

# Formal modelling vs. insight in Kalecki's theory of the business cycle<sup>‡</sup>

Daniele Besomi\*

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*“Si on veut, pour concevoir la crise, aller au-déla de l'idée de perturbation, d'épreuve, de rupture d'équilibre, il faut concevoir la société comme système capable d'avoir des crises, c'est-à-dire poser trois ordres de principes, le premier systémique, le second cybernétique, le troisième néguentropique, sans quoi la théorie de la société est insuffisante et la notion de crise inconcevable.” (Morin 1976, p. 149)*

## 1. Introduction

Kalecki's theory of the business cycle is rightly renowned for various reasons: in particular, besides itself providing an original contribution, it set the framework for Kalecki's ideas on effective demand, for his anticipation of a number of Keynesian elements, and for the development of Kalecki's related themes such as income determination and distribution. Although the secondary literature (both technical and descriptive) on this subject is immense, a specific aspect seems to deserve further reflection.

Kalecki's theory was expounded by means of a number of models couched in terms of functional equations (difference or mixed difference-differential equations), the first of which (Kalecki 1933a, 1935a, 1935b) was analytically resolved while the others were qualitatively discussed in an approximated fashion. These mathematical or geometrical representations were accompanied by extremely succinct statements supplying

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\* Address for correspondence: c.p. 7, 6950 Gola di Lago, Switzerland. E-mail: dbesomi@cscs.ch.

the author's economic interpretation of the formal models. Yet Kalecki's view, as emerging from these almost epigrammatic abstracts, does not always suit the properties of his models –or rather, his models do not always fully reflect Kalecki's understanding of the cycle as expressed in his own words.<sup>1</sup> The matter is intriguing, as Kalecki himself seems to have doubted, since his early formulations, that his models could capture some of the aspects of the working of the capitalist system in which he was interested; towards the end of his life these doubts seem to have taken over and led him to dedicate specific reflections to the implications of his 'econometric models' as compared to his other source of inspiration as to the approach of economics, that is, a certain (rather mechanistic<sup>2</sup>) view of Marxism.

In the following section Kalecki's intuitive interpretation of the cyclical phenomena is outlined. At first I focus on his emphasis on 'paradoxes', as referring to both theoretical statements and to the properties of capitalist economies: in the first sense, Kalecki distanced himself from orthodox economics and firmly established that business cycle theory should consider the economic system as a whole, as opposed both to what we would today call microeconomics and to the 'disproportionality' theories of the cycle. In the second sense, Kalecki identified in the antagonistic and contradictory character of capitalism the causes of the cycle and of the long-run incapacity of capitalism to supply its own endogenous conditions for growth. In section 3 Kalecki's description of the cycle as 'automatic' is examined, distinguishing between the use of the adjective as indicating the admitted determinism of his description and as expressing his belief that business fluctuations are a phenomenon intrinsically rooted in the capitalistic mode of production.

In section 4 I argue that while Kalecki's models fully support the first meaning of 'automatic' they fail to adequately represent his view that cycles are the form taken by the contradictions of capitalism: Kalecki either failed to provide a rigorous proof of the stability of the cycle when the model was endogenous or failed to provide an explanation of the cycle relying on the properties of the economic system, resorting instead to exogenous shocks to explain the persistence of fluctuations. The role of lags in Kalecki's models is also discussed, as well as the introduction of elements extraneous to the 'pure business cycle' setting in order to account for the asymmetry of the cycle.

Section 5 outlines Kalecki's reflections on the inability of 'econometric models' to represent in full the contradictions of capitalism relating to the long period, with particular emphasis on his interesting considerations on the capitalist system's reactions to the structural instability that occasionally arises, drawing out the implications regarding

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<sup>1</sup> This discrepancy does not seem to have been examined in the literature, except for occasional remarks. Steindl, for instance, noticed (without elaborating further) that Kalecki's last model provided an interesting mathematical treatment of the trend which, however, "does not fully reflect Kalecki's ideas" (Steindl 1981, p. 133, with reference to Kalecki 1968a).

<sup>2</sup> See for instance D'Antonio 1978 and Besomi 1988.

the short-period theoretical treatment of capitalistic dynamics. In section 6 the above conclusions are set in historical perspective.

## 2. On paradoxes

The word ‘paradox’ and related terms and adjectives (such as ‘contradiction’ and ‘antagonistic’) frequently recur in Kalecki’s writings, from the early 1930s to the end of his career. The passages where such expressions occur are often quoted in the secondary literature: Kalecki, in fact, usually employed them to strongly characterize his conclusions, thereby offering distinctive aphorisms neatly summarizing the essence of his thought. Their central place in Kalecki’s exposition of his ideas makes for a convenient starting point for examining the core of his message.

Kalecki used such terms in at least three distinct fashions of interest for his conception of the dynamics of capitalist economies.<sup>3</sup> The first of these made use of the word ‘paradox’ in its proper sense, that is, as referring to apparently contradictory, baffling or inconsistent *statements* or *propositions*. Kalecki was aware that some of his conclusions were incompatible with the conclusions of ‘orthodox’ economics; he did not try to hide this fact, but rather aimed at resolving the paradox by stressing where his own point of view differed from mainstream economics.<sup>4</sup> The reference to a paradox indicates a radical shift in the way of looking at a certain problem: in particular, on several occasions Kalecki stressed that issues such as the determinants of profits, the relationship of savings and investment, or the effect of the reduction of wages on employment required us to abandon the perspective of the individual capitalist and to adopt instead the viewpoint of the system as a whole.<sup>5</sup> The following passage, concerning the relationship between profits and expenditure, illustrates this point:

The conclusion that the increase in capitalist consumption in turn increases their profits *contradicts* the common conviction that the more is consumed the less is saved. This approach, which is correct with regard to a single capitalist, does not apply to the capitalist class as a whole. If some capitalists spend money, either on investment or on consumer goods, their money passes to other capitalists in the form of profits. Investment or consumption of some capitalists creates profit for others. Capitalists as a class gain exactly as much as they invest or consume. (Kalecki 1933a, p. 79, emphasis added)

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<sup>3</sup> Kalecki’s usage of words is somehow loose in this respect (contrary to his very precise language in expounding his analytical arguments): perhaps the translators or editors have slightly altered the original meaning. My grouping of Kalecki’s different usages does not reflect the whole range of dictionary meanings, but three specific features of Kalecki’s cycle theory: his adoption of a systemic *vs.* an individual viewpoint, the double character of investment, and the difficulties in the realization of profits.

<sup>4</sup> Keynes used the term in a similar way, for instance when explaining to Hobson the paradox that “saving in excess of investment involves in itself no sacrifice whatever to the standard of life of the consuming and saving class”. Keynes as well thought this result to be paradoxical for “the minds habituated to other channels of thought” (letter to Hobson, 1 November 1931, in Keynes 1973a, pp. 335-6).

<sup>5</sup> The paradoxical character of the systemic law if judged from the viewpoint of an individual’s experience is, of course, the other side of the fallacy of composition, consisting in applying to the whole the laws valid for individuals only while neglecting the interactions among individuals.

In the same essay Kalecki concludes, referring again to the passing of one capitalist's expenditure into the hands of other capitalists as profits, that investment finances itself by giving rise to the profits, out of which a corresponding amount of bank deposits is generated (Kalecki 1935b, p. 343; Kalecki also explains that the technicalities of the money market require a credit inflation, so that "at any time the corresponding bank account will be increased (per unit of time) by the amount  $I$  equal to the volume of orders allocated, and simultaneously decrease by an amount  $A$  spent on the production of capital goods").<sup>6</sup> Based on similar reasoning, Kalecki argued that savings must be equal to investment:

An individual capitalist may earn 'money'; the income of capitalists as a whole, in which mutual debits and credits cancel each other out, must equal the value of consumer goods for capitalists and capital goods. From this it follows that the saved income of capitalists as a whole corresponds to the output of capital goods.<sup>7</sup>

Kalecki stressed the change in the viewpoint (although without referring to paradoxes in this specific occasion) also when discussing the effects of a reduction in wages:

One of the main features of the capitalist system is the fact that what is to the advantage of a single entrepreneur does not necessarily benefit all entrepreneurs as a class. If one entrepreneur reduces wages he is able *ceteris paribus* to expand production; but once all entrepreneurs do the same thing, the result will be entirely different. (Kalecki 1935c, p. 188)

The same kind of argument applies to the effect of a reduction of wages on profits, prices and production, and to the entrepreneur's understanding of the process involved:

An individual entrepreneur, even if growing stocks in his warehouses becomes a serious problem for him, does not understand that a reduction in prices is the result of the previous reduction in wages, to which he also contributed. He regards the 'market' on which the reduction in prices took place as an external

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<sup>6</sup> It is worth recalling that Keynes seems to have followed an essentially similar line of thought: "My contention that for the system as a whole the amount of income which is saved, in the sense that it is not spent on current consumption, is and must necessarily be exactly equal to the amount of net new investment has been considered a paradox and has been the occasion of widespread controversy. The explanation of this is undoubtedly to be found in the fact that this relationship of equality between saving and investment, which necessarily holds good for the system as a whole, does not hold good at all for a particular individual. There is no reason whatever why the new investment for which I am responsible should bear any relation whatever to the amount of my own savings. Quite legitimately we regard an individual's income as independent of what he himself consumes and invests. But this, I have to point out, should not have led us to overlook the fact that the demand arising out of the consumption and investment of one individual is the source of the incomes of other individuals, so that incomes in general are not independent, quite the contrary, of the disposition of individuals to spend and invest; and since in turn the readiness of individuals to spend and invest depends on their incomes, a relationship is set up between aggregate savings and aggregate investment which can be very easily shown, beyond any possibility of reasonable dispute, to be one of exact and necessary equality" (Keynes 1939, pp. xxxii-xxxiii).

<sup>7</sup> Kalecki 1932b, in 1990, p. 147. Analogously, two decades later Kalecki argued that, due to the equality between saving and investment, "capitalists' savings 'lead' profits. This result may appear paradoxical. 'Common sense' would suggest the opposite sequence—namely, that savings are determined by profits" (Kalecki 1954, p. 55).

force, independent of him.<sup>8</sup> So from the falling prices he eagerly draws the conclusion that he should reduce wages still further. Consequently, the stocks of unsold workers' consumer goods increase once again, prices once again fall, etc. An even greater part of the social income will be tied up in stocks, the crisis will continue to deepen, and workers with their shrinking wages will be unable to take advantage of prices reductions to restore their previous standard of living. (Kalecki 1932a, p. 43).

Much later, Kalecki discussed the implications of the individual vs. systemic viewpoint in relation to Say's law, which interpreted the economic relationships in terms of "the experience of the individual", consisting in

the application to the economy as a whole of the experience of housekeeping where clearly less consumption means higher saving. But whereas the income of the individual is given, the national income is determined in a capitalist system by consumption and investment decisions, a fall in one of these components by no means leading automatically to a rise in the other. The individual experience does not correspond to the course of the economy as a whole (Kalecki 1964b, Engl. transl. p. 309)

Kalecki pointed out that in this respect Say's law resembled the Ptolemaic system, thereby implicitly describing his own 'systemic' approach as a Copernican revolution.<sup>9</sup>

There is an obvious resemblance between these statements and Marx's emphasis on 'total capital' as distinct from 'individual capitals': the latter are related to each other by competition, and competition turns all the economic laws upside down.<sup>10</sup> Whether or not Kalecki took this point over from Marx, it is clear that here lies the foundation of his concern for *macro*dynamics.

A different kind of usage of the expression 'paradoxical' in Kalecki's writings regards not propositions, but the *properties* of one of his objects of analysis –not just *any* object of analysis, but "the central *pièce de résistance* of economics": investment (Kalecki 1968a, in 1971, p. 165). The relevant passages have often been quoted:

We face here one of the most remarkable paradoxes of the capitalist system. The expansion of capital equipment, i.e., the increase in the national wealth, contains the seeds of a depression in the course of which the additional wealth proves to be only potential in character. For a considerable part of capital equipment is idle then, and becomes useful only in the next upswing (Kalecki 1935c, in 1990, p. 193)

And:

We see that the question, 'What causes the periodical crisis?' could be answered shortly: the fact that investment is not only produced but also producing.

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<sup>8</sup> This passage bears a striking resemblance to Marx's understanding of the role of competition in imposing the laws of capital in general upon individual capitalists: "Free competition brings out the inherent laws of capitalist production, in the shape of external coercive laws having power over every individual capitalist" (Marx 1867–94, vol. 1: III, Ch. 10, sect. 5, p. 270); "competition makes the immanent laws of capitalist production to be felt by each individual capitalist, as external coercive laws." (Marx 1867–94, vol. 1: VI, Ch. 24, sec. 3, p. 592); "Competition executes the inner laws of capital; makes them into compulsory laws towards the individual capital" (Marx [1857–58], Engl. transl. p. 752).

