relations (for example, when the domestic market was unable to absorb surplus goods). In Smith’s words:

“this natural order of things [...] has, in all the modern states of Europe, been, in many respects, entirely inverted. The foreign commerce of some of their cities has introduced all their finer manufactures, or such as were fit for distant sale; and manufactures and foreign commerce together, have given birth to the principal improvements of agriculture” (WN, III.i.9).

The last sentence anticipates the subject of the concluding chapter of Book III of the WN, devoted to “How the Commerce of the Towns contributed to the Improvement of the Country”. Smith explains that i) the town was a “ready market” for the “rude produce of the country”; ii) the town’s wealth was employed to purchase (often uncultivated) land; iii) commerce and manufactures introduced “liberty and security” in the country. Therefore very relevant was the gradual, “silent and insensible operation of foreign commerce and manufactures”, which permitted “great proprietors” to spend their revenue on buying consumer goods, instead of maintaining their tenants (WN, III.iv. 10). This was a “revolution of the greatest importance”, which induced the emergence of capital owners, as the social class best adapted to operating in the market society, and the corresponding decline of landlords. Another aspect of this long process was that, in “the greater part of Europe”, “the commerce and manufactures of cities, instead of being the effect, have been the cause and occasion of the improvement and cultivation of the country” (WN, III.iv.17).

Given these premises, two points follow:

1) History matters. The “natural course of things” may be completely reversed, and this may condition civilization for many centuries. Certainly, the tendency to re-equilibrate (and to improve the individual condition) is at work, so that, in this case, the country finally develops. Yet, it is difficult to think that the outcomes of the two possible courses of history (the “natural”, and the “unnatural” ones) have been the same. Many distortions remain, and harmful institutions continue to produce their effects in real life. In short, the natural order, once abandoned, is never perfectly re-established because the course of history leaves its traces. As a consequence, Smith never describes where and when the natural order re-appears.¹⁸

¹⁸ According to Evensky (2007, p. 17), Smith “offers an analysis of the course of recorded history explaining why the unnatural twists, turns, stagnations, and declines of societies do not represent violations of his general principles but, rather reflect peculiar distortions of those principles caused by human frailty”. In this sense, Smith’s “conjectural” and “narrative” histories are consistent. In my view, there is coherence between them (at least in Smith’s intention), yet the two histories cannot be completely overlapped: history follows a “design” and certain principles, but a number of empirical events and conflicting tendencies influence its direction (see sect. 7).

2) These processes were unpredictable, as the “great revolution” showed. History, contingencies, institutions, customs, habits, and preferences of economic actors determine unforeseeable issues, although a general tendency as regards historical processes can be observed. In the human realm, “natural” tendencies and “unnatural” processes often work at the same time, and all this modifies the Newtonian perspective in human sciences.

7. Institutions matter

Smith often cites institutions as responsible for the slow or inverted “natural course of things”. They are the result of the myopic human reason, and of moral propensities, and in certain conditions they acquire some sort of independent structure (with respect to individuals) which persists over time. As a consequence, this is another perspective from which to examine how natural inclinations cannot impede the accomplishment of an “unnatural” “course of things”.

Smith points out that the lack of “perfect liberty” in Europe has caused inequalities of different kinds (WN, I.x.a) and damaging competition, and the third book of the WN describes their political and institutional origins.

Institutions are human devices which can exhibit a kind of autonomous life owing to the limited human capacity for both rationality and prevision. At the beginning, in some circumstances, they can be consistent with reason, in others they cannot. The law of primogeniture and entails were not “unreasonable”, because great proprietors, by keeping land undivided, were able to assure protection to their “tenants”, since individuals were not able to survive isolated and undefended (WN, III.ii.6). By contrast, laws and institutions derived, for example, from the arguments of mercantilist doctrine were unreasonable, and their permanence – generally considered “absurd” and harmful – can be explained by showing how the interests of some social groups influenced their duration (like those of corporations or of the East India Company). Yet in many cases institutions are described as inertial structures which survive even though their original function has ceased: “Law frequently continue in force long after the circumstances, which first gave occasion to them, and which could alone render them reasonable, are no more” (WN, III.i.4). And their inertial character depends on habits and customs arising from those original institutions, which survived after these latter were “greatly altered”, leading the course of history towards an “unnatural and retrograde order” (WN, III.i.9).

