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**CHAPTER 18 OF THE *GENERAL THEORY* “FURTHER ANALYSED”:
ECONOMICS AS A WAY OF THINKING**

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INTRODUCTION

Chapter 18 of John Maynard Keynes’s *The General Theory of Employment, Interest and Money* is a somewhat surprising chapter. One would expect the last chapter of book IV of the volume to bring Keynes’s observations on “The Inducement to Invest” to conclusion, or serve as a sort of prolegomena to book V (“Money-wages and Prices”). It is not so: the chapter restates the whole *General Theory*. At its core (section II) is a concise summary of the volume (up to chapter 17), preceded by (section I) a description of the independent and dependent variables of the system and the factors Keynes has taken as given in the analysis, and followed by (section III) the enumeration of a series of “special characteristics” of the independent variables, which help explain why the system tends to oscillate round a position of less than full (but fairly above the minimum value of) employment.

In a now famous article of 1987, Greenwald and Stiglitz accused Keynes of having relied too much upon the “neoclassical and Marshallian tools” in drawing the summary of the *General Theory* in chapter 18; by presenting the volume in the form of the “simple model” (p. 120) of chapter 18, Keynes would have obscured the “much richer picture [that] emerges from the *General Theory* taken as a whole” (p. 127). The post-Keynesian strand has immediately challenged Greenwald and Stiglitz’s interpretation. Sardonì was the first to show that drastically different interpretations of chapter 18 were possible and, to some extent, had already been advanced in the literature: Shackle (1967) had rightly considered chapter 18 as the expression of

“a new philosophy of explanation of economic reality” (Sardoni, 1989-90, p. 293; see also Harcourt and Sardoni, 1994; Fontana, 2001).

The aim of our paper is to throw further light on such new philosophy of explanation. In particular, we advance an interpretation of chapter 18 as both an indispensable tool offered by the author to its readers to decode the text structure of the *General Theory*, and as a guide to the analysis of a complex economic material. In so doing, great value is assigned to the theoretical continuity between the *General Theory* and Keynes’s “essay on method”, the *Treatise on Probability*. After a brief outline of the chapter (section 1), we examine Keynes’s methodological criticism of the “classical theory” and especially of the use this latter makes of the “atomic hypothesis” (section 2). We therefore show that the notions of cause and dependence employed to discuss the relationships between the variables in chapter 18 are in truth related to the concept of “independence for knowledge”, which concerns logical connections between arguments rather than material connections between events (section 3). The paper then illustrates the two-stage methodology devised by Keynes to overcome the limitations of the Marshallian “*ceteris paribus*” analysis and mathematical economics, including general equilibrium theory (section 4). We show that the logical connections established in chapter 18 by the use of *ceteris paribus* conditions and assumptions of independence are explicitly re-discussed in chapters 19-21, which allow for probable repercussions between the factors as well as for interactive relationships between independent variables and remove the simplifying assumptions previously introduced. Focusing on the continuity this method provides with the analysis of credit cycles in *A Treatise on Money*, where Keynes explicitly stresses the importance of reader’s involvement in the analysis of the economic material under consideration, we claim that chapter 18 performs a fundamental role in helping the readers understand the text structure of the *General Theory* (section 5). We therefore further an interpretation of the *General Theory* as a vademecum to the complex economic world and the most powerful example of Keynes’s conception of economics as a method, that is a way of thinking to be used by readers willing to emulate the author’s efforts to grasp the complexity and interdependence of the economic material.

1. CHAPTER 18: AN OVERVIEW

The “summary of the General Theory” exposed by Keynes in the second and central section of chapter 18 (entitled “The General Theory of Employment Re-stated”) occupies less than two pages (CW 7, pp. 248-9 [1]). The system’s rate of new investment, he writes, is determined by physical supply in capital-good industries, confidence in the prospective yield of capital assets, liquidity preference and the quantity of money. The increase in the investment rate carries with it an increase in the rate of consumption according to the marginal propensity to consume. Assuming that the investment multiplier and the employment multiplier are equal, it becomes possible to infer the increase in employment. Before moving to the “conditions of stability” (p. 250) of the economic system, however, Keynes concerns himself with absolving the schematism of his reconstruction:

An increment (or decrement) of employment is liable, however, to raise (or lower) the schedule of liquidity-preference; there being three ways in which it will tend to increase the demand for money, inasmuch as the value of output will rise when employment increases even if the wage-unit and prices (in terms of the wage-unit) are unchanged, but, in addition, the wage-unit itself will tend to rise as employment improves, and the increase in output will be accompanied by a rise of prices (in terms of the wage-unit) owing to increasing cost in the short period. Thus the position of equilibrium will be influenced by these repercussions; and there are other repercussions also. Moreover, there is not one of the above factors which is not liable to change without much warning, and sometimes substantially. Hence the extreme complexity of the actual course of events. Nevertheless, these seem to be the factors which it is useful and convenient to isolate. If we examine any actual problem along the lines of the above schematism, we shall find it more manageable; and our practical intuition (which can take account of a more detailed complex of facts than can be treated on general principles) will be offered a less intractable material upon which to work (ib.).

As already noted by Hansen (1953), by referring to “other repercussions” exerting their influence on the position of equilibrium, Keynes is straightforwardly directing attention to the complexity of the economic system, to the extent that the schematism of the summary can be justified only by the convenience to isolate some factors for purpose of offering a “more manageable” problem and a “less intractable material”. It is with this aim in mind that Keynes illustrates the nature of the factors and variables of the analysis in the first section of the chapter. The taxonomy includes: i) “given factors” such as the quality and quantity of labour and equipment, technique, and social and institutional factors (e.g. consumers’ preferences and habits, the degree of competition); ii) “independent variables”: “the propensity to consume, the schedule of the marginal

efficiency of capital and the rate of interest"; iii) "dependent variables": "the volume of employment and the national income (or national dividend) measured in wage-units" (p. 245).

Yet both "given factors" and "independent variables" deserve further analysis. Keynes specifies that he is not assuming the former to be constant, "but merely that, in this place and context, we are not considering or taking into account the effects and consequences of changes in them" (p. 245). Moreover, these factors "influence" but "do not completely determine" independent variables (pp. 245-6): the marginal efficiency of capital, for instance, depends on the quantity of equipment but also on long-term expectations. As to independent variables, Keynes points out that two of the three "determinants" (p. 183) of the system, as he had defined them in chapter 14, namely the marginal efficiency of capital and the interest rate are not truly so: the former depends on the prospective yields of capital-assets, and the latter is affected by the liquidity-preference and the quantity of money. Therefore, the "ultimate independent variables" of the system are more properly "the three fundamental psychological factors, namely, the psychological propensity to consume, the psychological attitude to liquidity and the psychological expectation of future yield from capital-assets", the wage-unit and the quantity of money (pp. 246-7).

Nonetheless, Keynes warns soon afterwards that we are not in presence of "ultimate atomic independent elements", since given factors and independent variables "would be capable of being subjected to further analysis" (p. 247). In this regard, he holds that "the division of the determinants of the economic system into the two groups of given factors and independent variables is, of course, quite arbitrary from any absolute standpoint". "The division must be made entirely on the basis of experience", writes Keynes, who immediately imposes the "quaesitum" of the analysis (i.e. what determines the national income and employment) as the final criterion for evaluating, "in a study so complex as economics, in which we cannot hope to make completely accurate generalisations, the factors whose changes *mainly* determine our *quaesitum*. Our final task might be to select those variables which can be deliberately controlled or managed by central authority in the kind of system in which we actually live" (ib.).

The final section of chapter 18 deals with the four conditions of stability of the economic system (which may however result in an unemployment equilibrium), to be inferred from "certain special

characteristics of the propensity to consume, the schedule of the marginal efficiency of capital and the rate of interest, about which we can safely generalise from experience, but which are not logically necessary" (p. 249). First, the multiplier relating the volume of consumption to an increase of output is greater than unity but not very large; second, changes in new investment are not in great disproportion to changes in the prospective return of capital or in the interest rate; third, money wages tend to vary in the same direction as, but not in great disproportion to, changes in unemployment; fourth, a change in the investment rate begins to react on the marginal efficiency of capital if continued for a period which is not very large (so that fluctuations in one direction tend to reverse themselves in due course). Such "natural tendencies", however, do not determine a "mean position" by "law of necessity", nor configure a "necessary principle which cannot be changed" (ib.).

2. KEYNES'S METHOD AND THE CLASSICAL THEORY

An outstanding feature of the chapter is the author's frankness on the schematism of the summary of the *General Theory*, of the taxonomy of variables and of the conditions of stability of the system. Nor could his reiterated insistence on the need to take into consideration the "extreme complexity of the events", to "further analyse" the variables and to avoid confusing the stability conditions with a "law of necessity" easily go unobserved. In general, it is as if the author felt it necessary to remind the readers not only that the economic world is much too complex for this reductionism, but also that there is much more in the *General Theory* "taken as a whole" than it would seem from the schematism of chapter 18. This is hardly surprising: after all, the book was written for want of a truly *general* theory, which could redefine the neoclassical apparatus as one among many of its special cases:

I have called my theory a *general* theory. I mean by this that I am chiefly concerned with the behaviour of the economic system as a whole ... I argue that important mistakes have been made through extending to the system as a whole conclusions which have been correctly arrived at in respect of a part of it taken in isolation (CW 7, p. xxxii).