<sup>9</sup> Marx also refers to the Copernican view as paradoxical, if "judged by every-day experience, which catches only the delusive appearance of things" (Marx [1865], Engl. transl. p. 54).

<sup>10</sup> "So as to impose the inherent laws of capital upon it as external necessity, competition seemingly turns all of them over. *Inverts them.*" (Marx [1857–58], Engl. transl. p. 761)

Investment considered as capitalists' spending is the source of prosperity, and every increase of it improves business and stimulates a further rise of spending for investment. But at the same time investment is an addition to the capital equipment and right from birth it competes with the older generation of this equipment. The tragedy of investment is that it calls forth the crisis because it is useful. I do not wonder that many people consider this theory paradoxical. But it is not the theory which is paradoxical but its subject —the capitalist economy. (Kalecki 1937a, pp. 95–96; also 1939, p. 148).

These statements neatly summarize Kalecki's view of what *causes* the business cycle. The 'paradoxicality' consists in the fact that investment has a twofold effect: it increases the volume of aggregate profits, but at the same time it adds to the volume of capital. These influences have opposite effects on the current rate of profits, which is taken by entrepreneurs as a basis for estimating the expected profitability on which they base their investment decisions. In itself, there is nothing paradoxical in a variable behaving in such a way: almost any simple oscillating system in physics is the result of a similar process (the movement of a pendulum, for instance, is determined by the accelerating and decelerating action of mass as potential energy turns into kinetic energy and vice versa). What Kalecki wants to point out is that investment, by enhancing productive capacity, has the potential to fulfill human needs, but instead of doing so it causes widespread misery. This is Kalecki's version of the Keynesian paradox of poverty in the midst of plenty (Keynes 1973b, p. 377; see also Keynes 1934), which is resolved if one conceives of the capitalist system not as aiming at the "satisfaction of the needs of its citizens" but at "secur[ing] profits for capitalists". In fact, following the Marxist tradition (and in particular Tugan-Baranovsky) Kalecki does not conceive the capitalist system as a 'harmonious' regime, but rather as an 'antagonistic' one,<sup>11</sup> for which it would not be absurd to produce machines for the only purpose of producing more machines<sup>12</sup> (Kalecki 1967, in 1971, pp. 146-48). In Kalecki's view, therefore, the trade cycle is the form necessarily and automatically taken by this 'antagonism'.

Yet this is not all, because two additional 'contradictions' –Kalecki is here again using Marxian language, and frequently refers to the Marxist literature– are marring the dynamics of a capitalist economy, affecting its long-run development. The first is the

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<sup>11</sup> It has been claimed that Kalecki's frequent references to paradoxes testifies to the Marxian background of his ideas (for instance Osiatynski 1990, pp. 2–3 and 440; Lipinski 1977, pp. 72–73). It should be noticed, however, that there is no trace in Kalecki (nor in Tugan-Baranovsky, for that matter) of anything like Marx's dialectics: the 'contradictions' are interpreted in a rather mechanistic way (see D'Antonio 1978).

<sup>12</sup> Conversely, the stimulation of business could take place via the production of useless goods, as in the following example (where, incidentally, both the first two usages of the word 'paradox' are employed at once): "Let us assume, as often happens in the USA, that two competing railway lines run between two cities. Traffic on both lines is weak. How does one deal with this? Paradoxically, one should build a third railway line, for then materials and people for construction of the third line will be transported by the first two. What should be done when the third one is finished? Then one should build a fourth one and a fifth one .... This example, as we warned, is paradoxical, since unquestionably it would be better to undertake some other investment near the first two railway lines rather than to build a third one; nevertheless, it perfectly illustrates the laws of development of the capitalist system as a whole" (Kalecki 1933c, in 1990, p. 161).

insufficiency of effective demand: “the discrepancy between the development of productive forces and the markets for their products constitutes one of the main contradictions inherent in the capitalist system.”<sup>13</sup> Moreover,

if technical progress causes productive capacity to increase more slowly than the accumulation of capital, i.e. if the capital intensity of production increases, there comes into the picture another contradiction of the capitalist system formulated by Marx in his law of the falling rate of profit. (Kalecki 1945, p. 91)

Kalecki focussed on these contradictions from the early 1940s, when his pessimistic view of capitalism took the form of a theory of ‘stagnation’, consisting in the idea that capitalistic economic systems would not provide their own endogenous engines for growth but have to rely on semi-exogenous factors such as innovations (for instance Kalecki 1943a, 1954, 1962, 1968a).<sup>14</sup> This problem gradually superseded the cycle problem in the development of Kalecki’s thought:

Harrod observes rightly that his theory exhibits the basic ‘antinomy’ of the system;<sup>15</sup> he thinks that ‘antinomy’ leads to fluctuations around the trend line. I believe that the antinomy of the capitalist economy is in fact more far reaching: the system cannot break the impasse of fluctuations around a static position unless economic growth is generated by the impact of semi-exogenous factors such as the effect of innovations upon investment.<sup>16</sup> It is only in such a case that cyclical fluctuations do occur around the ascending trend line. (Kalecki 1962, growth, p. 134)

Kalecki went so far as to suggest that the more fundamental antinomy should be brought in in the explanation of the fluctuations around the equilibrium position (whether it be the stationary state or the higher rate of growth induced by the semi-exogenous factors): “Whenever the top of the boom is reached a downswing follows, reflecting the inability of the system to expand in the long run at a higher rate than  $\phi_B$  [the equilibrium rate]” (Kalecki 1962, p. 150).

The issue of the trend, however, did not completely supplant the cycle and the contradictions to which it gives form, but only called for a new method of approach.

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<sup>13</sup> Kalecki 1956, Engl. transl. p. 87 (Andrzej Dudzinsky points out to me that in the Polish original Kalecki uses the word “divergence” instead of “discrepancy”, as he did in his comment on Baran: Kalecki 1965, p. 59); for an earlier instance see Kalecki 1945, p. 91, while for posthumous statements see Kalecki and Kowalik 1971, where there are multiple references to the “contradiction between production and realization”.

<sup>14</sup> It has been noted that there is a point of contact between Kalecki’s results on trends and cycles: the equations describing the short-term dynamics and long-period development have some parameters in common, for the coefficient ‘promoting’ growth does at the same time diminish the damping of fluctuations, so that growth is paid for by additional instability (Lange 1965, Engl. transl. pp. 140–41; Steindl 1952, pp. 193–95; both cited in Osiatynski 1991, pp. 554–6).

<sup>15</sup> Andrzej Dudzinsky points out to me that the words “antinomy of the system” were later translated into Polish as “contradiction inherent to the system”. It is unclear, however, whether Kalecki personally checked the Polish translation.

<sup>16</sup> It should be noted, however, that while Kalecki had confirmed that the positive growth rate representing Harrod’s moving equilibrium is unstable, he assumed as a matter of course that the other solution of his equation, representing an equilibrium at a lower level (either stationary or determined by the semi-exogenous factors), is stable. Further research showed instead that such a solution is only stable under certain conditions, in particular that “the investors react slowly to any change in profits ... or ... that the past changes in profits that they take into account for the purpose of current investment decisions are those over a rather long period of time.” (Gomulka et al 1990, p. 532).

### 3. The automatism of the cycle

Before discussing Kalecki's approach to long-term dynamics and its relation to trade cycle theory it is expedient to examine his notion of the role of business fluctuations in capitalist economies.

From his very first writings on cycles, Kalecki insisted on the *automatic* character of business fluctuations. In his *Essay on the Business Cycle Theory*, for instance, he wrote:

The aim of this study is to provide an explanation, indeed one of the possible explanations, of the automatic mechanism of business fluctuations in a closed economy. [...] [T]he automatic mechanism of business fluctuations is defined here much more strictly than usual[...] we want to set out a mechanism which would explain the relative *regularity* of business fluctuations (Kalecki 1933a, Engl. transl. p. 66).

The regularity is only relative, and of course Kalecki admits the action of 'disturbing factors', such as crises of confidence. But, in order to outline the 'pure' theory of the cycle, such disturbances are abstracted from (Kalecki 1933b, p. 113).

The above, however, is not the only meaning of 'automatic'. Kalecki often contrasted the *automatic* business cycle due to the fluctuations of investment activity with the *synthetic* or *artificial* boom stimulated by government intervention. Significantly, when used in this sense the word 'automatic' is synonymous with 'natural' –he even wrote of an “automatic ‘natural’ adjustment process” (Kalecki 1932c, in 1990, p. 53):

the synthetic upswing is supposed to change into a natural one, with public investment 'relieved' by private ones. (Kalecki 1935e, in 1990, p. 185.

The business upswing in the USA was generated, not synthetically, but naturally, i.e. under the influence of private investments (Kalecki 1934a, in 1990, p. 176).

after some time private investment takes over from public investment: the 'artificial' prosperity is replaced by a 'natural' one –which, by the way, will sooner or later [...] come to a stop as a result of expansion of capital equipment. (Kalecki 1935c, p. 194)

The 'natural state' of the system, therefore, consists in fluctuations: “prosperity, as we know, has its limits. Boom years are inexorably followed by crisis” (Kalecki 1932a, p. 43). Capitalistic economies, unless they organize a synthetic stimulation of the upswing, are “at the mercy of the purely automatic forces of the mechanism of business upswing” (Kalecki 1933c, p. 164).<sup>17</sup> Albeit more frequent in Kalecki's early writings, references to the automatic character of the cycle also occur in later writings. In the *Theory of Economic Dynamics*, for instance, a section is dedicated to “The automatic business cycle”, which occurs when the coefficients in the dynamic equation “are such as to cause an automatic

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<sup>17</sup> The perception that for Kalecki the cycle was intrinsic to capitalism is, of course, quite widespread (though rarely qualified with precision). Osiatinsky, for instance, came to the conclusion that “the cyclical nature of capitalist reproduction was for Kalecki undebatable, and resulted from the very essence of the capitalist mode of production” (1991, p. 588).

halt to the rise of investment in the boom and to its fall in the slump” (Kalecki 1954, pp. 123–27).<sup>18</sup>

The ‘automatic’ cycle is caused by the twofold nature of investment:

It is not, of course, the purpose of this essay to present a complete theory of business fluctuations. An attempt is made to give a general idea of the mechanism of a ‘natural’ upswing, and in particular to clarify one of its aspects [the role of inventions]. It now becomes apparent that investment has a favourable effect upon the economic situation only at the time when it is executed and provides an outlet for additional purchasing power. On the other hand the productive character of investment contributes to the slackening of the upswing and finally brings it to an end. For it is the expansion of capital equipment that, in the light of the above analysis, causes the collapse of the boom. (Kalecki 1935c, in 1990, pp. 192-93).

It is now clear that, for Kalecki, the cycle is the ‘natural’ outcome of the antagonistic nature of capitalism: the “world in which we are living” is “queer and perverse”, but this “paradoxical and absurd character of ‘antagonistic systems’” (Kalecki 1967, in 1971, p. 155) takes the form of a relatively regular alternation of phases of prosperity and of depression, each one breeding and eventually replacing the other.<sup>19</sup>

This is not to say that Kalecki believed in a fully automatic dynamics of capitalism. First, while the ‘natural’ forces set in motion by investment determine a tendency to cyclical development, he acknowledged the existence of disturbing factors, from which however he abstracted in order to isolate a ‘pure’ cycle. Secondly, Kalecki recognised that in particular situations, such as the world slump in 1929–32, the system could become “stabilized at the bottom of the depression at a very low level of economic activity”, with investment well below the replacement requirements (Kalecki 1935c, pp. 190–93). In such cases, the automatic mechanism would bring an upswing only after a considerable time, and the system would need some help from semi-exogenous factors such as innovations or from an artificial stimulation by the government in order to set the upswing in motion:

all these factors which affect the course of the crisis [namely, “those components of the mechanism of the capitalist economy which could form a foundation for overcoming the crisis”, of which “the contraction of capital caused by the decline of investments (and also by the running down of stocks) should be in the first place”] do so only after a long time. Former crises as a rule have ended sooner –on account of the intervention of some ‘external’ factors, such as the conquest of new markets, or a wave of technological innovations. (Kalecki 1932c, in 1990, p. 52)<sup>20</sup>

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<sup>18</sup> The following are other examples of Kalecki’s reference to the ‘automatic’ character of the business cycle and to other factors affecting the upswing: “In the course of a ‘normal’ upswing the increase in profits is due to the rise of the component ‘investment’. [...] The higher profitability of existing establishments, which result from [a surplus of exports over imports], acts as a stimulus to investment activity; the upswing resulting from a new surplus in foreign trade thus leads to a ‘normal’ boom” (Kalecki 1933d, in 1990, pp. 165–66). “... the upswing’s being ‘natural’ or ‘artificial’, i.e. caused by government intervention” (Kalecki 1935d, in 1990, pp. 196-97). “[T]he ‘self-stimulating process’ [...] and the change in the capital equipment [...] create together an automatic business cycle” (Kalecki 1939, p. 144).

