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Minsky, Keynes and the structural instability of a sophisticated monetary economy

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Abstract - This paper argues that both Keynes and Minsky held a concept of financial instability which may be properly understood only in terms of *structural* instability, and not –as is usual- in terms of the traditional concept of economic instability, i.e. *dynamic* instability.

Keynes is quite explicit in denying that the dynamic instability of a monetary economy is a particularly serious problem; on the contrary, he claims that the crucial troubles are induced by discontinuous and unpredictable shifts of the two crucial financial functions of his heuristic model (the liquidity preference and the marginal efficiency of capital curves) which cannot be satisfactorily interpreted in terms of dynamic instability but only in terms of structural instability.

Analogously the Minsky's crucial concept of financial fragility which plays a crucial role in his theory of economic cycles has to be interpreted in terms of structural instability. The endogenous shifts of the degree of financial fragility which explain many basic features of economic cycles are best interpreted as fluctuations in the degree of structural instability of a sophisticated monetary economy.

The shift of emphasis from the usual concept of dynamic instability to the innovative one of structural instability has far-reaching implications for economic theory and policy which are briefly analysed in the paper.

Keywords: dynamic instability, structural instability, economic fluctuations, economic cycles, economic policy.

1. Introduction

Minsky wrote that there is no way for a generation of economists to make obsolete the future generations of economists because the economic reality is evolutionary so that sooner or later even the most profound theories worked out to understand and control it are made obsolete. We may add that, paradoxically, the sooner a great thinker is fully understood, the sooner he is made obsolete. In this case his name remains that of a founding-father the message of which is progressively refined and updated rather than as direct inspiration for original work. Cases in point are Newton in physics and Walras in economics.

As for Minsky himself, his important message on the financial instability of a sophisticated monetary economy, though quite influential, has not yet been sufficiently understood to make him obsolete. On the contrary after many decades since he has published the first versions of his original 'financial instability hypothesis', his work is more up-to-date than ever. Recent financial crises, including that started in 1998 in Far East Asia, are indeed very Minskian in their origin and diffusion and could have been avoided or aborted, or at least mitigated, if Minsky's message had been really understood and taken into due account.

There is a famous forecaster in history who has never been made obsolete: Cassandra who had foreseen the war of Troy and had suggested how to avoid it, but unfortunately was not taken seriously. We hope that a similar fate will not hit Minsky himself; to avoid that it is time that the profession and the public opinion take him seriously and try to penetrate the far-reaching implications of his contributions. This is not easy. Under the deceptive appearance of the colloquial language utilised in his mature and late works it is concealed a conceptual framework which is extremely complex from the theoretical and methodological points of view. In this paper we intend to clarify his pivot-concept of financial fragility which crucially affects the meaning, implications, and novelty of his approach to the explanation and control of economic cycles. In ordinary language the meaning of instability seems quite clear but at second inspection it emerges clearly that the word is very ambiguous as it may designate concepts which have different meanings and implications. In order to understand and develop Minsky's message and to draw the best from his insights, we have to clarify which exact meaning has to be attributed to his crucial concept of financial instability (or fragility).

The structure of the paper is very simple. In section 2 different concepts of instability are briefly examined as a general reference for the subsequent arguments. In section 3 Minsky's reconstruction of the Keynesian perspective on the nexus between the instability of a monetary

economy and its fluctuations is critically reviewed. In section 4 Minsky's own point of view on the nexus between the intrinsic financial instability of a sophisticated monetary economy and economic cycles is concisely examined and discussed. The policy implications of this approach are briefly analysed in section 5. A few concluding remarks follow in section 6.

2, Concepts of instability

In everyday language the word instability is generally used in the very vague and generic sense of 'liable to change'. In this sense we speak of an unstable weather, character, political situation, etc. In the more specialised ordinary language of economics we speak of instability in two different senses which are not clearly distinguished although their meaning is radically different. When we speak of the instability of a certain system or variable (prices, wages, investment, etc.) we intend to stress the tendency, which may be actualised even by a small disturbance, to a progressive divergence from a certain state (either of equilibrium or just historically given). In this case we focus the attention exclusively on the dynamic properties of the behaviour of a certain variable in reference to a given equilibrium value or state. On the contrary, when we speak of the instability of the industrial relations in a certain firm or of the instability of the financial structure of a certain economic unit we refer to the likelihood that a certain structure persists basically unchanged, notwithstanding the effects of a (virtual or actual) small perturbation. In this case it is often used the synonym *fragility* whenever the permanence of the original structure is seen as a 'good thing', or the synonym *flexibility* whenever the permanence of the original structure is seen as a 'bad thing'. The two synonyms are less ambiguous. The fragility of, e.g., a glass, indicates the propensity of a certain glass to break (change radically and rapidly its original structure) in consequence of a small shock.[1] The concept of financial instability of a certain economic unit clearly refers to this second structural meaning. In order to avoid confusions, not absent in the literature, we need a clear terminological distinction between the two basic concepts of instability.

We suggest to call the first concept *dynamic* instability as it focuses exclusively on the dynamic properties of the object to which it refers; when we say that a certain equilibrium is dynamically stable we mean that whenever a certain system is displaced from equilibrium, it will diverge progressively from it.

[1] Analogously, the flexibility of, e.g., a bow indicates its propensity to change shape (and dynamic behaviour, i.e. the direction and the strength of the impulse on the arrow) in order to adapt to a changing environment (determined by the pressure on the string by the archer).

