Joan Robinson's historical time and the current state of post-Keynesian growth theory

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Abstract

This paper discusses Joan Robinson's remarks on the importance of historical time in economic analysis. On the one hand, Joan Robinson expressed skepticism with equilibrium analysis as such, arguing that as soon as economists take into account the uncertainty of expectations, history needs to replace equilibrium. On the other, Robinson stressed that, while building economic models, one must be aware that it is historical time rather than logical time that rules reality, warning against the methodological mistake of confusing comparisons of equilibrium positions with a movement between them. We argue that these criticisms point to the possibility of thinking in terms of two different 'levels' of historical time – a higher (fundamentalist) level, and a practical (and more analytically tractable) lower level. Using this distinction, we provide a taxonomy of existing strands of post-Keynesian growth theory that are consistent with the concept of low-level historical time. It is shown that despite appearances to the contrary, much post-Keynesian growth theory displays fidelity to Joan Robinson's concern with the importance of historical time.

Keywords: Historical time; economic growth; provisional equilibrium; traverse; shifting equilibrium

JEL codes: B31; B41; E11; E12; O41

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1 Introduction

Joan Robinson clarified the distinction between historical time and equilibrium for the first time some 69 years ago (Robinson, 1953*a*,*b*). Since then, post-Keynesian theorists have consistently pursued her research agenda towards "a generalisation of the *General Theory*, that is, an extension of Keynes's short-period analysis to long-run development" (Robinson, 1956, p. vi, emphasis in the original), developing models in which short- as well as long-run growth processes are demand-led. But in so doing, they have focused little on internalizing one of the most important characteristics of capital accumulation pointed out by Joan Robinson, i.e. its temporal dimension. The fact that relatively little explicit attention has been paid to the way equilibrium analysis and out-of-equilibrium movements might unfold in historical time is puzzling, given the high degree of importance attached by Robinson herself to this methodological issue. It is particularly telling that – later in her life – Joan Robinson argued that the issue of measuring capital that led to the Cambridge capital controversy is only secondary to the problem of time in economic analysis:

> The long wrangle about 'measuring capital' has been a great deal of fuss over a secondary question. The real source of trouble is the confusion between comparisons of equilibrium positions and the history of a process of accumulation. (Robinson, 1978*a*, p. 135)

Consequently, it would seem natural for post-Keynesian growth theories to confront, present alternatives to, and possibly even supersede neoclassical growth theory on the basis of a correct accounting for history and time. This research agenda seemed clear to Joan Robinson right from her very definition of what post-Keynesian economics is:

> To me, the expression *post-Keynesian* has a definite meaning; it applies to an economic theory or method of analysis which takes account of the difference between the future and the past. (Robinson, 1978*b*, p. 12, emphasis in the original)

Drawing on these observations, the purpose of the present article is to examine the nature and relevance of historical time for contemporary post-Keynesian analysis. We focus specifically on the strand of post-Keynesian growth theory most directly inspired by Robinson's ideas –

and in particular her seminal work *The Accumulation of Capital* (1956). Accordingly, our main concern is with the 'Kalecki-Robinson' tradition (Blecker and Setterfield, 2019, Chs. 3-4) and, to a lesser extent, with Sraffian contributions embedded in the Supermultiplier model. We leave the investigation of historical time in Harrodian, Kaldorian, and other strands of post-Keynesian growth theory to further research.[1]

The article proceeds as follows. Section 2 reviews Joan Robinson's remarks on the relevance of historical time in economic analysis, discussing its irrevocable nature, its differences vis-à-vis space and logical time, and distinguishing between two different levels of historical time – a higher (fundamentalist) level and a lower one. Building upon this distinction, Section 3 identifies and discusses three classes of post-Keynesian growth models – models based on a 'provisional' or 'conditional' equilibrium, traverse analyses, and shifting equilibrium models – discussing the links between equilibrium, logical time and history in each one of them. We conclude in Section 4, summarizing our argument and suggesting potential implications for post-Keynesian growth theory.

2 History and Time in Joan Robinson's Thought

This section summarises the main elements of Joan Robinson's critical assessment of the significance and relevance of historical time in economic analysis. In subsection 2.1, we describe the irrevocable nature of time, before discussing the relation between historical time, logical time and space in subsection 2.2, and clarifying the distinction between high-level and low-level historical time in subsection 2.3.

[1] We also focus on equilibrium models, which dominate the Kalecki-Robinson tradition and (*prima facie*) most obviously conflict with Robinson's concerns with history and time. There is, of course, a rich tradition of modelling cycles in post-Keynesian macrodynamics. We leave analysis of historical time in these models to further research but note, in passing, that a model of cyclical growth does not in and of itself address Robinson's concerns – as also recognized by Velupillai (2013). Hence, for example, a dynamical system that produces closed orbits, movement along which has no effect on the structure of the system and movement between which requires exogenous shocks, is no more consistent with historical time than a model grounded in what is described below as standard equilibrium analysis.

2.1 Historical Time as an Irrevocable Process

This subsection seeks to describe the meaning and nature of historical time as a process in a socio-economic system. In line with Joan Robinson's agenda, the discussion abstains from broader philosophical considerations, focusing rather on operationalising the concept by discussing its key characteristics. This will subsequently allow us to distinguish between two levels of historical time and to classify post-Keynesian growth models accordingly.