<sup>19</sup> Sebastiani summarizes Kalecki’s view as follows: “The *causa causans* of the instability of capitalism is, therefore, an intrinsic feature of accumulation, which marks its limit and internal contradiction—the productive character of the investment” (Sebastiani 1994, p. 115).

<sup>20</sup> The asymmetry of boom and depression is further discussed in section 4.3. below.

Thirdly, the long-term component of economic dynamics essentially incorporates a factor ‘rooted in past economic, social and technological developments’: the institutional settings (Kalecki 1964a), and on the other hand semi-exogenous development factors such as innovations. Kalecki strongly stressed the difference between the long-term and the cyclical components of the dynamics of a capitalist system: while the former incorporates history, the short-term dynamics is “determined fully by the coefficients of our equations” (Kalecki 1968a, in 1971, p. 183).

The latter point reflects some of Kalecki’s most interesting methodological considerations on dynamics, but in order to appreciate them in full (see section 5 below) it is necessary to examine first how the analytical structure of Kalecki’s models of cycles reflects his vision of the phenomenon.

#### **4. Models and cycles**

Kalecki thus interpreted the cycle as the dynamic form expressing the intrinsic antagonism of capitalism. His theory is formulated by means of models that are meant to translate the causes of the cycle identified by him into a “mechanism of the business cycle”.<sup>21</sup> These models have a common basic structure: there is a fundamental equation representing the factors affecting investment decisions (profitability in the first attempts in 1933-39, to which internal saving was added in later versions), coupled with other equations expressing the relationships between investment decisions and actual outlay of capital goods, and between the other factors involved (aggregate profits, the amount of capital, saving) in terms of present and past investment or increase in investment. These equations are assembled together into a single functional equation, whose unknown is a function representing the unfolding of investment over time. The various versions of Kalecki’s mechanisms differ in how the various factors are involved and related to each other, in the number of time-lags involved, in the kind of functional relationship in the main equation, expressed as a mixed difference-differential equation up to 1943 and as a difference equation from 1954 onwards.

There exists an abundant literature concerned with the analysis of the formal properties of these models and the comparison with other formulations,<sup>22</sup> and there is therefore little to add to it. I will therefore only focus on how well Kalecki’s approaches reflect his intuitive perception of the phenomenon, that is, on the extent to which Kalecki’s

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<sup>21</sup> The expression is taken from the title of a section of Kalecki’s *Essay on the business cycle theory* (1933a), and of chapter 11 of his *Theory of Economic Dynamics* (1954); similar wordings, however, recur frequently in Kalecki’s writings.

<sup>22</sup> See in particular Steindl 1981, whose classification of Kalecki’s trade cycle theories into three versions (1933 to 1939; 1943a to 1954; and 1962 to 1968a) was largely accepted in the literature. It should be noted that Steindl’s categorization is based on the *form and content* of the respective investment functions. In what follows, as I will focus instead on the *stability* properties of the various models, the grouping gives different results: for instance, the 1943 nonlinear model describing a stable limit cycle is intrinsically different from the 1954 linear version describing damped fluctuations sustained by exogenous shocks.

equations are a faithful rendering of the words written between the equations and of his other commentaries on cycles and crises as expressed in non-technical (and often admittedly political) writings.

A first (rather un-original) observation is that Kalecki's models certainly portray the automatism of the cycle, in the sense of the capability of explaining the regularity of fluctuations. Kalecki explicitly accepted Ragnar Frisch's characterization of dynamics as

a theory that explains how one situation grows out of the foregoing. In this type of analysis we consider not only a set of magnitudes in a given point of time and study the interrelations between them, but we consider the magnitudes of certain variables in different points of time, and we introduce certain equations which embrace at the same time several of these magnitudes belonging to different instants. [...] Only by a theory of this type we can explain how a situation grows out of the foregoing. This kind of analysis is basically different from the kind of analysis that is represented by a system of Walrasian equations; indeed in such a system all the variables belong to the same point of time.<sup>23</sup>

Kalecki's models all explain how one situation results from the unfolding of the previous state of the system following a precise law expressed by the functional relationships: given an initial condition (that is, the state of the system at a certain point in time or during a certain interval), the whole past and future of the system are entirely determined. In this sense automatism is synonymous with determinism. Occasionally Kalecki pushed this view to its extremes by denying capitalists the faculty of making autonomous decisions,<sup>24</sup> as for instance in the following passage:

capitalists, as a whole, determine their own profits by the extent of their investment and personal consumption. In a way they are the masters of their fate. But how they master it is determined by objective factors, so that the fluctuations of profits appear after all to be unavoidable. Capitalist consumption is a function of gross accumulation. The gross accumulation, which is equal to the production of investment goods, is determined by investment orders which in turn were undertaken in a past period on the basis of the profitability in that period, i.e. on the basis of the gross accumulation and the volume of capital equipment in that period. (Kalecki 1933a, Engl. transl. pp. 79–80).

On the other hand, he was frequently at pains to stress that this mechanistic view could not capture the complexity of the phenomenon: besides his reservations cited at the end of section 3 above, he pointed out that “the overcoming of the crisis by capitalism is

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<sup>23</sup> Frisch 1933, p.171; Kalecki defined his first model as “A Macrodynamic Theory of Business Cycles”, explaining that “The term ‘macrodynamic’ was first applied by Professor Frisch in his work ‘Propagation problems and impulse problems in dynamics’ [...] to determine processes connected with the functioning of the economic system as a whole, disregarding the details of disproportionate development of special parts of that system” (Kalecki 1935b, p. 327). It is interesting to observe that Kalecki's interpretation of macrodynamics as disregarding disproportions does not have a counterpart in Frisch's article, but probably aims instead at better defining Kalecki's view of the cycle, not as a phenomenon arising from disturbances in the proportionate growth generalizing to the whole system (such as in Tugan-Baranovsky's approach or in Bernstein's view: see, respectively, Kalecki 1967 and Kalecki and Kowalik 1971, in Kalecki 1990, p. 467) but as the result of a more fundamental antinomy.

<sup>24</sup> This is also reflected in Kalecki's rather mechanistic treatment of expectations: although nominally the determinant of investment decisions was the *expected* profitability of investment, Kalecki approximated this factors by the *recorded* profit rate, arguing that capitalists evaluate the expected profitability on the basis of the current rate of profits; this variable is then taken, without provisos regarding changes in expectations, as the determinant of decisions to invest (Kalecki 1933a, pp. 73–74).

inseparably linked to the position taken, and the political actions pursued, by the working class”, and that the “decisive factor here is obviously not the economic but the social one –the position taken by the working class” (Kalecki 1932c, in 1990, pp. 50 and 53).<sup>25</sup>

If automatism in the sense of mechanical determination is overemphasized by Kalecki’s analytical models, the same cannot be said as to the other aspect of ‘automatism’ considered in the previous section, namely, the cycle as the form taken by the antagonism intrinsic to capitalism. Most of Kalecki’s models describe damped fluctuations around a line of stationary equilibrium and rely for the persistence of fluctuations on exogenous shocks; moreover, all of them crucially depend for cyclicity upon one or more reaction lags.

#### **4.1. The stability of equilibrium and the persistence of the cycle**

The problem of the persistence of fluctuations troubled Kalecki since the formulation of his first model in 1933 (Kalecki 1933a, 1935a, 1935b).<sup>26</sup> There, the mechanism of the business cycle was represented in terms of a linear delayed differential equation, of order one and with one lag (the ‘gestation period’ of any investment). Kalecki came to that equation after a series of approximations, a number of which consisted in linearization of the basic relationships.<sup>27</sup> This procedure implied that his equation could only give rise to exploding, damped or constant amplitude fluctuations, depending on the value of the parameters.<sup>28</sup> Kalecki originally discussed the case of constant fluctuations: a case “of a particular importance as it appears to be the nearest to actual conditions”, for “in reality we do not observe any *regular* progression or degression in the intensity of cyclical fluctuations” (Kalecki 1935b, p. 336), which would indeed represent the cyclical form of the paradox of the double nature of investment. But –as Frisch was quick to point out– the borderline between the areas of stability and instability is nothing but a mathematical abstraction, since it requires the coefficients to take some very specific values for which there is no empirical or theoretical justification.

We now know<sup>29</sup> that this is a consequence of the assumption of linearity: a linear functional equation only admits as solutions oscillating functions combined with an exponential term, thus giving rise to a stationary state (the most trivial case), to exponential growth or decay, or to constant, damped or exploding cycles; the case of constant

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<sup>25</sup> This aspect is further discussed in section 5 below.

<sup>26</sup> For brief overviews of Kalecki’s approach to this problem see Sawyer 1996, pp. 96–7, and 1985, pp. 57–8; the implications of the linearity of Kalecki’s models (except the 1943 version) and its relationship to the stability of equilibrium are not, however, discussed by Sawyer (nor elsewhere in the literature) to the extent they deserve.

<sup>27</sup> In particular the basic equation, representing the determinants of investment decisions per unit of existing capital in terms of the gross yield of capital, is assumed to be linear (for instance Kalecki 1935b, p. 331); similarly, capitalists’ consumption is decomposed into a constant part and a part proportionate to current profits (ibid., p. 327).

<sup>28</sup> The characteristic equation associated with Kalecki’s fundamental equation actually admits an infinity of solutions, only one of which, however, has period larger than the gestation lag. This was proved by Frisch and Holme (1935) on Kalecki’s request.

<sup>29</sup> See, however, the cautionary remark in **footnote 60**.

fluctuations is structurally unstable, as the slightest change in the coefficients would shift the system either in the area of stability or in the area of instability.<sup>30</sup> This, however, was not common knowledge in the early 1930s, and non-linear systems are (with a few exceptions) algebraically intractable. The only solution at hand was therefore that offered by Frisch in 1933: persistent fluctuations could be interpreted as the result of the superposition of random exogenous shocks upon a damped system.<sup>31, 32</sup> Kalecki readily recognised that there was a ‘metaphysical’ problem,<sup>33</sup> but at first he was not enthusiastic about this way out and suggested the following alternative:

Let us suppose that  $m$  [the coefficient relating investment decisions and the constant part of capitalists’ consumption plus gross accumulation: Kalecki 1935b, p. 331] has a slightly smaller value than that given above [the value determining a cycle of constant amplitude]; it is easily seen that this results in damped oscillations and in a short time the business cycle will practically disappear. But the requirements of liquidity of banks and enterprises will become less stringent and the disappearance of cyclical fluctuations will have the effect of an increase in reserves. The credit system will become more elastic and a given rise of price and production will call forth a less marked advance in the rate of interest. [But] the more elastic the credit system, the greater  $m$  will become, and, therefore, the damping of oscillations will lead to an increase in  $m$  and thus create a tendency towards return to fluctuations with a constant amplitude (Kalecki 1936, p. 360).

This approach (probably unknown to Kalecki) tackled the problem at its roots: it eliminated the assumption of linearity by treating the coefficient  $m$  as subject to positive feedback. Something, however, must have convinced Kalecki that such a solution could not be easily integrated within his line of approach. Perhaps he was overwhelmed by the analytical difficulties, or he may have realized that incorporating the credit system in his model would have required him bringing the rate of interest back in the main equation. The latter would have become much more complicated: Kalecki, in fact, while admitting that investment decisions depend on the rate of interest, eliminated this variable from his equation arguing that it varies in the same direction as the other determinant of investment, the gross yield: thanks to the “commonly known” fact that, “except for *financial panic* (the so-called crises of confidence), the market money rate rises and falls according to

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<sup>30</sup> “In the Kaldor model the cyclic behaviour is represented by a limit cycle in the phase space. Whereas in the Kalecki theory basing on linear time-delay equations the cyclic behaviour is represented by quasi-periodic solutions. As it is well known limit cycles are structurally stable whereas quasi-periodic behaviour is destroyed by small perturbations of the right-hand side of the dynamical system” (Szydlowski and Krawiec 2000, p. 391, with reference to Kaldor 1940 and Kalecki 1935b). Kaldor’s solution to Kalecki’s problem is discussed below, section 4.2.

<sup>31</sup> Frisch commented that “it is more correct, I think, to be prepared to accept any damping which the empirically determined constants will entail, and then explain the maintenance of swings by erratic shocks. This would be explained along the lines indicated in my paper in the Cassel Volume.” (Frisch and Holme 1935, p. 225, with reference to Frisch 1933).

<sup>32</sup> Alternatively, one could suppose that the system is unstable but oscillations are kept into boundaries determined by a ‘ceiling’ and a ‘floor’. This solution was propounded by Hicks in 1950, but was rejected by Kalecki in 1954 (see below in this section, and for a comment see section 6).