We suggest to call the second concept *structural* instability as it focuses mainly on the structural properties of the object to which it refers; when we say that a certain object is structurally unstable we mean that it is liable to change very rapidly the qualitative characteristics of its structure. Since there is often a strict correspondence between the structural properties of a certain object and the qualitative characteristics of its dynamic behaviour, structural instability generally implies also a radical and swift change in the latter, and vice versa.

So far we have discussed the distinction between the two basic concepts of instability in terms of ordinary language. However, a rigorous use of these concepts in reference to the language of formalised models requires a precise analytic restatement of both concepts. In the first case our task is not at all difficult because in the elementary textbooks of economics or mathematics for economists the concept of dynamic instability is presented as the only rigorous concept of economic instability and is defined in analytic terms. Economic instability is referred to an equilibrium, or to a system or variable having this sort of equilibrium, whenever a shift from it induced by a (possibly infinitesimal) disturbance leads to a progressive divergence from it (without limit in the case of 'instability in the large' or until a certain limit in the case of 'instability in the small'). On the contrary the second concept, surprising as it may be, still lacks an agreed upon analytical counterpart and is completely ignored by most economists. Therefore we have to introduce a few tentative definitions warning the reader that they are personal suggestions of the author (for more details on these concepts and their background and implications see, Vercelli, 1991).

It is convenient to start from the concept of structural instability introduced in mathematics by the school of Andronov (see, e.g., Andronov, Vitt, and Khaikin, 1937). In this view a system is structurally unstable when an *infinitesimal* disturbance changes the qualitative characteristics of its dynamic behaviour. This definition goes in the right direction but is much too demanding for applications to economics, since in the typical economic case the disturbances may be small but have a finite value. Therefore we may introduce a weaker concept of structural instability which we suggest to call *ε-instability*. A system is ε-unstable whenever it changes the qualitative characteristics of its dynamic behaviour in consequence of a disturbance not smaller than ε. This permits also to measure the degree of ε-instability on the basis of the size of ε: the smaller the size of the perturbation ε sufficient to change the crucial qualitative features of the economic system the larger is its degree of structural instability (which in the limit approximates the situation described by the usual mathematical concept of structural instability).

In some contexts it may be useful to introduce an even weaker concept of structural instability. The dynamic behaviour of an economic system, depends on the structure of the parameters which characterise the model. Generally speaking this structure is assumed to be

invariant to exogenous impulses in order to allow a correct use of the model, particularly for policy purposes (see, e.g., Lucas, 1981). However many economists have noticed that this assumption is in many cases quite unrealistic because some of the parameters may change rapidly and sizeably in consequence of a disturbance. In geometric terms this translates in sudden discontinuous shifts of the curve that represents a certain function. This form of instability has nothing to do with dynamic instability and is sometimes called structural instability. This terminology is not improper because it is a necessary condition of ε-instability; however, it is not a sufficient condition for it since not necessarily a shift of parameters changes in qualitative terms the dynamic behaviour of the economy. Therefore, in order to avoid confusion, we suggest to call this particularly weak form of structural instability with the different name of *parametric* instability. [2]

3. Minsky on Keynes

The enduring interest of Minsky for Keynes has not been mainly philological or hermeneutic. It is his dissatisfaction with the main contemporaneous currents in macroeconomics, in particular with the 'neoclassical synthesis' as well as with old and new classical economics, that has led him to look for a better alternative by drawing inspiration from a few crucial aspects of the *General Theory* (from now on GT) ignored or misunderstood even by most Keynesian economists. He believed that Keynes cannot be considered obsolete exactly because a crucial part of his message has yet to be understood and developed. To this end he provided 'a cyclical and financial instability interpretation of Keynes' (Minsky, 1975, p.xi). This interpretation may seem at first sight rather far-fetched as Keynes does not seem to have given particular emphasis either to cycles or to instability. Still we believe that Minsky's contributions on Keynes, and in particular his excellent book on the GT (Minsky, 1975), provide one of the most perceptive and stimulating interpretations of Keynes. In order to solve this apparent contradiction we have to examine in some detail the exact meaning and the role played in the GT by each of these features.

Let's start from economic cycles. Keynes dedicates to this subject only one chapter (the 22nd) having the accurate title of 'Notes on the trade cycle' which clearly reveals its nature of an

[2] As we are going to recall in the next section, Keynes's argument in the GT crucially relies on the attribution of this sort of instability to the curves of liquidity preference and marginal efficiency of capital. In addition this sort of instability underlies Keynes's scepticism for traditional econometrics which was made fully explicit in his critical review of the seminal book of Tinbergen on business cycles (Keynes, 1939). More recently Lucas based his famous 'critique' exactly on the allegedly unavoidable parametric instability of Keynesian econometric models induced by changes in the policy rules which in his opinion may be solved only by adopting the new classical approach (Lucas, 1981).

afterthought to the main bulk of his theory; this chapter is the first of the final Book VI whose unassuming title 'Short notes suggested by the general theory' clearly makes explicit its targets. In addition in the first page of the chapter he clearly declares that a fully-fledged theory of business cycles consistent with the GT should require 'a book rather than a chapter' so that the short notes in the chapter may only 'be sufficient to indicate the line of investigation which our preceding theory suggests' (Keynes, 1936, p.313). It seems therefore *prima facie* implausible the assertion of Minsky that the crucial perspective suggested by Keynes in the GT is an 'investment theory of cycles' (Minsky, 1975, p.70). Keynes himself lucidly clarifies the requisites for a fully-fledged theory of cycles which has to explain:

(i) the turning points, i.e. why 'upward and downward tendencies, once started, do not persist for ever in the same direction but are ultimately reversed' (Keynes, 1936, p.314);

(ii) a certain degree of regularity in the shape and timing of economic fluctuations, i.e. why there is 'some recognisable degree of regularity in the time sequence and duration of the upward and downward movements' (*ibidem*);

(iii) the phenomenon of the crisis, i.e. why there is a marked asymmetry between the upward and downward movements since 'the substitution of a downward for an upward tendency often takes place suddenly and violently, whereas there is, as a rule, no such sharp turning point when an upward is substituted for a downward tendency' (*ibidem*).