Smith points out that the “order of things” is usually promoted by the “natural inclinations of man”. Nonetheless institutions often do not mirror such propensities: “If human institutions had

never thwarted those natural inclinations, the towns could no where have increased beyond what the improvement and cultivation of the territory in which they were situate could support” (WN, III.i.3).

In short, human institutions “disturbed the natural course of things” (WN, III.i.4), often worked *against* it, and their autonomy defined a specific configuration of society at each point of time. The case of “law of primogeniture” and of “entails” is interesting, in that the autonomy of institutions is not determined by the permanence of self-interest of social groups able to influence laws (like those of merchants, who tried to condition policies in the mercantilist sense). By contrast, those medieval institutions survived, even though they soon became “unreasonable”, and were definitely removed by means of a “slow and uncertain” historical process, which allowed landlords to spend their revenue in consumer goods. Smith does not provide a precise theory as regards these events; rather, he shows how history and contingencies slowly changed institutional structures by gradually introducing market relations between country and town.¹⁹

Institutions as autonomous structures conditioning human life and imposing their own rationality on individuals, instead of being manageable tools of man’s intentionality, produce an invisible hand effect: reasonable institutions are engendered by men, yet their gradual change (or their inertial duration) produces unintended outcomes, and – to use Ferguson’s words – they appear to be “the result of human action but not the execution of any human design” (Ferguson, [1767] 1969, p. 250). From this perspective, legal institutions (not only the market) are connoted as self-sustaining systems, unintentionally adapted (or survived) to new situations, and which exhibit a self-organizing capacity which extends beyond agents’ rationality. On the other hand, Smith sometimes considers the autonomy of certain institutions to be among the causes of that unnatural “order of things” which culminates in the absence of “perfect liberty” in Europe. If we consider the course of civilization from the natural/conjectural perspective, some institutional structures, owing to their autonomous mechanisms, are certainly “the result of human action”, but at the same time they work against civilization, in that they reduce both the liberty and the social capacity to produce increasing wealth, although nature provides some re-equilibrating mechanisms in the long run. Individuals operate and contribute to the change in institutions, but these latter in their turn are, in many respects, independent from agents. Moreover, they condition their behaviours, and are regulated by autonomous rules.

From this perspective, the “invisible hand” is not limited to the market, but is a device which also works at institutional level, and whose outcomes, realized in each of these contexts, can be

¹⁹ For example, Smith simply points out the gradual transformation, so that he maintains: “To the slave cultivators of antient times gradually succeeded [the] Metayers” (WN, III.ii.11), and subsequently to them “succeeded, though by very slow degrees, farmers properly so called” (WN, III.ii.14).

conflictual. In other words, the *same mechanism* which produces “unintended outcomes” can exhibit opposite tendencies: on the one hand, the “invisible hand” (described in the WN) works to establish an unintentional order consistent with individual and public welfare; on the other hand, *certain* institutions determine an unintended result culminating in the state of “im-perfect liberty”, that is, an order far from the “natural course of things”.²⁰ The invisible hand, as a mechanism subsuming individual behaviours, can work at the same time on different subjects, whose performances are conflictual. Therefore, some (inertial and harmful) institutions act against the unintentional effort of individuals to improve general wealth, although this latter process will prevail over the former. Finally, this opposition impedes prediction of precisely which kind of social and economic configuration will emerge.

Contrary to the idea of an economic and social science based on predictive powers, Smith delineates a discipline in which the future is open, and scientists can only predict very general tendencies grounded on the human inclination to better man’s condition among contrasting forces. The great “revolution” which definitively ratified the passage to the market society occurred without “the least intention” of the social classes involved (WN, III.iv.17).²¹ This incapacity to foresee is shared by both social actors and scientists, where the former are characterized by structural myopia, and the latter by a constant search for “connecting principles” in order to overcome scant human far-sightedness.

The TMS explicitly treats the weakness of reason (TMS, II.i.5.10): “The natural course of things cannot be entirely controlled by the impotent endeavours of man” (TMS, III.5.10), where this course does not often follow the most “natural” way. History and contingencies deviate this latter from its ideal path, the one described by a “conjectural” approach. Nature does not direct human behaviours by means of prescriptions; rather, it exploits a more subtle and indirect device based on a kind of aesthetic consideration, since wealth is not perceived for its concrete benefits, but “as something grand and beautiful and noble”, so that “nature imposes upon us in this manner [and] It is this deception which rouses and keeps in continual motion the industry of mankind” (TMS, IV.I.10).