<sup>33</sup> “Frisch and Holme object to the above assumption of constant amplitude. They are right, for it is by no means sufficient to say that an assumption is correct just because it is confirmed by the conditions of real life. It must be made clear why real life is like that, otherwise the particular predilection it shows for a constant amplitude might appear metaphysical” (Kalecki 1936, pp. 359–60).

general business conditions” so that one can assume that “*The money rate [...] is an increasing function of the gross yield*” (Kalecki 1935b, p. 330). Whatever the reason, in the following version of his model he accepted Frisch’s solution:

Clearly it is an arbitrary and even unlikely assumption that the moving point comes back to its initial position E –the trajectory [in the phase space] may well be a spiral and not a closed curve. If the fluctuations produced by our mechanism have a tendency to subside, this means that the spiral converges towards point B, and in this way the system tends to attain long-run equilibrium. But as shown by the investigations of Professor Frisch, this is prevented by the existence of ‘erratic shocks.’ Since the relationships represented by  $f$  and  $\phi$  are in reality not quite stable functions, the actual dynamic process may be imagined as the resultant of the operation of the mechanism described above and of random shocks. Now Professor Frisch has shown that if the basic mechanism produces slightly damped fluctuations the existence of shocks establishes a state of relatively regular undamped fluctuations with an average period similar to that of the fluctuations created by the ‘basic mechanism.’<sup>34</sup>

Kalecki thus seems prepared to accept that the system, if left to itself, would tend to a point of stationary equilibrium, and is only prevented by the existence of erratic shocks from settling into a position of simple reproduction where investment just replaces the worn-out capital. Yet this footnote is appended to the paragraph immediately preceding the passage, already cited above, where Kalecki attributes the cause of the cycle to the paradoxical nature of the capitalist economy: in spite of his claim that “We do not [...] seek to determine the automatic restoration of equilibrium which has been distorted by disproportions of development” (Kalecki 1933a, Engl. transl. p. 66), Kalecki’s apparatus –abstracting from exogenous shocks– leads precisely to the restoration of the long-run equilibrium if, for any reason, the system is disturbed. The system is only kept in motion by a repetition of the disturbance, not by the paradoxical character of investment: this is reduced to an ancillary role, as it can only explain why the *erratic* shocks are transformed into a *semi-regular* movement, but does not account for the movement itself. The erratic component, conversely, instead of summarizing the factors one cannot take into account in the explanation of the basic mechanism, becomes the complex of causes of movement.<sup>35</sup> This is tantamount to saying that the movement remains largely unexplained. Kalecki’s view of capitalism as an antagonistic system marred by contradictions and paradoxes leading to a cycle of recurrent crises and temporary recoveries is therefore turned upside down by his own analytical apparatus, which accounts instead for a system tending to long-run equilibrium except for temporary perturbations originating from outside the main mechanism.

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<sup>34</sup> Kalecki 1939, p. 148n, with reference to Frisch 1933 and unpublished writings. This chapter is a reprint of Kalecki 1937a, where this footnote does not appear.

<sup>35</sup> Although this falls outside the scope of the present article, one can hardly fail to stress that the contemporary equilibrium business cycle theory are subject to similar difficulties. M. Lines (1990, 1990a), however, specifies that equilibrium business cycle theory logically resembles the approach propounded by Slutsky (1937) rather than Frisch’s (and Kalecki’s): the former relies on purely random shocks upon which some filters were applied in order to produce autocorrelation, while the latter superimposes shocks onto a linear dynamic model with damped fluctuations. For a general discussion of these two approaches see for instance Gabisch and Lorenz 1989, in particular chapters 2 and 3.

The issue of the persistence of fluctuations kept bothering Kalecki, perhaps also thanks to a criticism by Kaldor who pointed out that Kalecki's model with *stable* short-period equilibria required a number of special assumptions in order to keep the system in motion while his own (otherwise very similar) model characterized by unstable short-period equilibria was free of this difficulty.<sup>36</sup> At some point Kalecki started doubting that Frisch's solution was a suitable one:

An important point about any trade cycle theory is whether the cycle may be damped down or not. Indeed, the course of the cyclical fluctuations as determined by the fundamental equation may be such that the amplitude diminishes from cycle to cycle so that the system gradually approaches a state of equilibrium. It is true that it has been shown that a combination of a damping mechanism with erratic shocks (due to the fact that the economic relations as represented by the fundamental equation are rather loose) produces cycles with an amplitude which has no tendency to decline. But if damping is strong such cyclical movements would be of extremely irregular character. Thus, because it is difficult to prove why the coefficients of the fundamental equation should be such as to exclude strong damping, these theories have a serious loophole. (Kalecki 1943a, p. 73)

His first alternative proposal tackled the problem at its root. The fundamental relationship is formulated as a first-order differential equation with two lags in the argument; but while in the earlier (1933a, 1935a, 1935b) versions of Kalecki's model the equation was linear, in the *Studies in Economic Dynamics* the coefficients change in the course of the cycle, in particular the one measuring "the strength of the influence of the change in real profits upon investment" (Kalecki 1943a, p. 70); the equation is therefore nonlinear. Kalecki maintains that this feature frees his model from the difficulties related to the persistence of the cycle, without having to resort to external shocks:<sup>37</sup> "It may be shown that the type of variations assumed for the coefficient  $a$  prevents the cycle from being damped down" (ibid. p. 73).<sup>38</sup> Unfortunately Kalecki only gives a qualitative discussion of how his coefficient fluctuates in the course of the cycle, without supplying an analytical proof that

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<sup>36</sup> Kaldor's criticism (of which Kalecki was aware: see Kalecki 1943a, p. 74n) is partially misdirected, as it focuses on the role of lags; it will therefore be examined in section 4.2 below.

<sup>37</sup> A nonlinear system giving rise to a stable limit cycle describes persistent oscillation, and is robust to external perturbations. While it does not need external shocks to keep it in motion, considering such random events would do it no harm (unless their magnitude were such as to shift the system outside the area where the cycle is an attractor): the course of the cycle would be perturbed, but would return to its customary pattern after some time. Steindl was therefore misled when, responding to Goodwin's (1989) eulogy for nonlinear dynamics, argued in defence of Kalecki's apparatus that "the shocks are there in any case, you have no need to drag them in forcibly. You have to take them into account in any case, and I think it is most important to keep a theory of the cycle flexible so that it will be capable of accommodating all the exogenous influences: the history, the accidents, and all that a simple endogenous model cannot possibly take into account. I think that the problem of the business cycle should really be put like this: the question is, how does the system react to shocks coming from the outside, and is there a general pattern in this kind of reaction? Kalecki's theory can be regarded as an answer to this" (Steindl 1989, p. 312). Kalecki's own reflections on the robustness of a model under perturbation, however, were much more complicated than this: see section 5 below.

<sup>38</sup> For an early appreciation of the role of nonlinearity in Kalecki's new argument for the persistence of the cycle see Scitovsky's review, where he pleaded for "a more complete discussion of all the factors that tend to keep the amplitude of the cycle stable" (1946, pp. 451–2).

such a system gives rise to a stable limit cycle.<sup>39</sup> The lack of precise formal specifications and the mathematical difficulties involved in such an equation seem to have prevented commentators (both contemporary and later) from exploring the matter further, and Kalecki himself soon abandoned this path.

In the following, and last, discussion of this issue, Kalecki returned to a linear model but amended Frisch's approach –without, unfortunately, commenting upon the reasons for renouncing nonlinear analysis. In the *Theory of Economic Dynamics* the fundamental equation is no longer differential but is a difference one, with two time-lags.<sup>40</sup> Besides the unlikely borderline case of constant amplitude oscillations, Kalecki discussed both explosive and damped fluctuations. In his previous attempts he had not considered the former possibility, which was however brought to his attention by Hicks (1950),<sup>41</sup> who conceived of an unstable system kept within bounds by a 'ceiling' and a 'floor'. Kalecki considered "risky" the assumption that the mechanism is explosive and fluctuations are halted and reversed by limited resources, for "there is no confirmation for the theory that the 'ceiling' is usually reached in the boom" (Kalecki 1954, p. 139). This is consistent with the view frequently expressed by Kalecki that productive equipment and labour are rarely used at full capacity, even during the boom.<sup>42</sup>

As to damped fluctuations, Kalecki reiterated the argument that on the one hand "It is impossible to assume that the coefficients of the 'business cycle equation' are necessarily such as to produce mild damping", and on the other hand Frisch's solution is not suitable in case of heavy damping, for in such a case the evenly distributed erratic shocks considered by Frisch lead "to a rather irregular cycle with a small amplitude". He concluded that "we arrive, therefore, at a sort of impasse" (Kalecki 1954, p. 139; see also p. 129). The new way out consisted in assuming that the erratic shocks are subject not to a uniform distribution, but to a normal frequency distribution. This was justified on the basis of the Laplace-Liapounoff theorem, according to which the sum of random error is normally distributed, and on the 'reasonable assumption' that large errors are less frequent than small ones (ibid., p. 140). Kalecki did some rough experimenting with such errors, and concluded to his satisfaction that "even with relatively heavy damping such shocks generate fairly regular cycles":

This result is of considerable importance. It shows that a semi-regular cycle may be in existence even though the 'business cycle equation' involves substantial

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<sup>39</sup> The same approach and the same flaw were anticipated by Harrod's *Trade Cycle* (1936; for a discussion of the role of nonlinearities in Harrod's trade cycle theory see Pugno 1998).

<sup>40</sup> For a thorough discussion of this model see Sordi 1989.

<sup>41</sup> As Hicks himself admitted, this approach was anticipated by Harrod (1936, 1939): Hicks 1950, pp. 6–7. Harrod had even anticipated the terminology of the 'ceiling' (Harrod 2003, vol. 3, p. 1198).

<sup>42</sup> This is one of the recurrent topics in Kalecki's writings. In his early pieces he referred to the changes in the degree of utilization of capital to reject the principle of acceleration (see for instance Kalecki 1939, pp. 64–66; further references are given in **footnote 47 below**), in his later contributions he examined the long-term determinants of the degree of utilization (Kalecki 1962, pp. 150–53, and 1968a, in 1971, pp. 181–82).

damping. It thus dispenses with the necessity of accepting the explosive cycle which we considered unrealistic (ibid, p. 142)

After this remark, Kalecki does not seem to have taken up again the issue of the persistence of the cycle. His last words were thus concerned with rejecting the idea, intrinsic in the notion that equilibrium is unstable, that capitalist economies are subject to systematic troubles springing out from the antagonism and the paradoxical character of investment, and with discussing instead the conditions that the shocks have to respect in order to produce fluctuations when the system shows a strong tendency to reach a state of equilibrium. Curiously, the burden of the explanation has shifted from the determinants of investment decisions to the behaviour of erratic shocks, that is, of phenomena not accounted for by the theory, whether because they are truly erratic, or exogenous, or left out of account because deemed to be unimportant as compared to the ‘basic’ explanation of the cycle.<sup>43</sup>

#### 4.2. Lags and fluctuations

All of Kalecki’s models (including the ‘geometrical’ 1937-39 “Theory of the Business Cycle”) rely on one or more lags for their functioning. The basic one is the gestation lag, that is, the time necessary for the construction and delivery of industrial equipment; this is incorporated in all models, and is the only one considered in the 1933-35 version of Kalecki’s theory. Other lags were later also taken into account, such as the time necessary for the factor affecting investment decisions to exert their effect, or the delay between income and the investment giving rise to it. What is the role of lags in these models?<sup>44</sup>

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<sup>43</sup> In Goodwin’s words, the fact that “continuing and irregular cycles” generated by the random shocks in an auto-regressive model “look very much like the same sort of thing as trade cycles” “does not establish that they are trade cycles” (Goodwin 1956, p. 509). Lange reported that it was said that Napoleonic wars, taken as exogenous shocks, could be the ultimate cause of Kalecki’s cycles (Lange 1957, note 5, in 1970, p. 352n).

It has been argued that resorting to external shocks makes Kalecki’s model less mechanistic (see for instance Sardoni 1995, p. 199, and Tichy 1994, p. 444-45, who take up Steindl’s 1981a, p. 137, reflections on shocks: “The proposed marriage of exogenous and endogenous causes of the trend leave ample room for the role of history while at the same time admitting that the impulses coming from outside are seized and moulded by the inherent mechanism of the economic dynamics”; see also the passage quoted in **footnote 37** above). Shocks, however, engender themselves a deterministic response: in a linear model such as Kalecki’s, each shock eventually determines the amplitude of the cycle, and its effect lasts until a further shock supervenes and *adds* its stimulus that what remains of the cumulative effect of previous shocks. Far from being non-mechanistic, such an approach simply renounces finding the cause of the cycle in the working of the system and attributing it to what was left out of account in the formulation of the main equation.