In chapter 22 and in a few sparse passages before it we may find interesting hints on these points but not at all a full explanation. In reality what the GT is about is not 'an investment theory of cycles' around an elusive equilibrium but an investment theory of economic fluctuations of the short-period equilibrium itself induced by 'changing views about the future'. Keynes is fully aware that a theory of fluctuations so defined is a necessary but insufficient condition for a theory of economic cycles since fluctuations do not need to have a cyclical character: 'it is highly improbable that all fluctuations either in investment itself or in the marginal efficiency of capital will be of a cyclical character' (*ibidem*). In chap. 22 Keynes explains why in the economic environment of 19th century fluctuations in investment have had cyclical characteristics, but this is not granted in general neither in logical nor in empirical terms. In the bulk of the GT, indeed in all the chapters preceding this one, the analysis is focused on the determination of short-run equilibrium and on the explanation of the genesis and implications of its fluctuations, whether cyclical or not. This is what Keynes calls the theory of 'shifting equilibrium' in which 'changing views about the future are capable of influencing the present situation' (1936, p.293) that is a fundamental prerequisite for both cycle theory, to the extent that the fluctuations of short-run equilibrium are cyclical, and growth theory, to the extent that they have an irreversible component. From this perspective the

main contribution of Minsky has been that of extending Keynes's pregnant theory of fluctuations into a much more articulated theory of *cyclical* fluctuations complying with the three conditions indicated by Keynes in a co-ordinated way.[3]

We have now to clarify the second basic feature of the Keynesian perspective favoured by Minsky's interpretation of the GT and by his own research programme: the financial instability of a sophisticated monetary economy. In order to understand the meaning and the implications of this concept we have to start from a clarification of the role attributed by Minsky to disequilibrium in the GT. As a matter of fact Minsky repeats on many occasions that Keynesian economics is the economics of permanent disequilibrium (see, e.g., Minsky, 1975, p.68). This characterisation of GT is *prima facie* quite surprising as the basic fault of a monetary economy is described by Keynes in terms of permanence of a given unemployment *equilibrium*. This is not just a terminological difference because the terminology adopted by Minsky, which corresponds in this case to that favoured by orthodox macroeconomics, implies that only a state characterised by full employment may be properly interpreted as an equilibrium. The denial of this assertion is at the centre of the GT while the struggle of escape from the old ideas still entertained in the *Treatise on Money* may be described in its essence as a troubled shift from the disequilibrium perspective of the *Treatise* to the (short-run) equilibrium perspective of the GT. The new perspective radicalises the clash with the classical theory exactly because it introduces a main conceptual novelty vis-à-vis the classical theory and his own theory in the *Treatise*, i.e. that a short run equilibrium may imply involuntary unemployment. In addition, a given unemployment equilibrium is not an ephemeral evil since it may be dynamically stable. In fact a given unemployment equilibrium is conceived by Keynes not only as the gravitation centre of daily equilibria (Keynes, 1936, chap.3) but also as the central position around which the economy may fluctuate for a long spell of time since 'we oscillate, avoiding the gravest extremes of fluctuation in employment and in prices in both directions, round an intermediate position appreciably below full employment and appreciably above the minimum employment a decline below which would endanger life' (Keynes, 1936, p.254).

Minsky is of course fully aware of the emphasis put by Keynes on (unemployment) equilibrium, but he does not seem to take seriously Keynes's terminological choice which in his opinion misrepresents the alleged disequilibrium content, since in his understanding of Keynes's message:

[3] Minsky fully develops the first condition (explanation of the turning points), the third condition (explanation of the crisis and of the asymmetric features of the cycle) and the first part of the second condition (the regular succession of typical states), but he does not have much to say on the typical duration of its phases.

(i) a short-run equilibrium is never attained because ‘ endogenously determined changes occur which affect the set of system variables toward which the economy tends …The analogy is that of a moving target, which is never achieved but for a fleeting instant’ (Minsky, 1975, p.61);
(ii) whenever the equilibrium is attained it may only last a ‘fleeting instant’ because ‘during each short-period equilibrium, in Keynes’s view, processes are at work which will “disequilibrate” the system’ (*ibidem*).