Chapter 19 with Keynes's discussion of the "supposedly self-adjusting character of the economic system" (p. 257) as seen by the classics, provides the most vivid illustration of this attempt to construct a

general theory. The “assumed fluidity of money-wages” (p. 257) which supports the classical argument rests on the transposition of demand and supply schedules for different products of a given industry to “industry as a whole”; an “invalid” procedure “unless we also transfer our assumption that the aggregate effective demand is fixed. Yet this assumption reduces the argument to an *ignoratio elenchi*” (p. 259). One of the thirteen types of fallacy of argument listed by Aristotle in *Sophistical Refutations* (1928), *ignoratio elenchi* is regarded in logic as an informal fallacy of relevance, occurring when the premises of an argument are irrelevant to, and incapable of, establishing the truth of the conclusion of the argument. In effect, “if the classical theory is not allowed to extend by analogy its conclusions in respect of a particular industry to industry as a whole, it is wholly unable to answer the question what effect on employment a reduction in money-wages will have. For it has no method of analysis wherewith to tackle the problem” (p. 260; see also Gerrard, 1997).

It is no coincidence that the author of the *General Theory* but also of *A Treatise on Probability*, wherein Keynes outlined a general approach to epistemology later applied to his economic writings, uses the term “method” in this passage. Chapter 19 is entirely centred on the methodological “difference of analysis” (CW 7, p. 257) which separates Keynes’s work from that of the classics; a difference which “could not be set forth clearly until the reader was acquainted with my own method” (ib.). Once familiar with such method, readers can easily grasp the reason why it was simply impossible to discuss the effects of changes in money-wages “until our own theory had been developed”. The explanation offered by the classical theory of the money-wages argument is “quite a simple one”, writes Keynes: “It does not depend on roundabout repercussions, such as we shall discuss below” (ib.). It is Keynes himself, in the introduction to the Series of Cambridge Economic Handbooks (of 1922-23), who helps explain what is to be understood by “method”:

the theory of economics does not furnish a body of settled conclusions immediately applicable to policy. It is a method rather than a doctrine, an apparatus of the mind, a technique of thinking, which helps its possessor to draw correct conclusions (CW 12, p. 856).

In contrast to classical economists, who attempted to apply the method of physical sciences to economics, Keynes defines the latter as a “moral” rather than a pseudo-natural science, dealing with introspection and ethical values, with “motives, expectations, psychological uncertainties” (CW 14, p. 300),

so that “one has to be constantly on guard against treating the material as constant and homogeneous” (ib.). Starting from the pioneering works by Lawson and Pesaran (1985), Carabelli (1988) and O’Donnell (1989), a now wide literature has demonstrated that Keynes had already developed his anti-positivist stance on the theoretical foundations of economics in his *Treatise on Probability* [2]. Firmly opposing the frequency theory, the *Treatise* outlines a logical approach to probability which, furthermore, rehabilitates probability and limited knowledge as against the belief of classical theory that only truth and perfect knowledge are valid for science, and economics with it. In describing probability as “the general, because the commonest, case of knowledge” (ib., p. 16), Keynes draws attention to arguments which have a non-demonstrative and non-conclusive nature, that is to arguments which provide reasons for holding probable beliefs: “in economics”, he argues, “you cannot *convict* your opponent of error – you can only *convince* him of it” (CW 13, p. 470).

This approach to epistemology provides clear continuity with the definition of economics Keynes offered in 1938 on discussing Roy Harrod’s *Scope and Method in Economics*. Economics is “a branch of logic, a way of thinking” (CW 14, p. 296), whose object, he observed in the *General Theory*, is

not to provide a machine, or method of blind manipulation, which will furnish an infallible answer, but to provide ourselves with an organised and orderly method of thinking out particular problems (CW 7, p. 297).

These passages show Keynes’s dislike not only for the analogy between economic behaviour and the mechanical movement of physical bodies, but also for the attempt to blindly applicate mathematical discourse to a “moral” science (see O’Donnell 1989). Economics is for Keynes an apparatus of probable reasoning: without logic, economists risk losing themselves in a mathematical wood of “pretentious and unhelpful symbols” (CW 7, p. 298). Not “to lose sight of the complexities and interdependencies of the real world” in this labyrinth of symbols, the economist must adopt Malthus’s method as Keynes saw it: “profound economic intuition and an unusual combination of keeping an open mind to the shifting picture of experience and of constantly applying to its interpretation the principle of formal thought” (CW 10, p. 108).

By logic, Keynes meant a contingent form of non-demonstrative reasoning relative to contexts of shifting reality. He considered logical relations as objective, but believing that both thought and reality were

multidimensional, he rejected the basic assumptions of metaphysical realism: in the absence of universal theoretical point of view, theoretical categories must be related to contingent cognitive circumstances. In Keynes's theory of knowledge as probability, based on non-demonstrative and non-conclusive arguments, economics is a branch of probable logic helping economists to avoid logical fallacies in reasoning such as those affecting the classical theory. Adopting the same approach developed in the *Treatise on Probability* to attack Bernoulli's principle of indifference, of induction and statistical inference (see Carabelli, 1988), the *General Theory* contains a methodological criticism of the classical theory consisting in informing the reader of the tacit assumptions classical economists had introduced into their analysis.

"Brought up in the citadel" (CW 13, p. 489), Keynes explicitly recognizes the strength of the classical theory. The "heretics" (p. 488) of his days were mistakenly supposing that "common observation is enough to show that facts do not conform to the orthodox reasoning" (p. 489), whereas Keynes believed (see the *Treatise on Probability*, CW 8, p. 231) that observation is theory-laden, for it implicitly includes theoretical hypotheses about the observed material. One must use logic to raise doubts on a theory; yet, "if orthodox economics is at fault, the error is to be found not in the superstructure, which has been erected with great care for logical consistency, but in a lack of clearness and of generality in the premisses" (CW 7, p. xxi). By referring to the classical fallacy of composition in chapter 19, Keynes suggests that the classical theory is unwilling to make explicit those *tacit* assumptions introduced to support the generality and validity of its arguments (Carabelli, 1991; see also Gerrard, 1997). The classical theory builds on a tacit assumption of independence of the real variables of the economic system from changes in the value of money; it tacitly assumed the system to be always operating to its full capacity; in passing from the individual to the general level, it tacitly postulates independence from changes in the level of community income. Besides, the theory believes that the realm of validity of such assumptions is universal across all times and spaces. The aim of the *General Theory* is to demonstrate, conversely, that such "tacit assumptions are seldom or never satisfied" (CW 7, p. 378): conclusions obtained by classical economists are as limited as their premises, and the generality of the theory irremediably reduced [3].

3. MAKING SCIENCE WITH A COMPLEX WORLD: THE LEGACY OF THE *TREATISE ON PROBABILITY*

A *fil rouge* links Keynes's insistence on the concepts of cause and independence in chapter 18 to his criticism of the classical theory and the construction of an alternative one, but relevant parts of the thread pass outside the *General Theory*. In the *Treatise on Probability*, Keynes deals with the logical foundations of analogy and inductive reasoning. Analogy is possible, he writes, in case of "limited independent variety" (CW 8, p. 280), that is when the premises of an argument belong to a finite system of facts – the amount of "independent variety" made up by the system's constituents and the laws of connection between them is inferior to the number of its members. The application of the principle to the material world amounts to assuming

"what the mathematicians call the principle of the superposition of small effects, or, as I prefer to call it ... the *atomic* character of natural law. The system of the material universe must consist, if this kind of assumption is warranted, of bodies which we may term ... *legal atoms*, such that each of them exercises its own separate, independent and invariable effect, a change of the total state being compounded of a number of separate changes each of which is solely due to a separate portion of the preceding state ... each [particular body] has on the others its own separate and invariable effect, which does not change with changing circumstances, although, of course, the total effect may be changed to almost any extent if all the other accompanying causes are different. Each atom can, according to this theory, be treated as a separate cause and does not enter into different organic combinations in each of which it is regulated by different laws" (pp. 276-7).

This means that the "atomic hypothesis" which justifies inductive reasoning and mathematical calculus cannot be applied to organic complex systems: neither to probability, which has an organic nature ("a degree of probability is not composed of some homogeneous material, and is not apparently divisible into parts of like character with one another", p. 32), nor to social disciplines. In his 1926 *Essay on Edgeworth*, Keynes catalogues a series of problems invalidating the use of the hypothesis:

The atomic hypothesis which had worked so splendidly in physics breaks down in psychics. We are faced at every turn with the problem of organic unity, of discreteness, of discontinuity – the whole is not equal to the sum of the parts, comparison of quantity fails us, small changes produce large effects, the assumptions of a uniform and homogeneous continuum are not satisfied (CW 10, p. 262).

Readers of the *General Theory* find several references to the "complexities and interdependencies of the real world" (CW 7, p. 298) [4]. Keynes is critical of the attempt to blindly apply mathematics and statistics, with their assumptions of homogeneity, atomism and independence, to an economic material that

is essentially vague and indeterminate, not homogeneous, not divisible in homogeneous independent parts, not finite, and is characterized by organic interdependence. Yet the problem, in his view, concerns science in general. In his youth papers on aesthetics (see O'Donnell, 1995; Dostaler, 2007), Keynes had discussed the relationship between science and art, arguing that they possess similar procedures. He condemned the "supposed antagonism between the precise and verbal notions of philosophy and the organic, indivisible perceptions of beauty and feeling, between those things which we perceive piecemeal and those which we perceive as wholes", and stresses the need to combine the artist's "intuitive powers" with the scientist's intuitive ability (Keynes, undated, p. 2), so that "knowledge and creation may advance together" (ib.; see Keynes 1909).