<sup>44</sup> Among the roles of lags not of direct interest to this paper one should mention that of introducing a causal direction in the identical equality between profits and capitalists’ expenditure: Kalecki argues in fact that the latter is the determinant of the former, for “investment and capitalist consumption in the short period considered are the outcome of decisions taken in the past, and thus should be considered as given. With regard to investment, this follows directly from the time-lag dependent on the period of construction. But changes in capitalist consumption also follow those in profits with some delay. Now, sales and profits in a given period cannot be a direct outcome of past decisions: the capitalists can decide how much they will invest and consume next year, but they cannot decide how much they shall sell and profit. The independent variables in a given period are investment and capitalist consumption” (Kalecki 1968b, in 1991, p. 461).

Kalecki's own summaries of the causes of the cycle tend to identify as the culprit the factors affecting investment decisions and their paradoxical character; only occasionally are a few words devoted to lags. A first statement is dated 1932: commenting on the perspectives opened by 'new industries' in overcoming the crisis, Kalecki wrote that

as in business fluctuations in general, a major role is played here by the time taken to construct industrial plants. While factories that are to produce new articles are under construction, such articles have not yet appeared on the market, whereas investments have already caused an overall increase in employment and an expansion of the domestic market. (Kalecki 1932d, p. 54)

Although Kalecki is here concerned with a comparison of the situations in the 'new' and 'old' products industries, the argument is easily extended to any kind of investment undertaken in a situation of crisis: during the time necessary to construct industrial equipment new demand is created, but the products necessary to satisfy it are not yet on the market, thus opening new perspectives for producers and inducing them to push their investment plans further. In this case, the role of the gestation lag is to deceive producers into thinking that additional investments are needed to satisfy the existing demand, while this demand is created by the very fact of investments having been undertaken in the first place. The lag is thus part of a cumulative mechanism, which remains in place until some other factor slows down investment (Kalecki of course located this factor in the fact that investment, besides creating new demand, also increases the volume of capital equipment, thereby unfavourably affecting profit rates).

A further statement, rather less self-explanatory, is to be found in the concluding paragraph of Kalecki's essay on "Three Systems". After having examined how equilibria are reached according to three different economic conceptions (the classical view based on Say's law, a first relaxation admitting changes in the velocity of circulation of money and thereby 'creation' and 'destruction' of purchasing power, and finally the introduction of a reserve army of the unemployed) under the assumption that the capital equipment was given at the outset, Kalecki mentioned that normally the process of reaching equilibrium requires the adaptation of capital equipment, which in turn affects the new position of equilibrium. The resulting movement through a series of equilibria would continue "until the final equilibrium is attained, i.e. a position in which investment activity no longer changes the volume and structure of capital equipment". The situation, however, would be quite different if the gestation lag is taken into account:

Indeed, this is not the only possibility, if we still consider the *time of construction* of new investment goods. Then it may also turn out that the movement through a series of successive quasi-equilibria will be cyclical, and hence the position of final equilibrium will never be attained. In my opinion these are proper business fluctuations. (Kalecki 1934b, pp. 218–19)

In this passage Kalecki does not explain why the insertion of a lag turns a more or less uniform movement towards a long-term equilibrium into a persistent cyclical motion.

He refers, however, to his 1933 “Essay on the Business Cycle Theory”, where the lag comes into play to prevent the system from being stabilized in the equilibrium position where investment is exactly sufficient to replace the worn out and obsolete machinery. Mathematically, this is achieved by turning Kalecki’s fundamental equation from a first-order differential equation, whose solution consists of exponential growth or decay, into a mixed difference-differential equation, the solutions of which also contain an oscillatory component.<sup>45</sup> More intuitively, lags come into play during the phases of the cycle when the line of investment crosses the replacement (i.e., the equilibrium) level, recovery and recession:

By *recovery* we understand here the phase of the cycle of length  $\nu$  [the construction period] during which investment orders exceed the level of replacements requirements; capital equipment, however, has not yet begun to expand because deliveries of new equipment are as yet lower than the replacement requirements. [...] During *recession*, investment orders are below the level of replacement requirements. The volume of capital equipment, however, is still expanding because deliveries of new equipment are higher than this level. (Kalecki 1933a, English transl. pp. 77–78).<sup>46</sup>

The lags are not called to play any part in determining the lower and upper turning points of the cycle: the inversion of the direction of movement is dictated by the fact that as investment proceeds profits increase, while capital only grows after the replacement level has been passed. Only at that point does the ratio of profits to capital (which entrepreneurs take as an index for expected future profitability) begin to slow down, at first reducing the pace of increase of investment (and therefore also of profits) and eventually stopping it altogether. Kalecki stresses that the system cannot be stabilized at that level, because investment is still positive and, therefore, the volume of capital still increases and depresses the rate of profit. The depression is brought to a halt by the same change operating in a symmetric way. The lags explain instead why the system cannot stabilize at the replacement level: without the lag, investment decisions would immediately bring about the corresponding change in the volume of capital, and as soon as the replacement level was reached the requirements of capital would be satisfied, while profits

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<sup>45</sup> It actually contains an infinity of oscillatory components, only one of which, however, is relevant: see **note 28** above.

<sup>46</sup> It is worth pointing out that the presence of a construction lag implies that “business fluctuations are strictly connected with credit inflation”. From the fact that capitalists as a whole earn what they spend (on the assumption that workers spend what they get), Kalecki concludes that “the saved income of capitalists as a whole corresponds to the output of capital goods”. Saving = investment decisions is therefore an equilibrium condition, for it implies that investment decisions = the output of capital goods at the end of the period. Entrepreneurs, however, can decide to invest more than what they currently save, for their plans depend on expected profitability rather than on previous profits. For this to be possible, it is necessary that the credit system creates the additional purchasing power (Kalecki 1932b, pp. 147–48; 1933a, in 1990, pp. 80–81; 1935b, pp. 343–44, 1935a, p. 298), which in turn determines an increase in prices and forced savings on the part of workers, whose real wages fall leading to an increase in profits, a part of which is used to repay the additional loans (Kalecki 1932b, in 1990, p. 149, and 1936, p. 357). This mechanism is very similar to the one depicted by Robertson in “Saving and Hoarding” (1933), except that the Robertsonian lag affects the receipt of income and its expenditure instead of the expenditure on investment goods and the realization of profits.

in turn would have no tendency to change and accordingly the (expected) rate of profit would correspond to the actual level of investment decisions.

Kalecki's treatment of lags therefore matches the remainder of his analytical construction: the basic picture is that of a system tending towards equilibrium but prevented from settling there by a delay in the adjustment timing.<sup>47</sup> Again, there seems to be a discrepancy between this representation and his interpretation of the deep causes of the cyclical phenomenon. It has been pointed out that the gestation lag reflects the assumption that producers of investment goods do not anticipate the demand for their products, but only produce to order (James and Beltz 1938, p. 159n).<sup>48</sup> this is a rather flimsy basis for maintaining that the cycle is an intrinsic feature of capitalism reflecting its paradoxical character and antagonism.

Kalecki's 1937-39 'geometric' model is a sequence analysis<sup>49</sup> based on the lag  $\tau$  between investment decisions and the income generated by them, which includes the gestation period and the time span necessary for investment to produce income (about 3-6 months and 4 months, respectively, in Kalecki's estimate). The diagram consists in two curves, one representing investment decisions as a function of present income (taken as determining the income of capitalists), *given* the volume of capital, and the other representing the income generated by investment decisions after the lag. Their intersection represents a stable 'conditional' equilibrium, towards which the system tends in a cumulative process, characterized by investment decisions producing a level of income that induces entrepreneurs not to alter the previous investment decisions.<sup>50</sup> But as the

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<sup>47</sup> This view, as well as the argument referred to above that the construction lag creates false estimations of the capacity of capital equipment to satisfy the actual demand for products, was developed before Kalecki by Aftalion. This author argued that the construction time interferes with the adjustment between demand and supply, for entrepreneurs order their equipment on the basis of the price level while by the time the equipment is delivered and put to work the demand conditions have altered; entrepreneurs only realize this when they try to sell their newly produced goods, meanwhile acting on wrong expectations. Were it not for the gestation lag, prices would suggest the correct policy in the face of demand and supply conditions, and the system would tend to equilibrium (Aftalion 1913, vol. 2, pp. 354-92). Apparently Kalecki was not aware of Aftalion's theory, but promptly acknowledged the similarity when he was told (Osiatynski 1990, p. 440); however, rather than stressing this point he referred to Aftalion's acceleration principle, which he criticised for assuming a given and constant degree of utilization of capital (Kalecki 1933a, in 1990, pp. 104-5, and 1935a, p. 305).

<sup>48</sup> This assumption reflects Kalecki's attitude towards expectations: see **footnote 53** for a comment.

<sup>49</sup> Kalecki 1939 (Essays), p. 127: Kalecki remarked that "past investment decisions determine the present national income, which of course influences current investment decisions; and these will in their turn influence the national income in the future. This conception is the basis for the type of treatment which Mr. Lundberg has called 'model sequencies'", pointing out that the method was applied in the original version of the same essay (1937a) which appeared about the same time as Lundberg's.

<sup>50</sup> 'Equilibria' are "positions in which the rate of investment has no tendency to change" (Kalecki to Keynes, 4 April 1937, in Kalecki 1990, p. 525, with reference to Kalecki 1937a). Kalecki described the process as follows: "We have shown [...] that a cumulative process with constant equipment leads to a state in which investment decisions remain in the following  $\tau$ -periods at a constant level. Now we see that this 'equilibrium' is disturbed by the change of capital equipment. After the upward cumulative process has come to an end, the rise of equipment capacity at the top of prosperity causes a downward cumulative movement, which in turn is followed by an upward process started with the contraction of capacity at the bottom of the depression. The dynamic process consists thus of a series of upward and downward cumulative processes following each other. In other words, it forms a business cycle." (Kalecki 1937a, p. 94).

movement towards equilibrium implies a change in the volume of capital (including, at a certain point, crossing the line representing the replacement level), thereby affecting profitability, the investment decisions function shifts up and down. The system's dynamics is generated by the interplay of the movement towards conditional equilibrium and the shifting of the curve, with the corresponding change in the equilibrium position.

Kalecki has high claims for his lags:

Many writers who have constructed simplified models of the Keynesian theory have focussed their attention on the 'equilibrium' represented by the point B [the conditional equilibrium]. This was due to the fact that they did not distinguish between investment decisions and investment. They were therefore unable to conceive of the system being in a position different from that presented by the point B.<sup>51</sup>

The point he wants to stress is that as the adjustment to equilibrium takes time, meanwhile conditions may change—in particular, the volume of capital equipment varies: “the process of reaching this equilibrium will be in general spread over many periods. Thus it is interesting to know what determines the rate of investment *during* the process”.<sup>52</sup> Lags do not explicitly come into play in the description of the events during the four critical points in the cycle. When investment is at the wear and tear level, the system is prevented from settling there by the tendency to move towards the conditional equilibrium; it cannot settle at the upper and lower points of the boom and depression, for there the investment decisions function tends to shift as industrial equipment is above or below the replacement level (Kalecki 1939, pp. 144–47). The only full and stable equilibrium position is at the intersection of the investment decisions function and the replacement level: in such a case, the system would remain stationary in a position of simple reproduction.

Kaldor's criticism of Kalecki is relevant in this connection. In an appendix to his 1940 pioneering non-linear model of the cycle Kaldor pointed out that Kalecki's model assumed as a matter of course the stability of the conditional positions of equilibrium, for the investment decisions curve crosses the income function line from below (Kalecki later admitted he had failed to consider the opposite case, on which Kaldor's model is based, but argued that it was equally difficult “to advance any satisfactory *a priori* reasons for this shape's being necessarily such as he assumes”: Kalecki 1943a, p. 74n). According to

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<sup>51</sup> Kalecki 1939, pp. 139–40 (with reference to Hicks 1937, Meade 1937 and Lange 1938). Kalecki also adds that “They did not consider the influence of changes in capital equipment” (ibid). In the version of this chapter printed earlier in the *Review of Economic Studies*, Kalecki argued that the differences with Keynes in the determination of the rate of investment “are due to the important rôle played [...] by the time-lag between investment decision and investment production, and also to a different treatment of the question of the inducement to invest” (Kalecki 1937a, p. 77).

<sup>52</sup> Kalecki to Keynes, 4 April 1937, in Kalecki 1990, p. 525 (the point is also made in Kalecki 1939, p. 140: “It is true that [...] the system always moves towards the point B, but it may, of course, take several  $\tau$  periods to come close to it. Thus the time of adjustment is considerable ( $\tau$  is more than half a year)”. Keynes did not think much of this approach: “your argument seems to me a version of Achilles and the tortoise, and you are telling me [...] that even though Achilles does catch the tortoise up, it will only be after many periods have passed by. [...] I feel that you are making too much of a discontinuity between your periods” (letter to Kalecki, 22 April 1937, in Kalecki 1990, pp. 525–26).