Therefore Minsky does not deny that in Keynes there are equilibrating forces at work but he emphasises that they are offset by disequilibrating forces which operate even when a certain equilibrium position seems for an instant attained. If we interpret these statements in terms of dynamic instability, we have to conclude that Keynes’s equilibria are weakly stable rather than unstable, so that Minsky’s emphasis on instability would be undermined. This apparent incongruity may be dissolved as soon as we recognise that in Keynes there is a basic asymmetry between the equilibrating and the disequilibrating tendencies. The equilibrating tendencies refer to *dynamic* stability, i.e. to the convergence towards a given short-period equilibrium, that does not need to be a full employment equilibrium, while the so-called disequilibrating tendencies refer to *structural* instability, i.e. not to a divergent dynamic tendency away from a given equilibrium but to a sudden discontinuous shift of the equilibrium position itself. In logical terms these shifts do not need to be destabilising. However they are in general so because they are triggered by over-pessimistic expectations at the beginning of a crisis or by over-optimistic expectations at the end of the boom (see Minsky, 1957). In any case it is important to understand that their logical nature and underpinnings are completely different. The equilibrating forces are the usual ones of classical theory that assure the convergence towards equilibrium whenever a shock produces an excess supply or demand. So for example Keynes recognises that an excess supply in the labour market is likely to trigger a fall in money wages and that its indirect effect on the supply of money could by itself *ceteris paribus* have an equilibrating effect on the rate of interest, investment and effective demand; the trouble is that this equilibrating influence is offset by the induced perverse deterioration of long-run expectations which produces an adverse shift in the two curves of liquidity preference and marginal efficiency of capital. In other words the disequilibrating influences are induced by the parametric instability of the crucial functions which describe a monetary economy. In logical terms the parametric instability of a monetary economy which determines the fluctuation of its short-term equilibrium is fully consistent with the dynamic stability of the shifting equilibrium. The fact that according to Keynes the dynamic stability of equilibrium is in its turn very weak because of institutional reasons that determine the stickiness of prices does not affect in logical terms the need of distinguishing sharply between the two concepts of instability.

Summing up, Minsky is right in emphasising the intrinsic instability of a sophisticated monetary economy and in attributing this insight to Keynes but it is a pity that he did not emphasise sufficiently the crucial conceptual distinction between the concept of dynamic instability on one side and of structural instability on the other side. Therefore he did not perceive with clarity that the crucial instability in Keynes is not the usual kind of instability but an instance of what we have called structural instability. Notwithstanding this lack of awareness on this crucial point we are going to see in the next section that the concept of financial instability which is at the centre of Minsky's original contributions greatly extends Keynes's insights on the structural instability of a monetary economy.

4. Minsky on cycles and instability

As we have seen, the bulk of the GT aims to explain the possible stubborn persistence of a position of unemployment equilibrium, in the absence of apt policy interventions, in terms of compensation in principle between weak dynamic stability and structural instability. The parametric instability of the two crucial forward-looking functions of the GT, i.e. the liquidity preference and the marginal efficiency of capital curves, is also considered by Keynes to be the key for explaining economic fluctuations, including the sudden and violent fluctuations to which a monetary economy is liable. Finally, in chap. 22 Keynes gives a few hints on why, in an environment such as that of the monetary economies in 19th century, the fluctuations originated by shifts of the marginal efficiency of capital curve tend to exhibit a cyclical character. Here is where Minsky steps in to extend and articulate Keynes's hints into a coherent conceptual framework for studying economic cycles, updating at the same time the analysis of the institutional environment in order to encompass the sophisticated monetary economies of the 20th century. The outcome is a theory of economic cycles radically different from the main alternative theories that have emerged after Keynes. Minsky's theory is very complex and rich in theoretical and institutional details and cannot be satisfactorily analysed within the space limits of this paper. Therefore we will limit ourselves to analyse in some detail just what we believe to be the main conceptual and methodological difference distinguishing this approach from the main existing alternative approaches to business cycles, i.e. the different way of conceiving the endogenous and exogenous factors and their interaction that crucially depends on his concept of financial instability and on the correlative peculiar concept of shock.

As is well known, the two main approaches to the explanation and control of business cycles after Keynes are the macrodynamic approach which has dominated until the mid-1970s and the equilibrium approach introduced by new classical economists which has took over since. The

macrodynamic approach interprets business cycles as cyclical fluctuations around an equilibrium trend essentially determined by an endogenous mechanism, such as the interaction between the accelerator and the multiplier, which is represented by a model characterised by dynamic equations (difference, differential, integro-differential, etc). The trouble is that this sort of equations have cyclical solutions of three kinds neither of which seems to be by itself acceptable: explosive cycles *prima facie* inconsistent with the viability of any economy, damped cycles *prima facie* inconsistent with the persistence of business cycles, constant cycles which seem at first sight faultless but which are structurally unstable in the very strong mathematical sense of the term so that any disturbance, even infinitesimal, would make the cycles explosive or damped falling back into the above mentioned problems. From this dilemma two main ways out have been devised and explored.

The mainstream *orthodox* approach started by the multiplier-accelerator model of Samuelson (1939) has assumed the dynamic stability of full employment equilibrium consistently with the point of view of both classical economics and orthodox Keynesian economics (new classical synthesis) explaining the persistence of business cycles in terms of exogenous shocks just compensating the tendency to convergence. Specific information on single shocks is absent or irrelevant as the relevant information is restricted to the parameters of the stationary probability distribution of shocks which assures the persistence of regular cycles. In this view the role of structural and exogenous factors is very restricted since it is limited respectively to a combination of parameters which assures damped fluctuations, while the exogenous factors just release the necessary 'energy' to sustain cycles according to a clearly ad hoc assumption.