As he wrote as early as 1913, in *Indian Currency and Finance*, the economist must keep in mind that when confronted with an economic system wherein "every part fits into some other part" (CW 1, p. 181),

It is impossible to say everything at once, and an author must needs sacrifice from time to time the complexity and interdependence of fact in the interest of the clearness of his exposition. But the complexity and the coherence of the system require the constant attention of anyone who would criticize its parts. This is not a peculiarity of Indian finance. It is the characteristic of all monetary problems (pp. 181-2).

The analysis of such problems requires a theory and a method able to tackle organic interdependence among the variables at play without theoretically reducing the complexity of the system under investigation. Still, organicism poses a "problem of paralysis" (Chick, 2003, p. 318): the economist is free to adopt the artist's synthetic perspective, but science requires requires a certain degree of decomposability, not to speak of the need to communicate the results of the analysis at an epoch when the techniques of the modern economics of complexity were yet to be discovered.

A crucial point to consider is that, in line with the *Treatise on Probability*, the *General Theory* is critical of (the abuse of) mathematical formalisation (on formalism in the *General Theory*, see O'Donnell 1997). The latter may be a legitimate and effective tool to express functional relationships between variables, and – when its use is permitted by the nature of the material under consideration – be helpful to "disclose gaps and imperfections in your thought" (CW 8, p. 305), but its validity is greatly constrained by the introduction of assumptions of "strict independence":

It is a great fault of symbolic pseudo-mathematical methods of formalising a system of economic analysis (...) that they expressly assume strict independence between the factors involved and lose all their cogency and authority if this hypothesis is disallowed; whereas, in ordinary discourse, where we are not blindly manipulating but know all the time what we are doing and what the words mean, we can keep 'at the back of our heads' the necessary reserves and qualifications and the adjustments which we shall have to make later on, in a way in which we cannot keep complicated partial differentials 'at the back' of several pages of algebra which assume that they all vanish. Too large a proportion of recent 'mathematical' economics are merely concoctions, as imprecise as the initial assumptions they rest on, which allow the author to lose sight of the complexities and interdependencies of the real world in a maze of pretentious and unhelpful symbols (CW 7, pp. 297-8).

Keynes's preference for an organic rather than an atomic approach to economics is therefore connected with the use of ordinary rather than mathematical language. In the *Treatise on Probability*, Keynes stresses that, unlike artificial languages with their members in finite number and their exhaustive alternatives, the logic of probability is an open logic: the idea is developed, for instance, when Keynes compares the logic of probability to the logic of colours and of similarity (CW 8, pp. 38-39). In a similar vein, Keynes maintains that it is through ordinary language that the economist can cope with the complexity of economic material, which is "much too vague to support" (CW 14, p. 379) mathematical treatment. Unsurprisingly, this view is quite close to Marshall's, whose conception of economics as fundamentally complex is certainly a legacy of the utmost importance for Keynes (see Marchionatti 2010). In Keynes's view, Marshall believed that the economic interpretation of "the complex and incompletely known facts of experience" requires the economist to go beyond the "bare bones of economic theory" (CW 10, p. 86). Abstract reasoning is simply too rigid to allow for investigations into a complex economic material: it must be supplemented by "trained common sense" and by the use of everyday language – economics "must endeavour to conform itself to the familiar terms of everyday life" –, which allow for "shades of meaning" which can be interpreted "by the context" (Marshall, 1961, p. 51). As the complexity of the subject increases, however, economic reasoning becomes, in Marshall's (1898, p. 39) conception, "more biological in tone", thereby reducing the role of abstract reasoning (with its *ceteris paribus* conditions and its successive approximations approach) and of mathematics: the mathematician "takes no technical responsibility for the material, and is often unaware how *inadequate* the material is to bear the strains of his powerful machinery" (Marshall, 1961, p. 781).

Still, chapter 18 of the *General Theory* makes use of schematisms and assumptions of independence. More, Keynes apparently contents himself with Marshall's analytical method, the *ceteris paribus* condition – “breaking up a complex question, studying one bit at a time, and at last combining ... partial solutions [thus obtained] into a more or less complete solution of the whole riddle” (Marshall, 1961, p. 366) –, which usually goes along with partial equilibrium analyses. All this seems to produce a discrepancy with respect to Keynes's aspirations to investigate the “complexities and interdependency” of the economic system by means of a new, original methodology adequate to the task. The key to understand the methodological revolution of the *General Theory* is to be found in the *Treatise on Probability*.

Keynes's criticism of the classical theory is in fact a criticism of logical relevance: in his view, the classical theory tacitly introduces assumptions of “logical independence from” having the characteristic of universality in space and time. Discussing Bernoulli's principle of indifference in the *Treatise on Probability*, Keynes distinguishes between judgements of preference or indifference (between arguments which have same evidence but different conclusions) and judgements of relevance or irrelevance (between arguments which have the same conclusions but different evidence), which are not absolute but relative to the “quaesitum” and to the particular circumstances in which this latter is raised. Keynes considers judgements of independence, such as those supporting the atomic hypotheses which inform not only Marshallian “*ceteris paribus*” analyses but also mathematical economics and general equilibrium theory, as judgements of logical irrelevance. The above recalled assumptions of “independence from” in the classical theory are but judgements of “logical irrelevance” of changes in the value of money, in the value of output and income for determining the real variables of the system.

Likewise, judgements of logical relevance underpin the taxonomy of variables of chapter 18. Keynes's reluctance to assign to independent variables the role of “ultimate atomic independent elements” is a way of distancing himself from a rigid interpretation of the notions of “cause” and “independence” (see Carabelli, 1988). In the *Treatise on Probability*, he chooses not to focus on the material connection between events, but on the analysis of the cognitive conditions which surround the assertion of a causal connection. He thus differentiates between *causa essendi*, or “the cause why a thing is what it is” (which he also names “causal

dependence”) and *causa cognoscendi*, or “the cause of our knowledge of the event” (“dependence for knowledge”; CW 8, p. 308). Keynes deliberately chooses not to tackle the problem of the relationship between logical and empirical (material) relevance, but stresses that albeit the two aspects are often confused, the adoption of the hypothesis of atomic uniformity in science should not be interpreted as the acceptance of empirical uniformity, and clearly distinguishes between a form of “independence for knowledge” (informing his own view of probability) and “objective forms of independence” (p. 184).

It is no coincidence that Keynes refers to “causal analysis” as “strictly logical” in the 1933 draft of the *General Theory* (CW 29, p. 73): in a vision of economics as a branch of probable logic, cause is a cognitive concept and a rule to form propositions; a logical ground for believing, which is relative to particular circumstances and relies on a concept of *causa cognoscendi*. In Keynes's view, economics can be described as “a science of thinking in terms of models joined to the art of choosing models which are relevant to the contemporary world” (CW 14, p. 296). In general, Keynes opposed the use of quantitative models of the kind of those used in econometrics or applied economics: “it is the essence of a model that one does not fill in real values for the variable functions. To do would make it useless as a model. For as soon as this is done, the model loses its generality and its value as a mode of thought” (ib.). Models, in Keynes's economics, have rather a logical nature: their object is in fact “to segregate the semi-permanent or relatively constant factors from those which are transitory or fluctuating so as to develop a logical way of thinking about the latter and of understanding the time sequences to which they give rise in particular cases” (pp. 296-7).

It is because of the “logical” nature of the causal analysis of the *General Theory* that Keynes can describe the “complex” determinant of the system as “independent in the sense that their values cannot be inferred from one another” (CW 7, p. 183), and can name “given factors” those variables of which he is not considering, “in this place and context, the effects and consequences of changes in them” (p. 245); the taxonomy itself, continuously refined, is “arbitrary from any absolute standpoint” (p. 247) and valid in some but not all contexts (“we can *sometimes* regard our ultimate independent variables as consisting of ...” p. 246, emphasis added). In short, when drawing causal connections in the chapter 18 summary of the *General*

Theory, Keynes is using a “strictly logical” causal analysis and establishing connections between arguments and propositions on the bases of notions of logical relevance and of direct judgements of dependence or independence “for knowledge”.

In direct continuity with the *Treatise on Probability*, judgements of relevance in the *General Theory* are relative to the practical purpose of the analysis and the particular circumstances in which the *quaesitum* is raised: hence the decision to select those variables which can be “deliberately controlled or managed by central authority” (p. 247); or to focus on the amount of investment, as in the famous 1937 *Quarterly Journal of Economics* article, for “it is usual in a complex system to regard as the *causa causans* that factor which is most prone to sudden and wide fluctuation” (CW 14, p. 121). A criterion of usefulness and convenience is therefore adopted, so as to make the problem at stake “more manageable” for our “practical intuition”, “which can take account of a more detailed complex of facts that can be treated on general principles” (CW 7, p. 249).