By contrast, according to Smith, a prescriptive interpretation of nature was put forward by Quesnay, who maintained that the market systems can survive only within a unique equilibrium (“the exact regimen of perfect liberty and perfect justice”), while “the wisdom of nature has fortunately made ample provision for remedying many of the bad effects of the folly and injustice

²⁰ According to Smith, in his age, the market system and the related, coherent, institutional framework was not definitely established. In fact, nowhere in Europe did policies leave “things at perfect liberty” (WN, I.x.a.2), and “Entails [...] are still respected through the greater part of Europe” (WN, III.ii.6).

²¹ A similar gap between original intention and actual outcomes connoted the conquest of colonies (WN, IV.vii.b.21).

of man” (WN, IV.ix.28). Nature, although represented by means of a biological comparison between humans and the “political body”, does not intervene deterministically to re-establish “the natural progress of a nation towards wealth and prosperity” according to precise laws; rather, it can work in many ways, according to an “unknown principle of preservation”, which in political economy corresponds to man’s “natural effort” “to better his own condition” (WN, IV.ix.28).

The “unknown principle of preservation” describes a tendency to remedy “the bad effects of a political economy”. It is a principle which permits the self-organization of the market society over time, even when this latter moves along a sub-optimal path and exhibits a certain conflict between nature and institutions; whereas one schematically remarks that nature in some way directs man, but man generates institutions opposed to the course of nature.

Yet, not always can nature spontaneously re-establish the lost order, and man must intervene. For example, restoring the free importation of foreign goods, when this commerce has been prohibited for long time, could provoke high unemployment in those branches of industry artificially expanded by mercantilist policy. In this case, a correct response should be human intervention characterized “by slow gradations, and with a good deal of reserve and circumspection” (WN, IV.ii.40). Similarly, “To open the colony trade all at once to all nations” might produce “permanent losses” of capital investments in the sectors of industry involved; therefore these “ought gradually to be opened”, but “in what manner the natural system of perfect liberty and justice ought to be restored, we must leave to the wisdom of future statesmen and legislators to determine” (WN, IV.vii.c.44). In addition, some basic human inclinations must be moderated. For example, pride induces the “love to domineer” which prompts the imposition of slavery where it is possible (WN, III.ii.10), although productive activities realized by means of slaves are less efficient than those accomplished by free, self-interested, men. In this sense, a basic propensity, like the love of dominion, works against other inclinations coherent with a “natural” course, the one able to induce increasing wealth.

In short, there is a dialectical relation between the natural and institutional orders (including laws, and political systems). The former corrects human “follies”, mainly in the long run. Nonetheless, human reason can intervene when the self-adjusting mechanism of nature cannot be activated.

Conclusions

The aim of this paper has been to show that Smith in many fields of his work produced a theory in some sense non-Newtonian, although he sought to apply Newton's method in many circumstances. At first glance, this conclusion appears to be the consequence of the shift of the notion of "principle" (and of the related analytic-synthetic approach) from physics to the human sciences. More specifically, Smith in *Languages*, HA and WN always treated subjects in which history and contingencies matter, and where the human realm appears much more ambivalent and conflicting than the physical world.

The first part of the article has described how the analytic-synthetic method was essentially utilized to point out processes of re-description of the world, rather than describe its intrinsic truth (the one describable by human beings), establishing a circularity between concreteness and abstractness, and between common sense and the scientific perspective.

The second part of the article has examined some concepts in Smith's economic analysis in light of the Newtonian approach. In particular, the division of labour, although it is not an "original" (but a derived) principle, is used to explain (or deduce) a number of economic phenomena. Yet it cannot be understood without reference to history and contingencies, which in turn must be considered in order to explain when and how it works. More specifically, the (technical and social) division of labour permits the market to expand, generating increasing returns; yet the extent of the market (as an empirical fact) determines the extent of the division of labour. Once again, a circularity (also in terms of causality) is established between principles and empirical events.