Besides the *orthodox* approach it is possible to detect an *heterodox* macrodynamic approach started by Hicks (1950) and Goodwin (1951) which assumes the dynamic instability of full employment equilibrium conceived as a barrier (minimum value of unemployment) beyond which the economy cannot go, and not -as in the orthodox approach- as the gravitation centre of cycles. The existence and persistence of cycles is induced by a second barrier which posits a superior limit to unemployment, so that the economy is constrained to bounce back and forth between these two barriers. Also in this case the main source of cyclical dynamics is endogenous as is given by the assumption of dynamic instability within two given barriers; however exogenous factors play here a much more important role as they affect the exact positions of the two barriers which depends on systematic factors such as the degree of competition in the market of labour and in the industrial sectors, economic institutions, policies pursued, etc.

As is well known, since the mid-1970s the macrodynamic approach has been ousted by the more fashionable equilibrium business cycles approach suggested and promoted by new classical economists. The object of business cycles theory shifts from the explanation of the regularity of

period and amplitude of typical cycles exhibited by aggregate time series (such as income and investment) the existence of which is bluntly denied, to the explanation of the co-movements between time series which exhibit some regular correlation. Beyond this radical change of focus there is a major methodological change: cyclical movements are not seen any more as disequilibrium movements around, or in proximity of, equilibrium as in the macrodynamic tradition before and after Keynes but as cyclical fluctuations of the equilibrium itself which is allegedly always assured. Therefore in this extreme version cycles are by definition purely exogenous so that disequilibrium and instability are not only altogether irrelevant but also meaningless.[4] In this approach shocks are not altogether anonymous as they are related to well identified sources, namely discretionary interventions of policy authorities, and well identified 'receptors' such as money in circulation (monetary equilibrium business cycle) or technology (real equilibrium business cycle). However, also in this case the bulk of the explanation resides in the properties of the population of shocks as described by a well-defined stationary probability distribution. Notice that in all the three main approaches to business cycles after Keynes, the structural stability of the model and of the piece of reality described by it is always assumed either explicitly, as in the case of equilibrium business cycles, or implicitly.

Having set the background we are now in the position of calling on the stage Minsky's contribution to cyclical fluctuations and of appreciating the striking originality of his approach. The cycle is seen in its essence as the regular repetition of structural states characterised by a different degree of financial fragility which has to be interpreted in terms of structural instability. Both endogenous and exogenous factors play a crucial role and interact in a complex way. The endogenous factors are not grounded in disequilibrium dynamics (convergent or divergent) as in the macrodynamic approach but in the intrinsic structural instability of a monetary economy and its evolution.[5] On the other hand this approach gives also a different, enhanced, role to exogenous shocks which may trigger sizeable qualitative changes in the economic behaviour of the system and are not subject to probabilistic restrictions in their properties such as stationarity or symmetry.

In order to understand Minsky's approach, we have to clarify at the very outset the pivot concept of financial fragility in reference first to a single financial unit and then to the entire

[4] However, most specimens of this approach introduce 'propagation mechanisms' of the exogenous impulses in order to explain the autocorrelation of the deviations from central indicators which confers a quasi-wavelike profile to aggregate time series (Lucas, 1981). This greatly reduces the methodological gap with orthodox business cycles theory as disequilibrium -in the dynamic sense of the word- and dynamic stability are re-introduced giving a role, though only secondary, to endogenous factors such as learning and acceleration mechanisms (Vercelli, 1991).

[5] As we are going to see in section 5, disequilibrium dynamics still plays a role which, however, is subordinated to that of structural dynamics.

economy. The financial fragility of an economic unit describes its propensity to change its economic behaviour in consequence of a shock and is measured by the minimum size of a shock which induces a situation of insolvency, a state which is bound to change dramatically the behaviour of the unit. Financial fragility is therefore a very clear example of what we have called ε-instability. A more precise characterisation and measure of the financial fragility of a certain economic unit must take account that it is a multidimensional concept which depends on various structural features of the unit and on many kinds of shocks. For the sake of simplicity, following Minsky, the analysis may start by focusing on just one structural aspect, the financial structure of the unit, and one kind of shock, the unexpected increase of the rate of interest. We may therefore, at least in principle, easily grade the financial fragility of an economic unit by identifying the minimum size of an unexpected increase in the rate of interest which induces a state of insolvency on the basis of its expected cash flows and outstanding debts. However Minsky prefers to provide a qualitative measure of financial fragility similar in spirit to those adopted for measuring the potential destructiveness of certain natural phenomena (e.g. the Mercalli scale for earthquakes and the usual scale for the 'force' of the sea). This qualitative measure identifies three grades of financial fragility which are defined by clear qualitative thresholds:

i) hedge-financing unit which is the less fragile financial position as its capitalised value remains positive in each period whatever change of the rate of interest;

ii) speculative-financing unit which represents an intermediate level of financial fragility, when the cash payment commitments for some period, typically near term, are greater than the expected cash inflows; therefore its capitalised value may become negative for a sufficiently large increase in the rate of interest;

iii) Ponzi financing unit which has an expected cash flow insufficient in the early periods to service its outstanding debt in the hope of a subsequent 'bonanza' which may recover its financial soundness; of course its capitalised value may easily become globally negative even for a very small unexpected increase in the rate of interest.