4. KEYNES’S TWO-STAGE METHODOLOGY

It is only after having made explicit, in chapter 18, the assumptions of independence employed in constructing the *General Theory* until book IV that Keynes can legitimately outline his own method of analysis, thereby remarking the multifaceted revolution this latter brings about with respect to the classics. On one side, Keynes would have appreciated the ambition of general equilibrium economists to construct a theory of the economic system resting on the concept of interdependence, but he could not consider as acceptable (in Simon's 1957 terminology) the “atomic”, “empirically and logically independent”, sentences lying at the basis of the algebraic system of simultaneous equations on which the theory is built (see also notes [3] and [6]). It is in fact in chapter 21 that Keynes applies to “symbolic pseudo-mathematical methods of formalising a system of economic analysis”, which he attacks for assuming “strict independence between the factors involved”, the reasoning he had expoused in *A Treatise on Probability* when dealing with the “atomic character of natural law” and the corollary that each “legal atom”, to be treated “as a separate cause”, exercises “its own separate and invariable effect”. On the other side, chapters from 19 to 21” show

Keynes's dissatisfaction with the theoretical instrument developed by Marshall to make science with a complex material, and the ambition to bring his master's research program to completion. Keynes's own method of economic analysis requires the economist to exceed the limits of the *ceteris paribus* condition by deliberately repudiating those same "provisional conclusions" reached when assuming, within a purely logical, strictly finite time interval, "all other things" to be equal:

after we have reached a provisional conclusion by isolating the complicating factors one by one, we then have to go back on ourselves and allow, as well as we can, for the probable interactions of the factors amongst themselves. This is the nature of economic thinking. Any other way of applying our formal principles of thought (without which, however, we shall be lost in the wood) will lead us into error (CW7, p. 297).

Keynes acknowledges the (provisional) need of such assumptions to make science with a complex social world, but wants economists to make them explicit in the course of the analysis, as happens with a declared use of the *ceteris paribus* condition. And he wants to show them that it is in their power to resist the temptation of the Marshallian partial equilibrium analysis: the key is to adopt a two-stage methodology, one which, after having isolated the complicating factors one by one, allows for the probable interactions of factors amongst themselves (see also Vercelli, 1991). A truly general theory is for Keynes a theory which does not depend on the introduction of tacit assumptions of independence; a theory which is not universal in time and space, but is able to cope with different hypothetical cases characterized by different levels of dependence among the variables; a theory which allows for change and variability and permits them to play a central role in the analysis.

By this two-stage methodology, Keynes reaffirms that the economic material retains its complex nature even after the provisional introduction of schematisms, and that only our "ordinary language" logic can tackle this complexity. Intuitive direct judgements such as those implied in the choice of independent and dependent variables play a fundamental role with greater reason in the second, wholly and explicitly probabilistic (Vercelli, 1991) part of the analysis, as confirmed by the use of the term "probable" – in the logical sense of the *Treatise on Probability* (see section 5 for a more detailed discussion) – to denote the interactions of factors previously isolated. The hypothesis of independence inherent to the use of independent variables in chapter 18 is nothing but, exactly, a hypothesis, or which amounts to the same

thing, a case of “independence for knowledge”. “Acquainted with [the author’s] own method” (CW 7, p. 257), we are now in a position to understand the exact meaning of the “roundabout repercussions” proposed in chapter 19 to discuss the “fluidity of money-wages” argument of the classical theory.

Here is Keynes’s account of the two-stage methodology:

Let us, then, apply our own method of analysis to answering the problem. It falls into two parts. (i) Does a reduction in money-wages have a direct tendency, *cet. par.*, to increase employment, ‘*cet. par.*’ being taken to mean that the propensity to consume, the schedule of the marginal efficiency of capital and the rate of interest are the same as before for the community as a whole? And (2) does a reduction in money-wages have a certain or *probable* tendency to affect employment in a particular direction through its certain or *probable* repercussions on these three factors (p. 260, emphases added)?

The *ceteris paribus* hypothesis used in part (1) with respect to those variables which can be “sometimes regard[ed as] our ultimate independent variables” (p. 246) immediately leaves room for a study, in part (2), of the repercussions of the reduction in money-wages on the three factors, which is conducted, as the quote makes clear, in fully probabilistic terms. After answering negatively to question (1) – the volume of employment depends on the volume of effective demand, which in its turn depends on changes in the propensity to consume, in the marginal efficiency of capital and in the rate of interest –, Keynes enumerates seven “probable repercussions” which the classical theory fails to consider.

First, the reduction of money-wages induces a reduction of prices, which leads to a redistribution of real income from wage-earners to other factors of the production, and from entrepreneurs to rentiers. Keynes explicitly admits that this transfer is likely to diminish the propensity to consume. The same for the third repercussion, which, as happens with the second (though the final result is the opposite), is relative to an international system, where the reduction of money-wages relatively to money-wages abroad is likely both to induce a raise of investments via the increase of the balance of trade, and to worsen the terms of trade, with the result that the reduction in real incomes may tend to increase the propensity to consume. The fourth and fifth repercussions concern expectations: by increasing the marginal efficiency of capital, the reduction of money wages will be favourable to investment (repercussion #4), if it is expected to be a reduction relatively to money-wages in the future, while it will have the opposite effect if the community expects money-wages to further diminish in prospect. Yet the reduction will reduce in any case the schedule

of liquidity-preference for the community as a whole, thus raising investments (repercussion #5); but as in the case of the fourth repercussion (although with opposite effects), expectations play a fundamental role. The sixth and seventh repercussions deal respectively with the effects of a reduction in money-wages in terms of the general tone of optimism or pessimism they can produce on entrepreneurs (so that they “may break through a vicious cycle of unduly pessimistic estimates of the marginal efficiency of capital and set things moving on a more normal basis of expectation”, p. 264) and workers, and the negative influence of a greater burden of debt on the former.

Keynes concludes that a reduction of money-wages cannot alter employment unless it affects effective demand via its repercussions on the propensity to consume, on liquidity-preference and expectations of future yield from capital-assets. This is of the utmost importance, since it amounts to recognising that in the second stage of the analysis, a change in the value of an independent variable (money-wages) may have repercussions on variables which are also defined as “independent” in chapter 18 (the point is noted by Gerrard, 1997; see also Asimakopulos, 1991, and Togati, 2006; note that in the first proof of the *General Theory* – chapter 18 was sent to the publisher at the end of March 1935: see Hirai, 2008 –, Keynes even came to argue that “in some contexts it will be reasonable to take the readiness to consume ... amongst the given factors of the system”, CW 14, p. 503). The notion of independence used by Keynes in chapter 18 reveals to be in truth, and more correctly, “independence for knowledge”: allowing for the “probable interactions among the factors themselves”, the second stage of the analysis permits to get rid of the first-stage schematism, for these same interactions induce to redefine the relationships between the variables themselves.

But there is more. After illustrating the seven repercussions, Keynes explains that although they were probably “the most important”, the list was “not a complete catalogue of all the possible reactions of wage reductions in the complex real world” (CW 7, p. 264). In truth, chapters from 19 to 21 seem constructed in such a way as to inform readers that the economic material possesses the whole ensemble of attributes of complexity listed by Keynes in his *Essay on Edgeworth*, thereby strengthening the methodological positions expressed in the four intermediate chapters between the *pars destruens* (chapters 2-3) and the *pars construens*

of the *General Theory* (from chapter 8 on). Chapter 4 in particular is devoted to “the choice of units of quantity appropriate to the problems of the economic system as a whole” (p. 37). The volume of real output or income, that of real net output, the stock of real capital and the general price level are defined as “incommensurable collections of miscellaneous objects” (p. 39); “the community’s output of goods and services”, in particular, is “a non-homogenous complex which cannot be measured” (p. 38), since complex magnitudes, as Keynes writes in the *Treatise on Money* with respect to the value of money and the general price level, are “capable of variations of degree in more than one mutually incommensurable direction at the same time” (CW 5, p. 88).

There is nothing new, in this regard, in the *General Theory* approach. The *Treatise of Probability* defines non-comparable probabilities as the general case, and thereby treats individual beliefs as complex magnitudes; Keynes’s 1909 essay on “The Method of Index Numbers” (CW 11, pp. 49-56) deals with quantities such as individual prices, the general price level, the esteem standard and the wage standard, that are in themselves incapable of measurement; both the *Tract on Monetary Reform* and the *Treatise on Money* consider the general price level as a complex magnitude (see Carabelli, 1992). To reassure readers, Keynes explains, in chapter 4 of the *General Theory*, that “conundrums ... of no solution” engendered by such complex, vague magnitudes are in truth not insurmountable, provided economists renounce using “quantitatively vague expressions” (CW 7, p. 39) and opt for ordinary language:

[these difficulties] are “purely theoretical” in the sense that they never perplex, or indeed enter in any way into, business decisions and have no relevance to the causal sequence of economic events, which are clear-cut and determinate in spite of the quantitative indeterminacy of these concepts (ib.).

Still, these difficulties force Keynes to use the quantity of employment as a proxy for the volume of output; and in the summary of chapter 18 itself, as hinted at above, he brings problems of discreteness and discontinuity to the reader’s attention. In chapter 19, the classical theory is blamed for offering a “simple” (p. 257) “money-wages” argument: an echo of the *Treatise on Probability*, where, recalling Augustin-Jean Fresnel, the French physicist, Keynes maintains that “simplicity is a dangerous criterion” (CW 8, p. 239). Chapter 20 begins with expressing concern for problems of organic interdependence among variables and consequently

of measurement, inducing Keynes to substitute the “employment function for the ordinary supply curve”. The employment function, in fact, “expresses the *relevant* facts in terms of the units to which we have decided to restrict ourselves, without introducing any of the units which have a *dubious quantitative character*” and “lends itself to the problems of industry and output as a whole” (CW 7, p. 281, emphases added).

What is more, the two-stages analytical method is employed as concerns not only the hypothesis of independence, but also of proportionality. Initially, Keynes assumes that to every level of aggregate demand there corresponds a unique distribution of it between the products of each individual industry of the system. When aggregate expenditure changes, however, “the corresponding expenditure on the products of an individual industry *will not, in general, change in the same proportion*” (individuals will not change the amount of the products purchased from each industry in the same proportion, and prices of different products will react in different degrees; CW 7, p. 286, emphasis added). Therefore,

the assumption upon which we have worked hitherto, that changes in employment depend solely on changes in aggregate effective demand (in terms of wage-units), is no better than a first approximation, if we admit that there is more than one way in which an increase of income can be spent (ib., emphases added).