From this perspective, history matters, although it is directed by a general tendency to improve the human condition. In fact, the "inverted" history of Europe shows the extent to which contingencies and empirical circumstances have imposed their influence on the "natural" course of events, whereas the latter is a process coherent with original principles which should govern human behaviour. In particular, institutions play an important role in determining the "unnatural" "course of things". Their structure, relatively autonomous from the agent's intentionality and plans, is – so to speak – the other side of "invisible hand", in that, given their inertia, their action over time is unpredictable and sometimes conflicts with the rationality of the market, which in its turn is another institutional framework in which the invisible hand mechanism works.

Finally, for Newton, nature is deterministic and predictable, and its time is reversible, in that nature is always the same in every time and place. For Smith, the future is not deterministic: laws of (human) nature can produce unexpected effects if specific circumstances intervene to reverse the "natural course of things". The confidence in certain principles (by means of which the system

works), remains, but within an open universe, whose dynamics engender unpredictable outcomes (i.e. the heterogenesis of ends), and whose configurations are unknown in advance, as in the market, whose rationality emerges as a property of the system distinguished by the limited rationality of a number of agents operating within that framework.

References

- Becker J.F. (1961), *Adam Smith's Theory of Social Science*, "Southern Economic Journal", 28, 1, pp. 13-21.
- Berry, C.J. (2006), *Smith and Science*, in K. Haakonssen (ed.), *The Cambridge Companion to Adam Smith*, New York, Cambridge University Press, pp. 112-134.
- Bittermann H.J. (1940), *Adam Smith's Empiricism and the Law of Nature: I*, "The Journal of Political Economy", 48, 4, pp. 487-520.
- Campbell T.D. (1971), *Adam Smith's Science of Morals*, London, Allen & Unwin.
- Cohen, I.B. (1980), *The Newtonian Revolution. With illustration of the transformation of scientific ideas*, Cambridge, Cambridge University Press.
- Cohen I.B. (1993), *Scienze della natura e scienze sociali*, Roma-Bari, Laterza.
- Cremaschi S. (1984), *Il sistema della ricchezza. Economia politica e problema del metodo in Adam Smith*, Milano, Franco Angeli.
- Cremaschi S. (1989), *Adam Smith: Skeptical Newtonianism, Disenchanted Republicanism, and the Birth of Social Science*, in M. Dascal, O. Gruengard (eds.), *Knowledge and Politics: Case Studies on the Relationship between Epistemology and political Philosophy*, Boulder, US and London, Westview Press, pp. 83-110.
- Evensky J. (2007), *Adam Smith's Moral Philosophy. A Historical and Contemporary Perspective on Markets, Law, Ethics, and Culture*, Paperback edition, New York, Cambridge University Press.
- Ferguson A. ([1767] 1969), *An Essay on the History of Civil Society*, 4th edition, England, repr. by Gregg International Publishers Limited.
- Foley D.F. (2003), *Unholy Trinity: Labor, capital, and land in the new economy*, London and New York, Routledge.
- Freudenthal G. (1981), *Adam Smith's Analytic-Synthetic Method and the 'System of Natural Liberty'*, "History of European Ideas", 2, 2, pp. 135-54.