Kaldor, the system is prevented from settling in the conditional equilibrium position by the time-lag:

He assumes, however, that the time-lag between investment decisions and the corresponding income is large relatively to the rate at which the amount of equipment is increasing —*i.e.*, the movement *along* a  $\phi$  curve and the movement *between*  $\phi$  curves are of comparable speed— in which case the movement towards a stationary equilibrium may “overshoot the mark” —*i.e.*, the rate of investment decisions can continue to fall, even after it is less than what corresponds to replacement, simply because the fall in income lags behind. (Kaldor 1940, p. 91)

Kaldor also argues that, in order to prevent the system from being strongly stable, with movement quickly petering out, Kalecki also has to introduce other tacit assumptions:

(i) that the effect of current investment on total equipment should be relatively large, so that the equipment added during the period of the time-lag has a considerable influence on the rate of profit, and hence on investment decisions; (ii) that the angle enclosed by the  $f$  and  $\phi$  functions should be small. (*ibid.*)

The first line of Kaldor’s criticism puts Kalecki’s model on a par with the cobweb theories of fluctuations:<sup>53</sup> Kalecki’s approach (as well as Tinbergen’s) is

based on the assumption of statically stable situations, where equilibrium would persist if once reached; the existence of the cycle was explained as a result of the operation of certain time-lags which prevented the new equilibrium from being reached, once the old equilibrium, for some external cause, had been disturbed. In this sense all these theories may be regarded as being derived from the ‘cobweb theorem’. The drawback of such explanations is that the existence of an undamped cycle can be shown only as a result of a happy coincidence, of a particular constellation of the various time-lags and parameters assumed. [...] Moreover, with the theories of the Tinbergen-Kalecki type, the amplitude of the cycle depends on the size of the initial shock.<sup>54</sup>

These observations are partly misdirected. Kaldor’s criticism is aimed at the lag theories, but actually only concerns the *linear* ones<sup>55</sup>. Indeed, it applies to Kalecki’s 1933–35 model where (as discussed above) the role of lags is that of causing the system to overshoot the mark of the simple reproduction equilibrium and reproducing (in reverse)

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<sup>53</sup> The interpretation of time lags as a limitation on the speed of adjustment mirrors the observations on the cobweb theorem as expressed in Kaldor 1934, pp. 132–34. It should be noted that the construction lag cannot be interpreted simply as a kind of ‘friction’, as in the case of retarded reactions to changes in demand. The existence of the lag depends on the incapacity of the producers of capital goods to immediately supply the machinery requested by other entrepreneurs. If Kalecki’s implicit assumption that these goods are only produced to order is rather drastic, the opposite hypothesis would be equally extreme: the lag reflects the capital goods producers’ strategy in face of the uneliminable uncertainty of the market. Kalecki’s approach to this problem, however, does not depart from his mechanistic attitude reducing uncertainty to some form of calculable behaviour, such as for instance when he substitutes realized profit rates for expected profitability in his equation for the determinants of investment decisions.

<sup>54</sup> Kaldor 1940, pp. 91–92. This interpretation fully matches Harrod’s view on the ‘time-lag theories of the cycle’: “The introduction of a lag into an otherwise smoothly working system may set up an oscillation. Tinbergen reviews a number of theories of this sort in *Econometrica* 1935. Kalecki, Lundberg & others have been working on them. I think it is really only doing systematically and with the help of a sine curve what Dennis [Robertson] does laboriously with his day by day analysis” (Harrod to Keynes, 18 September 1938, in Harrod 2003, p. 865).

<sup>55</sup> This lack of precision is of course pardonable, considering that Kaldor was pioneering in nonlinear modelling without probably having understood in full the implication of the assumption of linearity. For a partial account of the relationship of Kaldor’s model and Kalecki’s, focussing on the instability of equilibrium and the persistence of fluctuations, see Assous 2003.

the disequilibrium state responsible for keeping the system in motion. It also depicts well the role of lags in Aftalion's theory of the cycle, the working of which (as explained in **footnote 47** above) has some strict analogies with Kalecki's previous model. But in Kalecki's diagrammatical 1937–39 model the investment decisions function is not a straight line, and moreover it does not make sense to consider this curve in itself (i.e., to focus on the 'conditional equilibrium), for it continuously shifts (and Kalecki did not specify the speed at which it shifts, which may therefore not be proportional to the volume of capital). The system's dynamics must be considered in its entirety, and in such a case the 'conditional' equilibria are not equilibria at all (unless, of course, they happen to fall on the replacements line). What matters is therefore whether the whole system is stable, that is, whether the 'long period equilibrium' (the simple reproduction state) is an attractor state. Kalecki did not discuss this aspect of the problem, but only affirmed that nothing guarantees that his diagram represents a closed line rather than a spiral.<sup>56</sup>

Yet there is much in Kaldor's argument: if the dynamics of the system is stable, the only way of explaining the existence of some kind of movement is to assume either that the establishment of equilibrium is systematically prevented by the occurrence of exogenous shocks or forces (but in such a case the disturbances or external factors become the main explanation of the cycle), or that the advance towards equilibrium is obstructed by some kind of friction or maladjustment.<sup>57</sup> The later developments of nonlinear dynamics vindicated Kaldor's point, for it turned out that in 2-dimensional systems cyclical behaviour is represented by stable limit cycles surrounding an unstable steady state.<sup>58</sup>

Kaldor's second set of observations is more to the point. The cyclical behaviour of Kalecki's model depends on the assumption that the effect of investment on the volume of capital goods is of the same order of magnitude as the effect of investment on profits, so that the rate of profit –on which investment decisions depend– is significantly affected by both variables (as described by Kalecki in the passage cited in section 2 above). Kalecki, however, did not specify the conditions guaranteeing such a result.<sup>59</sup> Although his 1937–39 model enjoys the advantage of not being as rigid as the 1933–35 one, where all relationships were spelt out explicitly at the price of requiring a number of specific simplifying assumptions and linearization, his intuition on the ultimate causes of the cycle does not find a suitable formal representation.<sup>60</sup>

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<sup>56</sup> Kalecki 1939, p. 148; the passage is cited in full in section 4.1.

<sup>57</sup> Again, this view was shared by Harrod –and indeed his criticism of the time-lags theories of the cycle is based on these epistemic considerations: see, for a full discussion, Besomi 1998.

<sup>58</sup> See for instance Gabisch and Lorenz 1989, pp. 122–35, and in particular the reference to the Poincaré-Bendixon theorem and related results (129–32).

<sup>59</sup> Eventually Kalecki downgraded the importance of this factor, as he recognized that changes in the volume of capital in the course of the cycle are small, in percentage terms, and so therefore are the fluctuations in the rate of profits (Kalecki 1954, p. 104n; for a comment see Steindl 1981, p. 127).

<sup>60</sup> Recently the role of lags in the generation of cycles has been revalued in the literature on dynamics. Kalecki (and Aftalion before him) treated lags as a sort of friction or maladjustment, preventing the

### 4.3. Symmetry breaks

As the solution to Kalecki's linear models consists in a combination of an exponential term (determining whether the amplitude of the cycle is increasing, constant or decreasing) and of a sine curve, the oscillations described by the investment function are strictly symmetric, both in their graphical representation and in the causal structure. Kalecki himself explained several times that the course of the depression is the precise reversal of the development of the boom phase, as well as the causes of the change in the direction of movement.<sup>61</sup>

Although Kalecki seemed to believe that the 'pure cycle' can (and perhaps should) be described as fully symmetric, on several occasions he raised doubts as to the suitability of such an approach. In his early formulations, Kalecki did not bother to justify the symmetry in the upward and downward phases of the business fluctuations: he probably accepted the ideas as intrinsic to a mechanism operating cyclically and automatically, as is the case for most oscillators described by the simplest systems in physics. Indeed, the symmetry in the amplitude of the fluctuations is implied in his formulation in terms of deviations from the average (i.e., in the case of the pure cycle, the level of wear and tear): "The negative investment in the slump may be just as large as the positive investment in the boom. In fact, if you consider the deviation from the trend line, the positive and negative deviations are of necessity equal" (letter to Joan Robinson, 26 July 1951, in Kalecki 1991, p. 541).<sup>62</sup> A rationale for postulating symmetry was only supplied later, probably as a reaction to the publication of Hicks's *Trade Cycle* with its emphasis on the 'ceiling' as a cause for the downturn: "Speaking generally, I think that a reasonable theory of the business cycle should permit [us] to explain the fluctuations without

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system from settling into an equilibrium position. Such an interpretation seems to have been quite widespread at the time, as witnessed by Kaldor's interpretation of Kalecki (cited in the text) and Harrod's interpretation of Tinbergen (see **footnote 54** above, and Besomi 1998, pp. 112–15). Yet, delays can also be interpreted as feedback mechanisms (Asea and Zak 1999, p. 1157), capable of dampening or amplifying fluctuations depending on the system's dynamic and the structure of parameters. Accordingly, it has been recently noted that the application of the now standard (but unknown at Kalecki's time) analytical techniques to Kalecki's 1933-35 model may indeed give rise to a sub-critical Hopf bifurcation for certain values of the coefficients and if the time to build is larger than a given threshold; in such a case, the system's dynamics switches from a stable steady state to a stable limit cycle (Szydłowski 2002; it should be noted, however, that the mathematics of delay differential equations remains a largely unexplored area, the simplest systems excepted).

These developments are applicable only to Kalecki's first model. They do not affect the argument presented here, as the incongruence remains intact between his interpretation of the cycle as reflecting the contradictions of capitalism and his acceptance of damped fluctuations kept alive by exogenous shocks.

<sup>61</sup> "The process of collapse of the boom is the reverse of that of that starting the upswing from the bottom of depression" (Kalecki 1935c, p. 192; see also Kalecki 1933a, in 1990, pp. 77–78; 1939, pp. 144–47; 1943a, pp. 69–71 –in this version, the fluctuations in the coefficient determining the non-linearity is also symmetric; 1954, pp. 123–26).

<sup>62</sup> The amplitude of fluctuations is not, of course, the only factor to be considered for determining the symmetry, the other being the speed of recovery and of depression. The reflection of early theorists of crises on the suddenness and violence of the crisis as opposed to the gentleness and regularity of the recovery do not find a place in Kalecki's writings, except perhaps by implication in his sparse references to financial panics.

assuming any bottle-necks. The end of the slump is then pretty symmetrical with the end of the boom” (ibid).<sup>63</sup>

Kalecki’s doubts that the cycle is really symmetric are more cogent than this. His first reflections originate from the observation of the difficulties experienced in recovering from the Great Depression. In Kalecki’s writings in the first half of the 1930s there are several references to the factors stimulating a synthetic recovery from which the natural movement would eventually depart, perhaps at a slow pace. The implication is that the system would have found great difficulty in recovering if it had to rely only on the automatic mechanism of the cycle.<sup>64</sup> (see section 3 above).

In *Studies in Economic Dynamics*, Kalecki addresses the “apparent contradiction” between the mechanism of the cycle which “seems to imply that there is always a recovery from the slump” and the concrete possibility that “investment activity can persist over long periods at its minimum level” (Kalecki 1943a, pp. 74–75). Kalecki argued that “a situation is conceivable in which the factors causing a recovery from the slump in our business cycle model will prove inadequate”. If investment activity is at the minimum level defined by the rate of profits reaching a critical threshold at which no investment plans appear profitable, it can remain there (or nearby) for a considerable time, for it would not engender noticeable changes in the rate of profit. In fact, although the volume of capital diminishes (minimum investment being below the replacement level), profits are very low and remain so for some time, and the slowly-changing part of capitalist consumption would fall, reducing profits further down and offsetting the positive influence of the decline in capital (ibid., pp. 57–58 and 75).

Kalecki’s reasoning thus relies on one of his trend components. In the *Theory of Economic Dynamics* Kalecki sees a different role for the trend. There are two arguments for asymmetry. One is that while investment in fixed capital has a lower limit (it cannot fall below zero), “there is no analogous limit to disinvestment in inventories. Thus, when gross investment in fixed capital reaches the zero level, the slump may be slowed down but not halted since disinvestment in inventories may gather momentum” (Kalecki 1954, p. 127). The other argument is that “the effect of capital destruction upon investment decisions during the slump is much weaker than that of capital accumulation in the boom because the equipment ‘destroyed’ in the slump is frequently idle in any case. As a result, slumps may be very long” (ibid., p. 126).<sup>65</sup> As a counterargument, Kalecki pointed out that if the economy is on a long-run trend, at the bottom of the slump the level of activity is

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<sup>63</sup> Strictly speaking, this argument is invalid: see section 6 below, where the reasons advocated by Kalecki for rejecting the instability of equilibrium are discussed.

<sup>64</sup> See section 3 above for references; Kalecki’s later observations on the crucial reform associated with the world slump (discussed in section 5 below) are fully consistent with his early interpretation of the events.