Moreover, with two final “practical qualifications” (CW 7, pp. 289-90) directing attention to the asymmetry between inflation and deflation of effective demand, Keynes violates the “crude quantity theory of money” ensuring the system’s equilibrium: as in chapter 19, changes in an independent variable, that is money-wages, affect another variable previously considered as independent, the propensity to consume. Rising money-wages come to the disadvantage of rentiers; the process is likely to begin before full employment is attained, which will be easier to reach “if the rentier is less prone to spend than the entrepreneur ... than will be the case if the opposite hypothesis holds” (p. 290). And this same hypothesis may be subjected to change as a result of the rentier’s impoverishment.

But the most interesting example of Keynes’s attempt to cope with the complexity of the economic material in the *General Theory* is probably offered by the theory of prices of chapter 21 (see also Marchionatti, 2010). Here again, the analysis is divided into two stages: first, Keynes introduces the

simplification of assuming that the rates of remuneration of the different factors of production which enter into marginal cost *all change in the same proportion*, i.e. in the same proportion as the wage-unit (CW7, p. 295, emphases added).

Yet he immediately feels the necessity to

simplify our assumptions still further, and assume (1) that all unemployed resources are *homogeneous* and *interchangeable* in their efficiency to produce what is wanted, and (2) that the factors of production entering into marginal cost are content with *the same money-wage* so long as there is a surplus of them unemployed (ib., emphases added).

Hence a theory of money assuring changes in employment (prices) “in the same proportion” (p. 296) as the quantity of money so long as there is unemployment (when there is full employment). Once these “simplifying assumptions” are introduced, however, the economist has to allow for those “possible complications which in fact influence events” (ib.):

- (1) Effective demand will *not change in exact proportion* to the quantity of money.
- (2) Since resources are *not homogeneous*, there will be diminishing, and not constant, returns as employment gradually increases.
- (3) Since resources are *not interchangeable*, some commodities will reach a condition of inelastic supply whilst there are still unemployed resources available for the production of other commodities.
- (4) The wage-unit will tend to rise, *before full employment* has been reached.
- (5) The remunerations of the factors entering into marginal cost will *not all change in the same proportion* (ib., emphases added).

In truth, the “complex real world” is characterized by lack of proportionality between causes and effects, by dishomogeneity and incommutability. It is no coincidence that Keynes outlines the “nature of the economic thinking” (implying the two-stages analysis) immediately after discussing such “complicating factors” (p. 297). Having accustomed his readers to interpret the “simplifying assumptions” introduced in the course of the analysis as the first logical step of a more complicated work, Keynes wants them to avoid supposing that the “possible complications” are “strictly” independent only in reason of their being considered “each of them in turn”. In Keynes’s own words (a perfect illustration of ordinary discourse at work):

We will consider each of them in turn. But this procedure must not be allowed to lead us into supposing that they are, strictly speaking, independent. For example, the proportion, in which an increase in effective demand is divided in its effect between increasing output and raising prices, may affect the way in which the quantity of money is related to the quantity of effective

demand. Or, again, the differences in the proportions, in which the remunerations of different factors change, may influence the relation between the quantity of money and the quantity of effective demand (ib.).

“The primary effect of a change in the quantity of money”, writes Keynes using a variant of his concept of *causa causans*, “is through its influence on the rate of interest” (ib.). This makes the analysis quite easy: it suffices to derive this effect from the schedule of (a) liquidity-preference (which gives the reduction of interest rate needed to induce holders to absorb the new money); (b) the schedule of marginal efficiencies (for the relationship between the reduction of interest rate and the increase of investments), and (c) the investment multiplier (for the relationship between increased investment and consequent increment of effective demand).

But this analysis, though it is valuable in introducing order and method into our enquiry, presents a deceptive simplicity, if we forget that the three elements (a), (b) and (c) are themselves partly dependent on the complicating factors (2), (3), (4) and (5) which we have not yet considered. For the schedule of liquidity-preference itself depends on how much of the new money is absorbed into the income and industrial circulations, which depends in turn on how much effective demand increases and how the increase is divided between the rise of prices, the rise of wages, and the volume of output and employment. Furthermore, the schedule of marginal efficiencies will partly depend on the effect which the circumstances attendant on the increase in the quantity of money have on expectations of the future monetary prospects. And finally the multiplier will be influenced by the way in which the new income resulting from the increased effective demand is distributed between different classes of consumers (pp. 298-9).

The reader may note that Keynes introduces a recursive argument into the analysis of the schedule of liquidity-preference, and that also this catalogue of possible repercussions is partial (“Nor, of course, is this list of possible interactions complete”, p. 299). True, Keynes argues, “if we have all the facts before us” (which is indeed a strong requirement), “we shall have enough simultaneous equations to give us a determinate result” (ib.). Yet, this is of little (if any) interest to him. Keynes limits himself to observe that “it is only in highly exceptional circumstances that an increase in the quantity of money will be associated with a *decrease* in the quantity of effective demand” (ib.). He then remarks the affinity linking the ratio between the quantity of effective demand and the quantity of money with the concept of “income-velocity of money”, only to stress that this latter is “in itself, merely a name which explains nothing. There is no reason to expect that it will be constant”, for it depends “on many complex and variable factors” (ib.) – such as the interest

rate, as he had already observed in chapter 15. As the income-velocity of money is allowed to vary, it becomes possible to write down a “generalised statement of the quantity theory of money” (p. 305) in mathematical formulas. However, Keynes attaches little value “to manipulations of this kind”, since “they involve just as much tacit assumption as to what variables are taken as independent ... as does ordinary discourse, whilst I doubt if they carry us any further than ordinary discourse can” (ib.).

What in fact captures Keynes’s attention is a phenomenon whose understanding depends on the possible complications from (2) to (5): the combination of rising labour-costs (when wages are given irrespectively of workers’ efficiency) as output increases (with the rates of remuneration of different factors showing “varying degrees of rigidity”, p. 302), on one side, and “bottle-necks” in the supply of particular commodities, on the other, both elements causing prices to increase before full employment is reached. This material proves to be intractable in a formal manner: bottle-necks are more easily reached when changes in effective demand are large and unforeseen rather than moderate, while “the psychology of the workers” and “the policies of employers and trade unions” concur to determine a series of “points of discontinuity” at which “an increasing effective demand tends to raise money-wages though not fully in proportion to the rise in the price of wage-goods; and similarly in the case of a decreasing effective demand” (p. 301). These positions of “semi-inflation” (ib.), Keynes argues, have “a good deal of historical importance. But they do not readily lend themselves to theoretical generalisations” (p. 302).

5. CHAPTER 18 AS A GUIDE TO THE READING OF THE *GENERAL THEORY*

Let us now “gather together the threads of our argument”, as Keynes writes (CW 7, p. 245) at the beginning of chapter 18, and suggest an interpretation of the three major issues raised by chapter 18 itself. The post-Keynesian literature has identified a fundamental difference between Keynes’s theory and general equilibrium models in the observability of the “special characteristics” of the system’s determinants. For sure, “experience” plays a fundamental role in helping determining the stability conditions of the system. But Keynes is critical of the German historical school, which is content with using “empirical methods”, and discards “formal analysis” (CW 7, p. xxv): for him too, as already for Marshall (who began his 1885

Cambridge introductory lecture, “The Present Position of Economics”, by attacking the historical school’s criticism of economics), “facts by themselves are silent” (Marshall 1925, p. 166). Writing as the author of the *Treatise on Probability*, Keynes suggests that if it is possible to “safely generalise from experience” about, say, the propensity to consume, this is because, despite obvious differences in human consumption behaviour, this “independent variety” is “limited”, so that generalising about this social phenomenon is safe. Keynes always filters experience through logic, as chapter 18 makes evident:

Now, since these facts of experience [that is, the economic system is not violently unstable] do not follow of *logical necessity*, one must *suppose* that the environment and the psychological propensities of the modern world must be of such a character as to produce these results. It is, therefore, useful to consider what *hypothetical* psychological propensities would lead to a stable system; and, then, whether these propensities can be *plausibly* ascribed, on our *general knowledge* of contemporary human nature, to the world in which we live (p. 250, emphases added).

Another confirmation comes from the first proof of the *General Theory*. The original formulation of what later became the third section of the chapter includes Keynes’s call for a fruitful collaboration between logic and experience, which however rests on a declared primacy of the former on the latter: “Thus we begin our theoretical study with the premise that changes in effective demand are what matters; and we then proceed interspersing our logic with practical judgements based on experience, to analyse the variables which can be regarded as chiefly significant in changing effective demand” (CW 14, p. 504). Rather, history and experience may alter the judgements of relevance lying behind the core of limited independent variety which Keynes exposes in chapter 18, and even the specific choice of the independent variables, since such judgements draw on historical circumstances and social conditions; but the hypothesis of relevance is of a logical, not empirical, nature, and strictly depends on the economist’s *quaesitum*.