- Guicciardini N. (2002), *Analysis and Synthesis in Newton's mathematical work*, in I.B. Cohen and G.E. Smith (eds.), *The Cambridge Companion to Newton*, Cambridge, Cambridge University Press.
- Hetherington N.S. (1983), *Isaac Newton's Influence on Adam Smith's Natural Laws in Economics*, "Journal of the History of Ideas", 44, 3, pp. 497-505.
- Hume D. ([1748] 1999), *An Enquiry concerning Human Understanding*, edited by T.L. Beauchamp, Oxford, Oxford University Press.
- Koyré A. (1968), *Newtonian Studies*, Chicago, The University Chicago Press.
- Lindgren R.J. (1973), *The Social Philosophy of Adam Smith*, The Hague, Martinus Nijhoff.
- Mayr O. (1986), *Authority, Liberty and Automatic Machinery in Early Modern Europe*, Baltimore, The Johns Hopkins University Press.
- Megill A.D. (1975), *Theory and Experience in Smith*, "Journal of the History of Ideas", 36, 1, pp. 79-94.
- Montes L. (2003), *Smith and Newton: some methodological issues concerning general economic equilibrium theory*, "Cambridge Journal of Economics", 27, pp. 723-747.
- Montes L. (2008), *Newton's real influence on Adam Smith and its context*, "Cambridge Journal of Economics", 32, pp. 555-576."
- Moscovici S. (1956), *À propos de quelques travaux d'Adam Smith sur l'histoire et la philosophie des sciences*, "Revue d'histoire des sciences et de leur applications", 9, 1, pp. 1-22.
- Newton I. ([1687] 1934), *Mathematical Principles of Natural Philosophy and his System of the World*, trans. into English in 1729, Cambridge, Cambridge University Press.
- Newton I. ([1704] 1952), *Opticks*, 4th English Edition (1730), with a Foreword by A. Einstein, an Introduction by Sir E. Whittaker, a Preface by I. B. Cohen, New York, Dover Publications.
- Prigogine I. and Stengers I. (1979), *La Nouvelle Alliance. Les Métamorphoses de la Science*, Paris, Gallimard. English version: *Order Out of Chaos*, New York, Bantam, 1984.
- Raphael, D.D., Skinner A.S. (1980), General Introduction, in Adam Smith, *Essays on Philosophical Subjects*, W.P.D. Wightman (ed.); in *The Glasgow Edition of the Works and Correspondence of Adam Smith*, Oxford, Oxford University Press.
- Redman D. (1993), *Adam Smith and Isaac Newton*, "Scottish Journal of Political Economy", 40, 2, pp. 210-230.
- Rosenberg N., *Adam Smith and the Division of Labour: Two Views or One?*, "Economica", May 1965, pp. 127-139.
- Schliesser E. (2005), *Wonder in the Face of Scientific Revolutions: Adam Smith on Newton's 'Proof' of Copernicanism*, "British Journal for the History of Philosophy", 13, 4, pp. 697-732.

- Skinner A.S. (1972), *Adam Smith: Philosophy and Science*, "Scottish Journal of Political Economy", 19, pp. 307-19.,
- Smith A. (1976) [TMS], *The Theory of Moral Sentiments*, A.L. Macfie, D.D. Raphael (eds.) in *The Glasgow Edition of the Works and Correspondence of Adam Smith*, Oxford, Oxford University Press.
- Smith A. (1976) [WN], *An Inquiry into the Nature and Causes of the Wealth of Nations*, R.H. Campbell, A.S. Skinner, W.B. Todd (eds.), in *The Glasgow Edition*.
- Smith A. (1978) [LJ(A)], *Lectures on Jurisprudence: report of 1762-1763*, in R.L. Meek, D.D. Raphael, P.G. Stein (eds.), in *The Glasgow Edition*.
- Smith A. (1978) [LJ(B)], *Lectures on Jurisprudence: report dated 1766*, in R.L. Meek, D.D. Raphael, and P.G. Stein (eds.), in *The Glasgow Edition*.
- Smith A. (1980), *Essays on Philosophical Subjects*, W.P.D. Wightman, J.C. Bryce (eds.), in *The Glasgow Edition*.
- Smith A. (1980) [HA], *The History of Astronomy*, in *Essays on Philosophical Subjects*, W.P.D. Wightman, J.C. Bryce (eds.); in *The Glasgow Edition*, pp. 33-105.
- Smith A. (1983) *Lectures on Rhetoric and Belles Lettres*, Bryce J.C. (ed.), in *The Glasgow Edition*.
- Smith A. (1983) [Languages], *Considerations Concerning the First Formation of Languages*, in *Lectures on Rhetoric and Belles Lettres*, Bryce J.C. (ed.), in *The Glasgow Edition*, pp. 201-226.
- Smith G.E. (2002), *The Methodology of the Principia*, in I.B. Cohen and G:E: Smith (eds.), *The Cambridge Companion to Newton*, Cambridge, Cambridge University Press.
- Stewart D. ([1793] 1980), *Account of the Life and Writings of Adam Smith*, in Adam Smith, *Essays on Philosophical Subjects*, W.P.D. Wightman, J.C. Bryce (eds.), in *The Glasgow Edition*, pp. 269-332.
- Thomson H.F. (1965), *Adam Smith's Philosophy of Science*, "Quarterly Journal of Economics", 79, pp. 212-33.