<sup>65</sup> A similar argument was advanced in a brief article in the early 1930s, where Kalecki argued that recovery in a sector previously run down is slowed down by the fact that factories and machinery are not actually destroyed in the depression, but left idle and ready to be utilized again without much additional investment in the early stages of the recovery (Kalecki 1932d, in 1990, p. 55).

increasing, as well as profits, while capital is still below the replacement level, and this is enough to increase the expectations of profits and restart the cycle.

The interesting point to notice is that Kalecki was aware that his model, even independently of the trend, could account for an asymmetric cycle, but only at the price of introducing a symmetry break in the original fundamental equation: “in such a case [the coefficient representing the influence of the change in the volume of capital on investment decisions] is smaller [...] in the depression than in the boom” (ibid., p. 126n). Again, Kalecki seems to have perceived a discrepancy between his ideas and the rigidity of his models. He wanted (in deference to realism, and consistently with his pessimistic outlook on economic systems) his models to be able to represent asymmetric situations, with the depression lasting longer than the boom and the possibility of the system ‘bumping along the bottom’, but he could only do so by referring to factors extraneous to his ‘pure cycle’ setting or by renouncing the assumption of fixed coefficients implied by the assumption of linearity.

## **5. Trends, structural stability, and the crucial reform**

While Kalecki’s first models were only concerned with the ‘pure cycle’, from 1943 he abandoned the assumptions explicitly introduced to make the system trendless. Initially, his approach to the trend consisted in *adding* a long-run component to the business cycle equation, which incorporated all the factors that were postulated as constant for the study of the pure business cycle: the long-term component of capitalists’ consumption, rentiers’ savings, the rise in population and productivity, and the effect of innovations (Kalecki 1943a, 1954 and 1962). These were assumed to be slowly changing over time, under the influence of the previous development of the system and in turn affecting its future evolution.

Some time after the publication of the “Observations on the Theory of Growth” in 1962, Kalecki seems to have dedicated some thought to the Marxist foundations of a number of his propositions strictly concerning dynamics,<sup>66</sup> as he wrote articles on the Marxian equations of reproduction (Kalecki 1968b), on the implications of the debate on crises and the development of capitalism between Tugan-Baranovsky and Rosa Luxemburg (Kalecki 1967; Kalecki and Kowalik 1971), and on “Econometric Model and Historical Materialism” (Kalecki 1964a). The latter is of great interest, for a certain dissatisfaction with the method of ‘econometric modelling’ emerges.

In truth, from his very first writings Kalecki had accompanied some of his theoretical statements with warnings that his conclusions should not be taken literally but weighed against a number of other considerations, the most important of which were of a political nature. Some reservations, dating from 1932, regarding the ‘automatism’ of the

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<sup>66</sup> The question of whether Kalecki was inspired by Marx or other Marxist authors at the time of writing his first essays, or whether these are ex-post rationalizations, is not important in the present context.

recovery have already been cited in section 3 above. In 1937, after pointing out that the theoretically most effective form of taxation for stimulating business and employment should affect capital, he stressed that this would be impossible to implement because it undermined the principle of private property (Kalecki 1937b). In “Political Aspects of Full Employment” he indicated reasons why capitalists are against policies aiming at creating and maintaining full employment in spite of their direct interest to the contrary (Kalecki 1943b), while in “Full Employment by Stimulating Private Investment” he hinted that the *economics* of full employment is a rather different issue from the *politics* of full employment (Kalecki 1945, p. 92).

In the essay on “Econometric Model and Historical Materialism”, however, Kalecki went much further than before, as he discussed the intrinsic limits of the analytical instruments he had used for analysing cycles and growth. These ‘econometric models’ crucially assume that the functional relationships linking variables to their present and past values or rates of change are invariable in time. This hypothesis

is rather far reaching. For it presupposes that economic development determined by [such] equation[s] does not cause such transformation in the sphere of natural resources, productive relations of the superstructure that would in turn make for the change in the shape of the relationships between economic variables [...]. In particular the abstraction of the interdependence between economic development and productive relations makes for the mechanistic character of the econometric model. This does not detract from its being a useful tool of analysis provided this limitations are kept in mind. (Kalecki 1964a, p. 234)

Generally speaking, one should take into account that the function describing, for instance, investment decisions, is not strictly constant. In the short run it is subject to small changes due to random elements, while in the long run the development of the economic system itself brings about changes in institutions, in the availability of natural resources and in productive relationships, which in turn affect the structural relationships determining the future course of the growth path. But what do such changes imply for the dynamics of the system?

Kalecki’s answer raises the problem of the *structural stability* of the model:<sup>67</sup>

A question arises here whether the small random changes in the parameters lead to corresponding small changes in the economic variables in question or whether the effect is disproportionately large. We may call these two alternatives a stable and an unstable process respectively. In an unstable process a small change in the parameters results in the system’s changing brusquely its path. This leads finally to a new stable process and it is this process that represents the actual development while the unstable process considered is ephemeral. For should it have ever existed it would have been supplanted under the impact

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<sup>67</sup> Kalecki’s reflections on the structural stability of ‘econometric models’ do not seem to have been noticed in the literature. The omission is rather striking in Webster’s interpretation of Kalecki’s method as a *ceteris paribus* dynamics: having correctly remarked that non-systematic forces and exogenous factors are assumed away by Kalecki “to remove complicated details”, Webster fails to point out that Kalecki was aware that such an elimination may cause a radical changes in the system’s behaviour, and that he discussed the case. Kalecki’s discussion of the limitations of ‘econometric models’ is thus interpreted as reflecting the distinction between theoretical and applied models (Webster 1999).

of random disturbances by the stable process referred to above. (Kalecki 1964a, p. 234).

In Kalecki's view, a structurally unstable system can only exist for a very short time: if a small change in the equation's form suffices to determine a radical metamorphosis of the system's behaviour,<sup>68</sup> the system switches to a new state or degenerates towards a "system [...] continuously subject to wild swings" –what would be termed today a chaotic motion. In the short run, any actual system can therefore be supposed to be structurally stable, as unstable states are ephemeral.

In the long run, however, matters are rather different. The system's evolution brings in a number of small changes in its structure. Most of these are rather innocuous, but from time to time their cumulation brings the system near to a structurally unstable configuration, where it is no longer immune from the catastrophic effects of further small changes:

It may be therefore concluded that  $f_t$  is normally a function of such a type that small changes in its shape do not lead to major changes in the economic variables; but in certain critical periods which do not last long it may not exhibit this characteristic. In such periods the path of economic development will alter abruptly and sometimes the system may show for some period extreme instability of economic conditions. (Kalecki 1964a, p. 237).

If the superstructure (i.e., the institutional setting) proves inadequate to the new productive relationships, the consequence of the change in status would be a revolution "in which both productive relations and the superstructure undergo a violent transformation". Nevertheless, often a process of more or less radical reform suffices to cope with the situation. In Kalecki's view, this was the case in the Great Depression:

Sometimes the reform caused by poor performance of the system may even not change basically the productive relations or the form and composition of the government. It may consist merely of implementation of government policies which, however, have an important bearing upon the economic dynamics of the system. To quote an example of a recent period: The Great Depression of the 'thirties shook capitalism to its foundations. What resulted from it, however, was merely a technique of government anti-slump intervention which barely scratched the surface of the capitalist system but nevertheless affected significantly the pattern of the business cycle. (Kalecki 1964a, p. 238)

The above summary is somehow ambiguous, for Kalecki sometimes refers to the structural (in)stability of the *model*, at other times to the instability of the actual *economic system*, and again to the dynamic instability of equilibrium in his model, without keeping

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<sup>68</sup> Consistently with this awareness, Kalecki knows that his simplifying assumptions, most of which consist in a slight alteration of the form of the structural equation (e.g., by ignoring some terms, or linearizing an equation), must not involve "a distortion of the dynamics of the system". This is the deepest sense of his celebrated aphorism "we do make drastic simplifications to concentrate the attention of the reader on the most essential issues without, however, throwing out the baby along with the bath water" (Kalecki 1968a, in 1971, pp. 166–67; the term 'distortion' is used three times in this connection in just over a page of text). This concern, however, only emerged in the 1960s, while earlier Kalecki was mainly concerned with the realism of his assumptions.

the three matters sufficiently distinct.<sup>69</sup> It is however clear that he believed that capitalist economies occasionally fail to absorb strains, undergo wild swings to which they react either by subverting their structure or by incorporating reforms that make it capable of resisting similar tensions.<sup>70</sup> Correspondingly, models must reflect these properties. This makes it expedient to distinguish between short- and long-period considerations. As a structurally unstable system would soon turn into something else, the case is not worth considering. For the purpose of short-run analysis one can therefore assume that the system is structurally stable, while for the study of long-run dynamics one should account for changes in the structure of the system of equations –at least for the structurally stable regions. Kalecki adopted this guideline when elaborating his last model of the trend and the cycle –and actually went a bit further:

in our approach the rate of growth at a given time is a phenomenon rooted in past economic, social and technological developments rather than determined fully by the coefficients of our equations as is the case with the business cycle. This is, indeed, very different from the approach of purely ‘mechanistic’ theories (based frequently on such fallacious *a priori* assumptions as a constant degree of long-run utilisation of equipment), but seems to me much closer to the realities of the process of development. To my mind future inquiry into the problems of growth should be directed not towards doing without such semi-autonomous magnitudes as  $A(t)$  and  $B(t)$  but rather towards treating also the coefficients used in our equations [...] as slowly changing variables rooted in past development of the system. (Kalecki 1968a, in 1971, p. 183).

Kalecki is thus treating the short-run configuration not only as structurally stable, but also as invariant. Although when he wrote that the course of the business cycle is ‘fully determined’ by the equation Kalecki probably aimed at bringing home the claim that his result is less mechanistic than those obtained when analysing the ‘pure business cycle’ (Kalecki 1968a, in 1971, p. 165), rather than really meaning that the latter is fully deterministic, the distinction is neat. While for long-run purposes a mechanistic kind of analysis is not possible, such an approach is admissible instead so far as one is concerned with the ‘pure’ theory of the cycle abstracting from political and other practical considerations.<sup>71</sup> Such a fiction, however, does not seem to be appropriate.

In his last article, written with Tadeusz Kowalik and published posthumously, Kalecki elaborates on the political implications of his views on structural stability<sup>72</sup> with respect to the debates among the German social-democrats at the beginning of the

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<sup>69</sup> After having defined the (structural) instability of the system in terms of the large effect of a small perturbation in the parameters, Kalecki cites as an example the (dynamic) instability of the (Harrodian) growth rate, with reference to his own argument that the growth equation gives two results, the highest of which is unstable (Kalecki 1964a, pp. 234–35, referring to Kalecki 1962).

<sup>70</sup> The presence of regime-switching in Kalecki’s analysis, with reference to his political business cycle article (Kalecki 1943b) has already been noted by Ferri and Greenberg 1992, pp. 120–21.

<sup>71</sup> Kalecki’s claim that “the long-run trend is but a slowly changing component of a chain of short-period situations” (1968a, in 1971, p. 165) should be seen in the context of his view of structurally stable short-period positions mechanistically chained together except in the rare occasions when a certain threshold is reached and the system become structurally unstable and undergoes a regime change.

<sup>72</sup> Kowalik recollected that this article originated from the authors’ discussions concerning “Econometric Model and Historical Materialism” (Kowalik 1990, p. 614).

twentieth century. The authors argue that the disharmony in the development of superstructure and productive relations originates in the “contradiction between production and realization in capitalism” (1971, Engl. transl. p. 467 and passim). Nothing ensures that all that is produced can be profitably sold: this gives rise to the cycle in the short run, and to a tendency to stagnation in the long run, unless some ‘external market’ provides additional outlets for products and helps the realization of profits. The ‘crucial reform’ that affected capitalism after the Great Depression, and especially after the Second World War, consisted precisely in government intervention in support of demand becoming systematic. This has radically changed the nature of capitalism: “the *laissez faire* capitalism is dead because of widespread government intervention. [... T]he present state of capitalist economies is an offshoot of a somewhat chaotic interplay between the *laissez faire* tendencies and of a government action” (Kalecki 1970, p. 313).

Kalecki claimed that economic dynamics should not refer to *laissez-faire* capitalism but ought to reflect the fact that “the institutional framework of a social system is a basic element of its economic dynamics and thus of the theory of growth relevant to that system” (Kalecki 1970, p. 311). Kalecki’s solution, however, is not fully satisfactory: in his last model (Kalecki 1968a) institutions are only incorporated as a semi-exogenous factor, slowly changing over time, reflecting preceding developments and the history of the system. History, however, is not really integrated into the model: it is only superimposed on it. The structural instability of the system helps to explain the occurrence of revolutions or crucial reforms, but it is not, in turn, explicitly explained by Kalecki, except for the intuitive reference (and here we come back to the starting point) to the basic contradiction of capitalism lying in its incapacity “of finding a market for its products at full utilization of resources” (Kalecki 1970, p. 311).