We should emphasise that an unexpected increase in the rate of interest and\or an unexpected fall in the cash inflows may increase the degree of financial fragility of a certain unit shifting it from the expected hedge position to a speculative position, or even -for large shocks- into a Ponzi position. This underlies the debt-deflation mechanism of propagation of a financial crisis because the unexpected insolvency of unit A which entertains a debt with unit B increases the financial fragility of unit B leading eventually to its insolvency, and so on. The financial fragility of a whole economy depends on the proportion of Ponzi units and speculative units in the economy. In order to fix the ideas a possible aggregate index of financial fragility could be the following:

$$(aS + kbP)/ cH, \qquad k > 1,$$

where S measures the number of speculative units and a their average financial size, P the number of Ponzi units and b their average financial size, k gives a higher weight to Ponzi units, H is the number of hedge units and c their average financial size.[6] In addition the aggregate financial fragility of a certain economy depends also on the rapidity of the propagation mechanism of insolvency which depends not only by the above index but also on further structural and institutional features of the economy. Finally both the degree of aggregate financial fragility and the velocity of propagation of a financial crisis depends on aggregate constraints such as the average degree of capitalisation of financial units, the degree of liquidity in circulation, the weight of public expenditure and of the public debt which may sustain cash flows, etc. Aggregate economic policies heavily affect the probability of a financial crisis and the velocity of its propagation (see next section).

The cycle is based on the tendency of investment to increase whenever the financial structure of the economy is solid and the fears raised by the last financial crisis are sufficiently distant in the past. The acceleration of investment gradually deteriorates the financial solidity of the economy because any investment project is to same extent speculative as its costs are to be sustained in the early phases of the projects wile the returns may be earned only later, and because the buoyancy of the economy induced by it spreads over-optimistic expectations. Eventually, after a sustained boom the financial structure of the economy becomes so fragile that a small shock may be sufficient to trigger a financial crisis which severely reduces investment. Only after a sufficiently long period of depression the financial structure becomes again sufficiently solid and the expectations sufficiently optimistic to allow a new upturn of investment.

We cannot even hint here to the richness of analytic and factual details which makes so interesting Minsky's theory. However the very synthetic account of the basic conceptual framework of his theory may be sufficient to assess the originality of his approach as compared with the main alternatives mentioned above. The main engine of cycles lies in the intrinsic structural instability of a sophisticated monetary economy, i.e. in its financial fragility, and in its tendency to fluctuate with a certain qualitative regularity as a consequence of fluctuations in long term expectations. This is not the consequence of irrationality of economic agents but of their limited rationality in an environment characterised by hard uncertainty. During the boom a more speculative behaviour increases short-term returns so that it is very difficult to resist the pressure of competition with

[6] In Vercelli (1991) a different measure of aggregate financial fragility is suggested.

considerations based on the distant future when competitive markets continuously compare the short-term performance of firms and banks in order to choose where to direct the flows of new financial commitments. Disequilibrium and bounded dynamic instability are consequences of the fluctuations in structural instability, although they may in their turn endogenously trigger further shocks. This mechanism produces fairly regular fluctuations in the main aggregate variables, as emphasised by macrodynamic theories, as well as co-movements between them as emphasised by equilibrium business cycles but the scope of the theory is much wider. The trend of the main endogenous variables is not given before and independently of the fluctuations but it is determined by them since they encompass an irreversible and permanent element. In particular the trend of growth depends on the behaviour of the investment which depends on the complex factors of Minsky's theory. Also the exogenous factors play a more crucial role in this structural instability perspective because even a small shock may trigger a process leading to great consequences when the degree of financial fragility is high. In addition, differently from the previous approaches, even the individual characteristics of a shock matter: its size, its nature (monetary, real, aggregate or induced by the insolvency of another unit) and the characteristics of the units which are first hit, in particular their degree of financial fragility. Moreover, structural and institutional factors which are almost completely ignored in the other theories of cycles are fully integrated in the theory. Finally the evolution itself of the structure of the economy and of its institutional framework becomes partly endogenous to the theory.

Of course the very large scope of Minsky's theory of economic cycles and its great conceptual complexity have their costs which are reflected in the absence of a fully rigorous analytic treatment.[7] However this section has tried to suggest that nothing forbids a fully rigorous analytic version of Minsky's theory, or at least of parts of it, provided that we are prepared to introduce new rigorous analytic counterparts to the most innovative concepts. The first step is that of translating the crucial and most innovative concept, financial fragility, in rigorous analytic terms; to this end we believe that the concepts of structural instability here defined may indicate a promising way. This research programme resumes and carries forward Minsky's own attempts of formalisation of his own theory. A particular interesting example is his model of 1957 which is often cited by Minsky himself as ultimate source of clarification of the methodological characteristics of his own concept of financial fragility. His model is conceived as an attempted contribution to the heterodox macrodynamic tradition based on the dynamic instability of a monetary economy; however the most original part of the paper which introduces a first version of

his financial instability hypothesis leads him to characterise instability in a way that leads him outside this tradition foreshadowing his own approach based on structural instability. In fact he has a linear dynamically unstable system that whenever hits a barrier, which plays here the role of a sizeable economic shock, is induced to change initial conditions in such a way that they may change the direction of its movement. This is presented as a mere 'reinterpretation' of the non-linear accelerator model of the Hicks-Goodwin tradition but in fact implies a radical shift of approach as the discontinuous change in initial conditions is nothing but what we have here called parametric instability, while the case in which this shift induces a change of direction is clearly a case of what we have here called ε-instability. This conceptual shift is at the root of its subsequent work on what has to be interpreted as the structural instability of a monetary economy; it is a pity that his choice of playing down this conceptual shift has blurred, perhaps also to himself, the exact meaning of his own concept of instability and has inhibited further efforts in the direction here advocated.[8]

5. Instability and policy

We have argued in this paper that Keynes and Minsky share the idea that the basic flaw of a sophisticated monetary economy resides in its intrinsic structural instability that should not be confused with the received concept of (dynamical) instability. This point does not intend to be just hermeneutic or methodological since it has far-reaching policy implications. In order to understand them we have to recall briefly what policy implications have the alternative assumptions on instability entertained by the main approaches to cycle theory mentioned above (see *retro* section 4).