The above provides a framework to understand also the somewhat flexible taxonomy of variables and the apparently reductionist character of the summary of the *General Theory* in chapter 18. In the first draft of the book, the chapter was entitled “The Equilibrium of the Economic System” (CW 14, p. 502; see Kriesler and Nevile, 2002). The original title would have characterized chapter 18 exclusively as the final destination of the theoretical journey proposed by Keynes in chapters from 1 to 17, whereas, in the light of

what precedes, chapter 18 should also be considered as the starting point (hence the need of “restating” the *General Theory*, as the chapter’s title makes clear) of a travel which is yet to begin.

The summary of chapter 18 is a synthetic representation of the results obtained by exploiting the first stage of Keynes’s analytical method. True, the Marshallian-neoclassical tools upon which the summary rests might be interpreted as a betrayal of Keynes’s proclaimed revolution; and yet, consistently with his own methodological positions, Keynes could not win the struggle against the classic citadel except by explicitly adopting, at an initial stage, the classical methodology, only to abandon it later on, when he passes to the second stage of the analysis. In his view, as seen, the classical theory lacks adequate understanding of the relationship between the characteristics of the theoretical tools adopted and those of the material under consideration. Where Keynes methodologically departs from the classics is therefore exactly in making explicit, in the summary of the volume, the assumptions of independence tacitly introduced into the analysis of chapters from 1 to 17.

In so doing, Keynes assigns a fluid character to the independent variables. The taxonomy is flexible in a general sense: it depends on the *quaesitum* and rests upon Keynes’s preference for manageable and controllable variables. But by subjecting the chosen variables to a potentially endless “further analysis”, he also admits the impossibility to indicate the ultimate, atomic independent elements of his analysis. He simply cannot do so, since the notion of independence he uses in the *General Theory* is that of “independence for knowledge”, which is the only kind of independence allowed in a study of a complex economic material. This help understanding Keynes’s proceeding by “provisional closures” [5] to be removed in the course of the analysis: for instance, chapter 3 introduces the marginal propensity to consume as key to understand the relationship between demand and income, “but makes no attempt to explain investment when aggregating to output as a whole: it is taken as given” (Chick, 2004, p. 9), as happens with both long-period and short-period expectations, and the latter are also taken as correct. Then, in chapter 5, Keynes removes the assumption that short-period expectations are correct, although the level of aggregate demand is still taken as given. This latter assumption is removed in chapters 8-10, which make an attempt to explain it through the consumption function, the multiplier and shifts in long-term expectations (see Chick 2004).

By illustrating the interplay between (only presumed) independent variables, and revisiting the results of the analysis in the light of any possible repercussion between such factors, chapters 19 to 21 of the *General Theory* shed light on the characteristics of complexity of the economic material which necessarily prevent, in Keynes's view, the use of the atomic hypothesis on which both the Marshallian *ceteris paribus* analysis and the system of simultaneous equations of general equilibrium theory rest. It could be argued that some chapters of the *General Theory* – chapter 3, wherein he exposed the principle of effective demand, and chapter 10, dealing with the multiplier – are mathematical in their essence. Yet, consistently with his preference for “symbolic” rather than “algebraic” equations, the latter requiring “assumptions which are too much simplified” (reported in Rymes 1989, p. 77) Keynes used functional relationships and abstract (that is, not precisely specified) functions only. Moreover, he used the more precise term “curve” when exposing the classical theory but always opted for the more abstract term “function” when expounding his own theory (Backhouse 2010). He employed the strong term “determines”, in the first-stage chapters, to identify causal relationships between independent and dependent variables, thereby constructing a multi-causal logical analysis of the economic material under consideration, and, at the same time, to attack on the indeterminacy of the classical theory. Still, the author of a formidable defence of probable reasoning (of having some reasons to believe, in his own words) against the too strong requirement of certainty of belief, as well as of a logical instead of mathematical conception of probability, Keynes constantly reminded readers of the *General Theory* of the danger of blind mathematical manipulations, inviting them to avoid reasoning in terms of certainty and of mathematical probability, and reiteratedly insisted on the strong limitations of mathematical analysis.

Symbolically representing the interrelationships between complex variables (see Gotti 1994), chapters 1 to 17 often refer readers to the explicitly probabilistic chapters 19 to 21 (e.g. CW 7, pp. 18, 89), and Keynes anticipates, in chapter 14 (pp. 183-84), the core methodological argument of chapter 18. He repeatedly warns readers that it would be a mistake to limit the analysis to the first stage of the analysis: he tries to be as honest as possible in declaring the restrictive hypotheses he has introduced into the analyses of chapters 1 to 17, although he adequately tackles them only later, in chapters 19 to 21, and despite the necessity of chapter

18 to help readers identify the rules of this game. It is also in the light of such “flashes forward” (Chick 1983, p. 14), softening the apparently more demonstrative character of the “first stage” chapters of the *General Theory*, that the two stages of Keynes’s original methodology finally appear as two intertwined parts of a more general, non-deterministic and non-demonstrative logic, which pays due regard to contingencies and varying cognitive circumstances (hence the insistence on variables that can be controlled or managed).

Chapter 21 in particular is conceived as an exercise in complexity. Simplifying assumptions initially introduced are later removed, with an explicit admission that the possible complications thus derived should not be treated as independent one from another. More, their list is left open-ended, as in the case of the repercussions of a change in the volume of employment on the schedule of liquidity-preference in chapter 18 and of the catalogue of possible reactions to wage reduction in chapter 19: Keynes constantly encourages readers to enlarge the perspective with new “possible complications”. A relevant antecedent of this specific method is detectable in the *Treatise on Money*, and particularly in the analysis of the credit cycle in chapter 20, which is significantly entitled “An Exercise in the Pure Theory of the Credit Cycle”. In the *Treatise*, Keynes describes credit cycles as episodes of disequilibria of purchasing power brought about by changes due to “investment factors”, that is to divergences between the market rate and the natural rate of interest. Yet, more properly, they constitute “a complex phenomenon resulting from the combined effects of changes in the costs of production and of the phases of the credit cycle proper” (CW 5, p. 249), for monetary and industrial factors interact with investment factors in the course of the cycle. Keynes holds that “theoretically at least – it is possible to disentangle from these complications the element of commodity inflation which constitutes a credit cycle” (ib., emphasis added). But the closure is exactly valid on a theoretical level only: investment factors are only provisionally taken as independent, since they are independent “for knowledge”.

“The possible varieties of the paths which a credit cycle can follow and its possible complications are so numerous that it is impracticable to outline all of them” (p. 253), Keynes remarks; and on introducing chapter 20 of the *Treatise*, he illustrates a “method” of analysis implying the introduction of “simplifying assumptions which have to be introduced in order to rule out the various complexities which are usually

present in actual life" (p. 274). After describing the "particular type of credit cycle" which result from the eight chosen "simplifying assumptions", Keynes "abate[s] the rigour of [the] assumptions" (p. 280) and finally removes these "limitations" (p. 284), thereby allowing for "complications" which he describes as "non-essential" only in respect to the purpose of the analysis – that is, "to set out the essential mechanism" (p. 275). Here too, as in the *General Theory*, simplifying assumptions are not independent one from another. The removal of a single limitation makes the cycle "more complicated, and one can only describe its exact course if one first makes an assumption as to its exact character" (p. 285): when Keynes abates the "no-hoarding hypothesis" (p. 288), he is obliged to treat separately a situation in which the course of the credit cycle is "correctly foreseen" and one wherein "mistaken expectations" (p. 289) prevail, that is between a situation in which another simplifying assumption (accurate forecasts) is met and one in which it is not.

This parallel between the *General Theory* and the *Treatise on Money* throws further light on the flexible character of the taxonomy of variables in chapter 18. The two volumes are constructed upon different "quaesita" – related to national income and employment in the *General Theory*, to prices in the *Treatise on Money* –, and Keynes's choice of independent variables (itself based on judgements of logical relevance which, in their turn, depend on the economist's quaesita) vary accordingly. Still, this is exactly a result of strict methodological continuity between the two works in the use of a non-demonstrative logic which takes account of the variety of circumstances. But there is more to be said. The epilogue of chapter 20 of the *Treatise on Money* invites the reader to apply the author's "general system of thought here exemplified" for any possible extension of the argument:

Evidently the possible ramifications and extensions of the foregoing argument are so numerous that one could continue for many more pages amplifying, qualifying and generalising it. Perhaps, however, it has been carried far enough to enable a reader, who has entered the general system of thought here exemplified, to apply it for himself to any further interesting cases which may occur to him (p. 292).

"Reader involvement" (Gotti, 2009, p. 291) is an issue of the utmost importance in Keynes's writings and in the *General Theory*, which includes twenty-two appeal to the reader or instructions given to her/him (Henderson, 1995) in the ambition to "stimulate the reader into a cooperative effort of interpretation of the book" (Gotti, 1994, p. 175; see also Chick, 2006). As Keynes himself writes:

When we write economic theory we write in a *quasi-formal style*; and there can be no doubt ... that this is our *best available means of conveying our thoughts to one another*. But when an economist writes in a quasi-formal style, he is composing neither a document verbally complete and exact so as to be capable of a strict legal interpretation, nor a logically complete proof. *Whilst it is his duty to make his premises and his use of terms as clear as he can, he never states all his premises and his definitions are not perfectly clear-cut*. He never mentions all the qualifications necessary to his conclusions ... It is, I think, of *the essential nature of economic exposition* that it gives, not a complete statement ... but *a sample statement*, so to speak, out of all the things which could be said, *intended to suggest to the reader the whole bundle of associated ideas*, so that, if he catches the bundle, he will not in the least be confused or impeded by the technical incompleteness of the mere words which the author has written down, taken by themselves. This means, on the one hand, that *an economic writer requires from his reader much goodwill and intelligence and a large measure of co-operation*; and, on the other hand, that there are a thousand futile, yet verbally legitimate, objections which an objector can raise (CW 13, pp. 469-70, emphases added).