## 6. Conclusion

The question ‘What did Kalecki think business cycles actually are?’ does not seem to have a simple and straightforward answer. The view he expressed in words, which I think may fairly be summarized as the idea that cycles are the form taken by the antinomies intrinsic in capitalism, conflicts with the representation emerging from the actual working of his analytical models, which (except the 1943 version) describe economic systems as tending towards a long-run equilibrium position that they cannot reach because of lags and exogenous shocks. These conceptions could not be further apart:<sup>73</sup> indeed, Keynes drew the dividing line between the ‘orthodox’ economists and the ‘heretics’ (among which, of course, he ranged himself):

On the one side are those who believe that the existing economic system is, in the long-run, a self-adjusting system, though with creaks and groans and jerks,

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<sup>73</sup> An indirect proof is the similarity of the dictum implied in Kalecki’s formal models and the conclusions reached by equilibrium business cycle theories, if instead of ‘random’ shocks one reads ‘undesirable government interference’.

and interrupted by time lags, outside interference and mistakes. [...] These authorities do not, of course, believe that the system is automatically or immediately self-adjusting. But they do believe that it has an inherent tendency towards self-adjustment, if it is not interfered with and if the action of change is not too rapid. On the other side of the gulf are those who reject the idea that the existing economic system is, in any significant sense, self-adjusting. They believe that the failure of effective demand to reach the full potentialities of supply, in spite of human psychological demand being immensely far from satisfied for the vast majority of individuals, is due to much more fundamental causes. (Keynes 1934, pp. 486–87)

If it is arguable that Keynes's dichotomy fails to capture other aspects of orthodoxy and heresy and that its language is more intuitive than analytical,<sup>74</sup> it is hardly disputable that he captured the essential distinction so far as the approaches to cycles and crises are concerned. How then could these contradictory views coexist in Kalecki's writings?

Kalecki's interpretation of the business cycle in words (dating from 1932) pre-dates the publication of his first mathematical model in 1933, although the precise sequence of the writing stages of the latter can not be established, in particular regarding a possible public discussion of it in Autumn 1931 (Osiatynski 1990, p. 437). The chronology cannot, therefore, help in deciding whether Kalecki first developed his vision and later worked out his mathematical equation to model it, or whether the formal treatment came first and was given an ex post economic interpretation by the author. The former case, however, seems more likely, for Kalecki stuck consistently to his view of the cycle being a phenomenon intimately connected with the capitalist mode of production, while the analytical formulation underwent drastic changes. His political beliefs, of course, are also likely to have played a part in his interpretation of economic phenomena.

The problem is therefore that of the inconsistency between Kalecki's view of the cyclical development of economic systems and the mechanism depicted by his models.<sup>75</sup> More precisely, a good part of it lies in an inappropriate choice of mathematical tools: Kalecki's linear equations are simply not capable of describing persistent cycles without the help of exogenous shocks.<sup>76</sup> By adopting this language, Kalecki had to renounce explaining fluctuations in terms of some fundamental properties of capitalist economies, relying instead on the occurrence of events essentially extraneous to the basic mechanism. Certainly one knows that no model can capture all aspects of reality (if it did, it would be as useful as a one-to-one map), and therefore any model has to incorporate a term

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<sup>74</sup> The choice of an intuitive terms such as 'self-adjusting' partly reflects the fact that this proposal was formulated in a radio talk rather than in an academic publication. But there is more in this choice: Keynes believed that orthodox theory had constructed in a century a strong citadel of "organized economic thinking and doctrine", while the heretics had only "survived as isolated groups of cranks" who could only argue that *facts* do not conform to the theory. He maintained that to defeat the citadel it had to be assailed from inside, and at that point "no successful attack [had] been made" (Keynes 1934, pp. 488–89), but he was himself not yet ready for the final assault.

<sup>75</sup> For a general discussion of the non-neutrality of the formalism used to express a theoretical conception see Chick and Dow 2001.

<sup>76</sup> See **footnote 60** for a proviso. It should be noticed that, on grounds of Kalecki's own observations on simplifying assumptions (see **footnote 68**), one should be careful to introduce linear approximations, as these do indeed alter the behaviour of the system.

summarizing what is left out. But a model of the cycle should enable one to interpret the basic features of the phenomenon, leaving to errors, omissions and special events the explanation of the deviation from the theoretical norm. In Kalecki's vision the 'normal' behaviour of the system consists in fluctuations, the actual course of which may be modified due to political or other circumstances; in his models, on the contrary, the norm (the state to which the system tends) is equilibrium, and the cycle consists in accidental deviations from the theoretical norm.

Kalecki's view has been illustrated by means of the analogy with the closed systems of physics:

Perhaps an appeal to system theory may help some readers to appreciate this view. The closed systems of physics always tend to come to a rest (an equilibrium) owing to the second law of thermodynamics. To evolve a system and keep it moving it must be stimulated from outside. The pure [= trendless] business cycle, if it is damped, and as long as no shocks are introduced, does indeed come to rest in a stationary state in the same way as the closed systems of physics. To keep up the cycle random shocks have to be introduced. To get evolution (a trend) in addition to the latter more systematic influences from outside have to be brought in.<sup>77</sup>

This analogy is surely suitable to describe Kalecki's models, but is certainly not compatible with his perception of the phenomenon. Kalecki's models indeed represent closed systems, isolated from the external world but for exogenous shocks in the short run, and semi-exogenous factors such as innovations in the long run. The representation of 'pure' business cycles abstracts not only from the trend, but also from all extraneous interferences; the cycle, in other words, fully depends on the handful of factors listed among the determinants of investment decisions. Kalecki's reflections on 'econometric models' take off from the recognition that the economic system interacts with the state of natural resources and with the institutional setting. Although in the 1960s Kalecki argued that the cycle can be approximated in deterministic terms (see section 5 above), probably because he thought that the interaction with non-economic spheres can be taken to be slow, his earlier thoughts on the political conditions for the success of government intervention (Kalecki 1943b, 1944, 1945) point in a different direction: the economic system is subject even in the short run to (at least) a twofold kind of interference from the external world, public expenditure (the systematic nature of which is induced by "a strong pressure of the masses": Kalecki & Kowalik 1971, Engl. transl. p. 467) on the one hand and the entrepreneurs' discontent on the other.

Kalecki's view would thus better be described (if we want to retain the analogy with systems theory) by means of a dissipative structure: a system open to continuous exchanges with the external world, not only in terms of more or less systematic shocks but

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<sup>77</sup> Steindl 1981, p. 132. Steindl also resorted to an analogy with a pendulum with friction: if left on its own, the movement dies out. If, however, the peg on which the pendulum is suspended is subject to random movements, these determine an oscillatory motion; and if the random movements have a preferred direction, they determine a trend as well as fluctuations (Steindl 1989, p. 311).

also in terms of the resources and the institutional framework enabling the conflicting tendencies constantly generated by the system and interacting with it to organize the uncoordinated actions of individual entrepreneurs into an orderly behaviour taking the form of a semi-regular cycle. This requires giving room to positive feedbacks capable of maintaining the system far from equilibrium, rather than letting negative feedback dominate and bring the system towards equilibrium. Equilibrium, in other words, must be unstable, as Kaldor –and, before him, Harrod– had clearly perceived.

Kalecki's argument against the assumption of instability was twofold. On the one hand, he countered Hicks's special version of a cycle based on instability. Kalecki saw no evidence that the cycle regularly hits the ceiling of full employment of labour or resources, and thought instead that such a condition was rather rare.<sup>78</sup> His reasoning overlooks the possibility that other kinds of controls intervene to endogenously determine a reversal of the movement.<sup>79</sup> For instance (to elaborate on a suggestion by Kalecki himself, 1943b), the entrepreneur's aversion to full employment could be modelled by making investment decisions sensitive to the rate of unemployment, so that when a certain threshold is reached investment is slowed down, profits falter while capital keeps increasing, profitability declines and the turning point is reached without necessarily hitting the ceiling of full employment. Conversely, the existence of a large reserve army of unemployed may somehow offset the depressing effects of low perspectives of profits. Kalecki's 1943 model is an instance of an endogenous, non-linear regulating system, for in some phases of the cycle the values of the coefficient act as a positive feedback accelerating movement, while in other phases they act as a negative feedback retarding it, and eventually permitting turning points.

Kalecki's other argument was that there is no empirical reason for assuming that the functions have the specific shape making equilibrium unstable. Indeed, Kaldor and Harrod did not rely on empirical facts, but resorted to an *epistemic* argument: if we want our description to account for cycles, we have to introduce into our system *at the outset* the *possibility* of the persistence of a disequilibrium state. In other words, we have to construct the model in such a way that equilibrium is unstable.<sup>80</sup> Kaldor's and Harrod's

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<sup>78</sup> Kalecki 1954, pp. 126–28. Shortly after the publication of Hicks's book (1950) Kalecki criticized Joan Robinson for not having considered that the boom may not last indefinitely because the parameters of the investment function were such as to make the process convergent. He explained: "My idea [...] serves merely to show why every boom has to reach a stage where the process *is* convergent, so that there should be no need for any specific assumption on the parameters of the investment function" (Kalecki to Robinson, 26 July 1951, in Kalecki 1991, p. 540). This is analogous to Kalecki's notion that 'conditional equilibria' are stable in 1937-39 (see the passage cited in **footnote 50** above): there must be a cumulative process responsible for movement, but it should be convergent in order not to overshoot the mark, which would require us either assuming for the parameters the values giving rise exactly to a cycle of constant amplitude, or to rely on a ceiling to explain the turning point.

<sup>79</sup> The same argument applies to Kalecki's reasoning in favour of a symmetric representation of the cycle reported in section 4.3 above.

<sup>80</sup> Kaldor 1940, p. 91; Harrod 1934, pp. 465–70 (on the origin and context of Harrod's approach to instability see Besomi 1999, chapters 1 and 7, and 2002).

approach was less concerned with realism than with the *logical* steps necessary to build their model.<sup>81</sup> This formally translates as follows:

What is required is that the equilibrium must be unstable, so that the system will *never* be found there or be found approaching it. For large values of the variable the system must be asymptotically stable. It follows then that there must be at least one closed orbit separating the stable from the unstable region. One thus has a stable equilibrium motion, towards which the system is always tending and which is a generalisation of the idea of a stable equilibrium point (the notion had been developed long ago by Poincaré).” (Goodwin 1989, p. 250)

Kaldor’s and Harrod’s intuition soon proved to be correct, although neither of them was aware of the relationship between their chosen starting point and the properties of the nonlinear relationships they were using.<sup>82</sup> Other authors also were concerned with understanding under what conditions crises and fluctuations are possible at all: Marx and Tugan-Baranovsky, for instance, insisted that the *possibility* of crises should be examined before attempting to explain the phenomenon (see Besomi 2004). It is therefore to be regretted that Kalecki failed to draw inspiration from these authors on this point.

This is not to say, however, that Kalecki’s baby has to be thrown out along with the bath water. His last reflections on the methodology of dynamics should perhaps be considered in this light, as indicating that the formal model should be opened to the *interaction* with the non-economic spheres, rather than simply *superimposing* the effect of history in a broad sense (summarized by an unspecified slowly changing function) onto the economic system –both in the long-run and in the short-run. Joan Robinson wrote that “Though Kalecki liked to express his ideas in neat formulae, he was always conscious of the limitations of that style of exposition, and set his arguments against the background of history, politics, and institutional change”.<sup>83</sup> This, however, was not sufficient, as he eventually himself claimed: history and institutions should not stay in the background, but should be *incorporated* in economic modelling as well as in the perception of economic relationships.

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<sup>81</sup> This aspect does not seem to have been appreciated in the literature: Lange, for instance, argued that “in the absence of empirical evidence to the contrary, Mr. Kalecki’s theory seems preferable to that of Mr. Kaldor because it does not need to assume inherently unstable equilibria” (1941, p. 193). A relevant exception is Goodwin’s observation that the crucial distinction between linear and nonlinear dynamics, “which eluded Kalecki, was arrived at from sheer logic by Kaldor, in total innocence of the awesome difficulties of non-linear dynamics” (Goodwin 1989, p. 250).

<sup>82</sup> Harrod, moreover, also failed to produce a consistent model: in his 1936 book he only gave an intuitive idea of the kind of relationships involved, while in the subsequent models an assumption was missing regarding the connection between different states of the system, so that the analysis was confined to a single instant.

<sup>83</sup> Robinson 1977, p. 17. Kalecki’s use of mathematics, as against his awareness of the limits of this language for the use to which he put it, seems to have struck a number of commentators, who could not fail to “perceive the presence of life” and “the moral purpose” behind it (Lipinski 1977, p. 70, and Worswick 1977, p. 28, respectively).

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