As we have seen, the orthodox macrodynamic approach prevailing up to the mid-1970s, whether of classical or Keynesian inspiration, assumed that cycles are disequilibrium fluctuations around an equilibrium trend. The moving equilibrium position is considered in principle (dynamically) stable but the tendency to converge toward equilibrium is just offset by external disturbances which keep alive the cycle and explain its observed irregularity. The structural stability of the model, and of the economy described by it, is implicitly assumed so that the shocks do not affect permanently the structural aspects of the economy including the equilibrium trend. This approach leads naturally to examine whether or not contracyclic policies are desirable, and –in case

[7] Hints of a formal theory may be found in important early contributions (in particular in Minsky, 1957, and 1959), and in sparse passages of his later work (see in particular the appendix to Minsky, 1986.)

[8] A model of cyclical fluctuations based on financial fragility interpreted in terms of structural instability is suggested in Vercelli, 1999.

of a positive answer- to choose the best contracyclic policies which are available. As is well known different schools of thought have given different answers. The orthodox Keynesians advocating the 'new classical synthesis' argued in favour of stabilisation policies based on automatic stabilisers or on fine tuning; monetarists on the contrary argued that such policies would just increase the variance of the shocks and advocated fixed rules of economic, in particular monetary, policy. In any case this approach to economic cycles has induced the policy debate to concentrate on contracyclic policies rather than on the structural aspects of the economy. In addition, its underlying assumption of (dynamic) stability of full employment equilibrium limits the choice of interventions to those which are consistent with the model of a competitive market economy.

On the other hand, the heterodox macrodynamic approach to cycle theory assumes that the full employment equilibrium is (dynamically) unstable (Hicks, 1950; Goodwin, 1951), and that the economy fluctuates within a corridor whose ceiling is represented by full employment equilibrium while the floor is differently characterised by specific features of a market economy. The cycle is produced by the joint action of the instability of full employment equilibrium and the presence of a lower barrier. This approach, differently from the preceding one, recognises a basic flaw in the performance of a market economy which is identified in the dynamic instability of full employment equilibrium, but this flaw may not be after all so important if the economic policy manages to push the lower barrier near the full employment equilibrium and to mitigate the dimensions and the effects of the crisis and the depression phase. In any case, also in this approach structural policies remain outside the scope of the theory.

Since the mid-1970s the macrodynamic approach has been ousted by the new classical equilibrium approach which denies any regularity in the period and amplitude of fluctuations of the macro variables and focuses on the regularity of their co-movement instead. In this case the structural stability of the model, and of the reality represented by it, is explicitly assumed while disequilibrium and dynamic instability are considered not only inconsistent with empirical evidence but altogether meaningless. This approach excludes in the most radical way the desirability, and even the viability if not the meaningfulness, of contracyclic policies. However, contrary to what has been often maintained by the critics, this approach does not necessarily imply that we live in the best possible world. In fact it is recognised that the underlying structure of the economy may change and that to each possible structure corresponds an optimal and stable equilibrium. Therefore there may be an alternative structure to which a better equilibrium is associated, in particular because the new structure is closer to the ideal model of a perfectly competitive economy. Therefore the debate on macroeconomic policy is shifted towards structural problems concerning the optimal design of economic institutions and of their decisional rules (Lucas,1981). However this

apparently promising opening in the direction of structural problems is then frustrated by the strict limits posed to the analysis by the assumption of structural stability that excludes any evolutionary perspective on the structural changes of the economy and by the unassailable faith in the superiority of the ideal model of perfect competition which strictly bounds the options concerning desirable economic institutions and behavioural rules.

Minsky's approach to cycles is completely different from the three main options pursued after Keynes that we have just recalled. His emphasis on instability, as well as most other methodological and theoretical tenets of his contributions, distinguish sharply his approach from that of old and new classical economics and from the orthodox macrodynamic approach. As for the policy implications, his focus on structural problems is evolutionary, and is therefore much more far-ranging than that of the new classical economists; moreover it does not exclude a role for contracyclic policies, although these are quite different from those advocated by the orthodox macrodynamic school. The relationship between Minsky's theory and that of the heterodox macrodynamic school is more problematic as both emphasise the intrinsic instability of a monetary economy and because the evolution of his own theory springs out from this tradition (Minsky, 1957, and 1959). However, if the interpretation advanced in the preceding section is correct, the shift in emphasis from dynamic instability to structural instability is at the root of the profound analytic and policy differences that distinguish his mature theory from that of heterodox macrodynamic models. In Minsky's view structural instability is not only the mainspring of the cycle but also of the structural evolution of the economy. This requires a continuous updating of the economic institutions and of their behavioural rules, which implies a prevailing focus on structural policies within which contracyclic policies may play an accessory role. Minsky suggests a few general rules for thwarting a financial crisis; in particular:

(i) well-calibrated interventions of central banks as lenders of last resort in order to interrupt, or at least mitigate, the destructive effects of debt-deflation processes;

(ii) apt contracyclic increases of public debt in order to sustain the profits eroded by the reduction in private demand which characterises any crisis.