Marshall was evidently an influence on Keynes, who in his *Cambridge lectures* of November 1933 praised the master for refusal of rigidity in defining economic concepts, and for allowing readers to “get his meaning from the richness of his context”: rather, precision comes “from the context and the whole of the thought” (in Rymes 1989, p. 102). The passage also makes clear that in a general conception of the relationship between scientists (economists) and their subject of study (agents’ beliefs) as capable of reciprocal influence, Keynes believes in the possibility of change, and uses persuasion as a tool for changing beliefs and opinions; not the artificial, purely rhetorical expedient easily associated with it, but a non-demonstrative logic consisting in providing (some) reasons for holding probable beliefs. It is with this aim in mind that Keynes assigns to his readers “not merely the role of decoders and recipient of his views but a far more demanding role as his collaborators in working out the final form and the exact meaning of a new economic theory” (Gotti, 2009, p. 298).

It has been rightly noted (Henderson 1995, p. 160) that in justifying the schematism of the summary of the *General Theory* in chapter 18, Keynes uses the personal pronoun “we” instead of “I”. In truth, the *whole* chapter uses this linguistic expedient: the reader is constantly invited to “retrace with the author its route to knowledge” (Marzola 1994, p. 197) and to follow him in emancipating from the classics. Interestingly, Keynes uses the expedient also in chapter 16 of the *Treatise on Money*, “A Classification of the Causes of a Disequilibrium of Purchasing Power”, which performs, with respect to the analysis of credit cycles in the *Treatise*, the same role of chapter 18 in the *General Theory*: it provides the reader with a theoretical framework

which, resting upon a concept of “independence for knowledge”, needs to be “further analysed” so as to allow for roundabout repercussions between variables heretofore enclosed in a seemingly rigid causal structure.

In the *General Theory*, Keynes is not so explicit as in the *Treatise on Money* in inviting readers to adopt his method and continue exploring the economic material accordingly. This seems due to the particular nature of the *General Theory* itself as a text whose internal structure reflects the structure of Keynes’s argumentation. The open-ended structure of the book embodies the ambiguity inherent to making science in a complex world: the economist must decompose the material under investigation if he is to reach valuable conclusions about its dynamics, but his attempt is destined to crash against the complexity and interdependence which characterizes the material itself. The author is thus obliged to offer its readers not only, and not so much, a complete theory about the economic system as a whole, but above all, and maybe only, a method to tackle its complexity.

It could not be otherwise: Keynes’s definition of economics as a moral science, and “a method rather than a doctrine”, is tantamount to a rejection of positivist methods and the “mechanical theory” of physical science (Keynes 1905). The *General Theory* poses no theoretical limits to “further analysis”: all closures are provisional, all simplifying assumptions are temporary, and the list of probable repercussions is never complete [6]. One is therefore reminded of the *Treatise on Probability*, where Keynes discusses the problem of how far the analytical process is to be pursued by an individual before taking a decision on how to act. Keynes’s approach is quite similar to the one developed by Sigmund Freud (1937) in one of his last articles, *Analysis Terminable and Interminable*, where the termination of an analysis is considered as a practical matter: the analysis may be an endless business (see Carabelli, 1988). Neither “settled conclusions” nor “infallible answers”, what Keynes’s theory offers is a method of analysis, allowing readers who have entered this way of reasoning about the complex economic material to apply it for themselves and draw correct conclusions.

Form and substance, in the *General Theory*, are inextricably interrelated: theory and method truly have an “interdependent existence” (Fontana, 2009, p. 30). One should not infer, therefore, that theories are allowed to change, in Keynes’s economics, *despite* methodological continuity; rather, it is *because of* the

persistence of this peculiar method, that Keynes's theories can vary according to changing times and circumstances, and to different sets of judgements of logical relevance, which depend on the economist's *quaesita*. The interplay of theory and method makes reader's involvement as a necessary, not dispensable, requisite of Keynes's own work. It is exactly in the proposal of economic theory as a way of thinking and a logic, wherein form and content are interdependent entities, that lies the radical novelty of Keynes's way of reasoning in economics. By taking the *General Theory* as a general formal model happily tolerating assumptions of independence of the kind of those condemned by Keynes in the book, the reductionist models of the neoclassical synthesis have simply denied this core theoretical argument of Keynes's economics: logic comes first, and economists must do their best to avoid logical fallacies in reasoning.

In conclusion, chapter 18 plays a fundamental role in the *General Theory*. It accomplishes three different but interconnected tasks: first, it offers a powerful illustration of how Keynes believed it possible to make science, some decades before the development of complexity science, in a complex social world; second, it drives its readers to the analysis of a complex economic material; third, it provides them with a guide to the reading of the *General Theory* itself. In short, what the indispensable chapter 18 helps us perceive and appreciate is exactly the "much richer picture" that emerges from the *General Theory* "taken as a whole".

Notes

[1] The abbreviation "CW" followed by a roman number stands for a specified volume of *The Collected Writings of John Maynard Keynes* (see Keynes 1971–1989 in the references).

[2] One of the most comprehensive work on the so-called Keynes-philosophy literature is Runde and Mizuhara, 2003, which is also representative of the different positions about the continuity issue between Keynes's early writings in probability and ethics and his mature economic works. See also Dow and Hillard, 1995; Gerrard and Hillard, 1992.

[3] It seems useful to stress that Keynes's methodology of criticism based on the tacit introduction of assumptions of independence is not constructed on the need to antagonise the classical theory. Rather, Keynes applied it without hesitation to theories toward which he was much more sympathetic: in the correspondence on two essays by Kalecki on the effects of three different taxes on national income and employment, Keynes proved to appreciate Kalecki's analysis but not its method, exactly for the introduction of tacit assumptions of independence of consumption and investment decisions from the levy (De Vecchi, 2008). Less surprising is that criticisms of this kind were equally employed to denounce the limits of econometrics in commenting Tinbergen's work (see Carabelli, 1988, Garrone and Marchionatti, 2009): the

“question of methodology” was to Keynes “central”, given Tinbergen’s attempt to apply “the method of multiple correlation to unanalysed economic material, which we know to be non-homogeneous through time”, whereas this method would require “numerically measurable, independent forces, adequately analysed so that we were dealing with independent atomic factors and between them completely comprehensive, acting with fluctuating relative strength on material constant and homogeneous through time” (CW 14, p. 285). Keynes could not be clearer about the essence of his critique: “In practice Professor Tinbergen seems to be entirely indifferent whether or not his basic factors are independent of one another ... I infer that he considers independence of no importance” (p. 310). This also sheds light on Keynes’s criticism of the concept of interdependence as used in general equilibrium theory – where multi-causality rests on connections between ultimate atomic factors, whereas Keynes sees the economic system to be characterized by organic interdependence.

[4] This article deals with Keynes’s complexity approach to the analysis of the economic material in a rather general way. A similar perspective can be found in works such as Marchionatti, 2010, Dow, 2010, Togati, 2006, Chick, 2003. This relatively new research program also counts on works by Jespersen, 2008, and Chick, 2004, proposing a Post-Keynesian macroeconomic methodology based on the concept of open systems. Works by Colander (e.g. 2011) emphasize the importance of Keynes’s method for the development of a complexity approach in economic theory. Articles by Vines (2003) and Carabelli and Cedrini (2010) investigate Keynes’s international economics and diplomacy by adopting a complexity perspective. Finally, works by Ormerod, 2009, Foster, 2006, and Barkley Rosser, 2006, are evidence of the seminal role played by Keynes as a thinker of complexity in the history of economic thought, of the relevance of his remarks on the conditions and means to capture the complexity of economic process beyond the limits of simplistic theorizing, as well as of the possibility to establish the foundations of a Keynesian macroeconomics that considers economies as complex evolving systems.

[5] For the open-system interpretation of the *General Theory*, see Chick and Dow, 2001; Jespersen, 2008.

[6] This is another way of saying that Keynes rejects the application of the principle of “limited independent variety” to a complex economic material. His criticism of mathematical economics rests as seen on a requirement of strict independence, but also the accompanying condition of finiteness on which algebraic system of simultaneous equations (such as the one of general equilibrium theory) rest. The evident similarity between Keynes’s definition of the “atomic hypothesis” and the conditions outlined by Simon for the introduction of causal relations in such systems (first, the existence of “a set of n atomic sentences which are assumed to be empirically and logically independent”; second, “an object language with a finite number of one-place predicates ... in one-one relation with the original set of atomic sentences”) helps understand this point. It is also to be noted that Keynes’s critical attitude towards Tinbergen’s work (see note 3) owes to the attempt to treat the economic material as if it consisted of “independent atomic factors” which are “between them completely comprehensive”.

Bibliography

Aristotle. 1928. *Sophistical Refutations*, edited by William D. Ross. Oxford, Clarendon Press

Asimakopulos, A. 1991. *Keynes’s General Theory and Accumulation*, Cambridge, Cambridge University Press

Backhouse, R. E. 2010. An abstruse and mathematical argument: the use of mathematical reasoning in the *General Theory*, pp.133-47 in Bateman, B., Hirai, T., and Marcuzzo, M. C. (eds), *The Return to Keynes*.