However, Minsky is fully aware that policy measures of this kind are only efficient to the extent that they succeed in having structural effects, and manage in particular to stabilise the financial structure of the economy; moreover he is fully aware that stabilising measures of this sort are likely to have collateral effects which are bound to produce destabilising effects in the longer term. In particular an increase in the supply of money induced by last-resort interventions are likely to produce inflationary pressures; in addition economic agents may feel encouraged to take speculative and hyper-speculative positions under the pressure of competition in the hope that

regulators will intervene in case of insolvency (moral hazard); on the other hand the most prudent units are typically characterised in the boom by lower returns which induces the adverse selection by the market of the most speculative units.

The right dimension, timing and implementation procedures of the contracyclic measures depend on the structural characteristics of the economy; Minsky's contributions are rich of insights on these matters in reference to specific historical episodes. However in his view more important are the structural policies meant to assure a higher degree of structural stability to a sophisticated monetary economy; in particular:

(i) the structure of public expenditure should change shifting towards the investment in public capital goods and infrastructures that enhance the efficiency of economic activity;

(ii) apt prudential regulation measures should be introduced or re-enforced in order to check the intrinsic tendency towards more speculative positions in the boom period,

(iii) market and policy institutions should be continuously updated in order to increase the structural stability of a sophisticated monetary economy.

These concise observations on the policy implications of Minsky's approach should be sufficient to emphasise that they are never conceived as ready-made recipes good for all seasons but as heuristic rules to be specified according to the circumstances. This attitude towards policy issues, which is very similar to that of Keynes, is the only one consistent with his evolutionary paradigm based on the intrinsic structural instability of a sophisticated monetary economy.

6. Concluding remarks

In this paper it has been argued that in both Keynes's and Minsky's theories a crucial role is played by a concept of instability, different from the usual dynamic concept of economic instability, that has been here called structural instability. Minsky is one of the very few interpreters of Keynes who has caught this central aspect of the GT; he has also much developed it by clearly distinguishing between different states characterised by different degrees of structural instability, and by connecting them in a succession which explains many important aspects of economic cycles and of financial crises. The emphasis given in this paper on the crucial role of structural instability is not meant to be a mere hermeneutic or methodological point, since it has been claimed that it has crucial descriptive and prescriptive implications which have been foreshadowed by Keynes and further investigated by Minsky.

In particular it has been argued that Minsky's approach to the explanation and control of economic cycles in a monetary economy is based upon a conceptual framework which:

(i) is more general than that of the main alternative approaches,

(ii) is strikingly innovative from both the theoretical and methodological points of view.

From the descriptive point of view Minsky's approach is more general than that of the equilibrium business cycles because it does not limit itself to analyse the co-movements among a few selected variables but enquires also to what extent the main endogenous macro variables, such as investment, income and rate of interest, are affected by fairly regular cyclical fluctuations. It is also more general than the macrodynamic approach because it drops the assumption, shared with the preceding approach, of structural stability of the economic system and extends its scope to the evolutionary aspects of economic cycles. Cyclical fluctuations are not seen by Minsky just as waves around an independent trend but as spirals where the irreversible shifts of the trend which characterise the process of development are crucially affected by the cycle itself. The latter is not conceived as the outcome of a given stationary mechanism but as the result of the moves and the counter-moves of the economic agents in the market and of the authorities which have the task of regulating it. These moves and counter-moves include not only innovations in the behavioural rules but also in the institutions which characterise both the markets and the policy authorities.

The wide-ranging descriptive and explanatory scope of Minsky's approach greatly expands also the scope of its policy implications. Since the structure of the economy is liable to change and is in continuous evolution, fixed rules of economic policy cannot guarantee constant, or at least predictable, effects nor the minimisation of systemic uncertainty, as maintained by their advocates. On the other hand, the efficacy of counter-cyclical policies may change in function of specific contingencies, such as time, space, nature of the crisis, etc.; in addition, even if a certain contracyclic measure proves efficient when first introduced, its impact may be frustrated by counter-moves of the economic agents meant to elude them through behavioural and institutional innovations. Thus there is not much scope in the longer period for the traditional 'Keynesian' policies based on automatic stabilisers or fine tuning; on the contrary an increase of deficit spending meant to sustain profits in a crisis or interventions of last-resort by central banks meant to thwart debt-deflation processes may be crucial in aborting, or at least mitigating, a financial crisis but their optimal dimensions and modalities cannot be defined in general terms. In addition their repetition may induce reactions inspired by moral hazard and adverse selection which in the long term increase the probability of financial instability. The regulators must adapt to the continuous evolutionary process of structural change by introducing promptly, whenever required, new behavioural and institutional approaches of intervention and control.

Summing up, the game played by regulators with economic agents is repeated many times so that the economic agents have the opportunity of learning how to escape control. New classical

economists have based on these considerations their claims on the superiority of fixed rules over discretionary rules of economic policy but have ignored that the repeated policy game is evolutionary and that its implications cannot be sterilised by the assumption of dynamic and structural stability of the evolutionary process.

We may conclude by observing that from the shoulders of Keynes, who in the reconstruction of Minsky is still the unrivalled giant of the macroeconomic thought in this century, he has managed to see much further than most other economists. In particular he has seen the irreducible evolutionary nature of a sophisticated monetary economy and the intrinsic complexity of its behaviour. This raises a challenge to economists who cannot think of analysing and controlling such an intractable system with the traditional concepts and methods. We have therefore to climb on Minsky's shoulders trying to see even further. However to keep our balance in this acrobatic position we need a thorough clarification of the complex analytical and methodological issues raised by Minsky's theory as well as detailed applications to the recent episodes of financial crises.

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