Keynes and Keynesian policies in the new millennium, Cambridge (MA), Harvard University Press

Barkley Rosser, J. 2006. Complex dynamics and Post Keynesian economics, pp. 74-98 in Setterfield, M. (ed), *Complexity, Endogenous Money and Macroeconomic Theory. Essays in Honour of Basil J. Moore*, Cheltenham

and Northampton (MA), Edward Elgar

Carabelli, A. M. 1988. *On Keynes's Method*, London, Macmillan

Carabelli, A. M. 1991. The methodology of the critique of the classical theory: Keynes on organic interdependence, pp. 104-25 in Bateman, Bradley W. and Davis, John B. (eds), *Keynes and Philosophy*, Aldershot, Edward Elgar

Carabelli, A. M. 1992. Organic interdependence and Keynes's choice of units in the *General Theory*, pp. 3-31 in Gerrard, B. and Hillard, J. (eds), *The Philosophy and Economics of J. M. Keynes*, Aldershot, Edward Elgar

Carabelli, A. M. and Cedrini, M. A. 2010. Keynes and the complexity of international economic relations in the aftermath of World War I, *Journal of Economic Issues*, vol. 44, no. 4, 1009-27

Chick, V. 1983. *Macroeconomics after Keynes. A Reconsideration of the General Theory*, Cambridge (MA), MIT Press

Chick, V. 2003. Theory, method and mode of thought in Keynes's *General Theory*, *Journal of Economic Methodology*, vol. 10, no. 3, 307-27

Chick, V. 2004. On open systems, *Brazilian Journal of Political Economy*, vol. 24, no. 1, 3-16

Chick, V. 2006. *The General Theory* is difficult: whose fault is that?, *Revista de Economia*, vol. 32, no 2, 135-51

Chick, V. and Dow, S. C. 2001. Formalism, logic and reality: a Keynesian analysis, *Cambridge Journal of Economics*, vol. 25, no. 6, 705-22

Colander, 2011. The Keynesian method, complexity and the training of economists, pp. 183-201 in Arnon, A., Weinblatt, J. and Young, W. (eds), *Perspectives on Keynesian Economics*, Springer, Berlin-Heidelberg.

De Vecchi, N. 2008. Keynes on Kalecki's theory of taxation: contents approved, method questioned, *History of Political Economy*, vol. 40, no. 1, 163-82

Dostaler, G. 2007. *Keynes and His Battles*, Cheltenham and Northampton (MA), Edward Elgar

Dow, S. C. (2010) Preliminary draft: was there a (methodological) Keynesian revolution?, pp. 268-86 in Dimand, R.W., Mundell, R.A. and Vercelli A. (eds), *Keynes's General Theory After Seventy Years*. London, Palgrave Macmillan

Dow, S. C. and Hillard, J. 1995. *Keynes, Uncertainty and the Global Economy. Beyond Keynes*, Volume 2, Cheltenham, Edward Elgar

Fontana, G. 2001. Keynes on the "nature of economic thinking". The principle of non-neutrality of choice and the principle of non-neutrality of money, *American Journal of Economics and Sociology*, vol. 60, no. 4, 711-43

Fontana, G. 2009. *Money, Uncertainty and Time*, London and New York, Routledge

Freud, S. 1937. Analysis terminable and interminable, *International Journal of Psycho-Analysis*, vol. 18, 373-405

Garrone, G. and Marchionatti, R. 2009. The role of econometric method in economic analysis. A reassessment of the Keynes-Tinbergen debate, 1938-1943, pp. 148-72 in Arena, R., Dow, S. C. and Klaes, M. (eds), *Open Economics. Economics in Relation to Other Disciplines*, London and New York, Routledge

- Gerrard, B. 1997. Method and methodology in Keynes's *General Theory*, pp. 120-48 in Harcourt, G. C. and Riach, P. A. (eds), *A "Second Edition" of the General Theory*, Volume 2, London and New York, Routledge
- Gerrard, B. and Hillard, J. 1992. *The Philosophy and Economics of J.M.Keynes*, Aldershot, Edward Elgar
- Greenwald, B. and Stiglitz, J. E. 1987. Keynesian, new Keynesian and new classical economics, *Oxford Economic Papers*, New Series, vol. 39, no. 1, 119-33
- Gotti, M. 1994. The "General Theory" as an open-ended work, pp. 155-91 in Marzola, A. and Silva, F. (eds), *John Maynard Keynes: Language and Method*, Aldershot, Edward Elgar
- Gotti, M. 2009 Aspects of individuality in J.M. Keynes's *General Theory*, pp. 279-302 in Gotti, M. (ed.), *Commonality and Individuality in Academic Discourse*, Bern, Peter Lang
- Hansen, A. H. 1953. *A Guide to Keynes*, New York, McGraw-Hill Book Company
- Harcourt, G. C. and Sardoni, C. 1994. Keynes's vision: method, analysis and "tactics", pp. 131-52 in Davis, J. B. (ed.), *The State of Interpretation of Keynes*, Boston, Kluwer
- Henderson, W. 1995. *Economics as Literature*, London and New York, Routledge
- Hirai, T. 2008. *Keynes's Theoretical Development. From the Tract to the General Theory*, London and New York, Routledge
- Jespersen, J. 2008. *Macroeconomic Methodology. A Post-Keynesian Perspective*, Cheltenham and Northampton (MA), Edward Elgar
- Keynes, J. M. 1905. Miscellanea ethica (31 July), King's College Archive Centre, Cambridge, The Papers of John Maynard Keynes
- Keynes, J. M. 1909. Science and art (20 February), King's College Archive Centre, Cambridge, The Papers of John Maynard Keynes
- Keynes, J. M. (1971-1989) *The Collected Writings of John Maynard Keynes*, edited by E. Johnson and D. E. Moggridge, London, Macmillan, for the Royal Economic Society
- Vol. 1. *Indian Currency and Finance* (1913), 1971
- Vol. 2. *The Economic Consequences of the Peace* (1919), 1971
- Vol. 5. *A Treatise on Money. I. The Pure Theory of Money* (1930), 1971
- Vol. 7. *The General Theory of Employment, Interest and Money* (1936), 1973
- Vol. 8. *A Treatise on Probability* (1921), 1973
- Vol. 10. *Essays in Biography* (1933), 1972
- Vol. 11. *Economic Articles and Correspondence: Academic*, 1983
- Vol. 12. *Economic Articles and Correspondence: Investment and Editorial*, 1983
- Vol. 13. *The General Theory and After. Part I: Preparation*, 1973
- Vol. 14. *The General Theory and After. Part II: Defense and Development*, 1973
- Vol. 29. *The General Theory and After. A Supplement (to vols XIII and XIV)*, 1979

- Keynes, J. M. (undated) "On Beauty and Art. On Art Criticism and the Appreciation of Beauty". King's College Archive Centre, Cambridge, The Papers of John Maynard Keynes.
- Kriesler, P. and Nevile, J. 2002. IS–LM and macroeconomics after Keynes, pp. 103-14 in Arestis, P., Desai, M. and Dow, S. C. (eds), *Money, Macroeconomics and Keynes*, London and New York, Routledge
- Lawson, T. and Pesaran, H. 1985. *Keynes's Economics: Methodological Issues*, London-Sidney, Croom Helm
- Marchionatti, R. 2010. J. M. Keynes, thinker of economic complexity, *Journal of Economic Ideas*, vol. 18, no. 2, 115-46
- Marshall, A. 1898. Distribution and exchange, *Economic Journal*, vol. 8, no. 29, 37-59
- Marshall, A. 1925[1885], The present position of economics, pp. 152-75 in Pigou, A.C. (ed), *Memorials of Alfred Marshall*, London, Macmillan
- Marshall, A. 1961[1920]. *Principles of Economics* (revised edition), London, Macmillan
- Marzola, A. 1994. Rhetoric and imagination in the economic and political writings of J.M. Keynes, pp. 192-223 in Marzola, A. and Silva, F. (eds), *John Maynard Keynes: Language and Method*, Aldershot, Edward Elgar
- O'Donnell, R. 1997. Keynes on formalism, pp. 94-119 in Harcourt, G. C. and Riach, P., *A "Second Edition" of The General Theory*, Volume 2, London and New York, Routledge
- O'Donnell, R. 1995. Keynes on aesthetics, pp. 93-121 in Cottrell, A. F. and Lawlor, M. S., *New Perspectives on Keynes*, Durham and London, Duke University Press
- O'Donnell 1989. *Keynes: philosophy, economics and politics. The philosophical foundations of Keynes's thought and their influence on his economics and politics*, London, Macmillan
- Runde, J. and Mizuhara, S. 2003 *The Philosophy of Keynes's Economics. Probability, Uncertainty and Conventions*, London and New York, Routledge
- Rymes, T. K. 1989. *Keynes's Lectures 1932-35*. London: Macmillan
- Sardoni, C. 1989-90. Chapter 18 of the *General Theory*: its methodological importance, *Journal of Post-Keynesian Economics*, vol. 12, no. 2, 293-307
- Shackle, G. L. S. 1967. *The Years of High Theory*, Cambridge, Cambridge University Press
- Simon, H. A. 1957. *Models of Man*, New York, Wiley
- Togati, D. T. 2006. *The New Economy and Macroeconomic Stability: A Neo-modern Perspective Drawing on the Complexity Approach and Keynesian Economics*, London and New York, Routledge
- Vercelli, A. 1991. *Methodological Foundations of Macroeconomics: Keynes and Lucas*, Cambridge (MA), Cambridge University Press
- Vines, D. 2003. John Maynard Keynes 1937–1946: the creation of international macroeconomics, *The Economic Journal*, vol. 113. no. 488, 338-61

detailed reviews of the paper.