Joan Robinson stressed the importance of time in economic analysis for the first time in 1953, in two articles (Robinson, 1953*a*,*b*) and a lecture (reprinted in Robinson 1973). Even though the subsequent literature on the issue often references only her later works, Robinson's paper on '*The production function and the theory of capital*' (1953*b*) already makes clear the defining characteristics of historical time:

> Time is unlike space in two very striking respects. In space, bodies moving from A to B may pass bodies moving from B to A, but in time the strictest possible rule of one-way traffic is always in force. And in space the distance from A to B is of the same order of magnitude [...] as the distance from B to A; but in time the distance from to-day to to-morrow is twenty-four hours, while the distance from to-day to yesterday is infinite, as the poets have often remarked. (Robinson, 1953*b*, p. 85)

The quotation above draws to attention one of the key characteristics of historical time, i.e. its irrevocable nature. In this respect, it is worth recalling Georgescu-Roegen's (1971, p. 197) distinction between reversible, irreversible and irrevocable processes. A reversible process "can follow the same course phase by phase in the reverse order" (*ibid.*). In other words, the sequence of actions of which a reversible process is comprised can be inverted so as to restore initial conditions. This is the case, for instance, in models that postulate the convergence of a system to a unique and stable equilibrium: once-over shocks may lead to disequilibrium when the shock occurs, but subsequent adjustments ensure that the system settles back into its initial equilibrium state. This movement may apply to space – where it is possible to move indifferently from A to B or vice versa – but not to time. As highlighted by Joan Robinson, a good way to go "clean off the rails [...] is using a metaphor based on space to explain a process which takes place in time" (Robinson, 1978*a*, p. 138). A similar caveat applies to irreversible

processes, in which a sequence of actions "cannot be inverted so as to restore initial conditions, even though the initial conditions which existed prior to the process can be restored by some subsequent process" (Setterfield, 1995, p. 5). Some natural phenomena – such as the alternation of seasons – conform to this definition, which is however hardly valid for human history. In this respect, the old adage that 'history repeats itself' might be misleading. *Some* socio-economic processes come in cycles, but not *all* of them, and in any case not in such a way as to ensure full replication of previous conditions: it would thus be more correct to say that 'history never repeats itself, but it does often rhyme', in line with a maxim attributed to Mark Twain. In Georgescu-Roegen's terminology, historical processes are thus irrevocable, as they "cannot pass through a given state more than once" (Georgescu-Roegen, 1971, p. 197). In the case of an irrevocable process, a sequence of actions cannot be inverted so as to restore initial conditions, nor can they be restored by any subsequent process, as "in time the strictest possible rule of one-way traffic is always in force" (Robinson, 1978*a*, p. 82) and hence "movement can only be forward" (Robinson, 1962, p. 26).

After discussing the irrevocable nature of historical time, a discussion of its relationship to logical time and equilibrium is now in order.

2.2 Historical Time and Logical Time

The distinction between historical and logical time is discussed by Joan Robinson in the second chapter of her *Essays in the Theory of Economic Growth* (1962). More specifically, she describes a common method followed by economic theorists as consisting of the specification of "a sufficient number of equations to determine its [the system's] unknowns, and so finding values for them that are compatible with each other" (Robinson, 1962, p. 23), i.e. finding the equilibrium that brings about the stability of the economic system. When applied to growth theory, this methodology implies treating dynamic matters *as if* they are static ones – at least as long as the conditions for the equilibrium are met (Hicks, 1965): the stability of the system becomes a kind of 'dynamic stillness' over a deterministic growth path. If the problem of the traverse is not rigorously taken into account, the major trouble with this method is that it only allows for description of an ahistorical process: little to nothing could be inferred about the actual time

movement underlying the interactions between a model's equations and its unknowns. In other words, system dynamics take place in the realm of logical time, in which adjustments could be seen as instantaneous and reversible:

> In a model depicting equilibrium positions there is no causation. It consists of a closed circle of simultaneous equations. The value of each element is entailed by the values of the rest. At any moment in logical time, the past is determined just as much as the future (Robinson, 1962, p. 26).

Movements in logical time are deterministic in the sense that "given the values of its state variables for some initial period, the theory logically determines a unique set of values for those variables *for any other period*" (Nagel, 1961, p. 285, emphasis added). Unlike historical time, and following the categorization of Georgescu-Roegen (1971) discussed above, processes taking place in logical time can only be of reversible or irreversible nature, but not irrevocable. In this sense, logical time is more similar to space than to historical time;[2] a process unfolding in logical time could be brought back to its initial conditions without perturbing the stability and uniqueness of final outcomes, at least as long as this is consistent with the internal logic of the model. Logical time is to this extent not only ahistorical, but also anti-historical (Harris, 2005), as it constitutes an obstacle to a correct time representation of a historical process by contradicting the irrevocable nature of time.[3] Provided that the adjustment does not occur entirely within the unit period under consideration, a correct time representation of a logical-time process can only be derived by rigorously assessing the path that a system takes during the traverse between its final positions – regardless of whether these correspond to an equilibrium.[4]

Furthermore, there is a second – and more radical – aspect underpinning the distinction between logical and historical time, which involves the role of expectations and the idea that the

[2] Currie and Steedman (1990) make a similar point when discussing the symmetry between the treatment of time and space in the Arrow-Debreu model.

[3] In light of these remarks it is not surprising that, as previously noted, Robinson's concern with historical time first became evident in the early 1950s in the context of reflections on capital theory and the (neoclassical continuous) production function. The capital stock (both physical and human) and the technique of production it serves are obvious embodiments of the legacy of history - specifically, prior processes of accumulation and technological change. This legacy will, in turn, affect the future trajectory of the economy, and may impede the traverse to any future position (of equilibrium or otherwise) toward which the economy was previously tending. In light of all this, it is not surprising that concerns with historical time continue to inform scholarship on capital and production theory - see, for example, Foley and Michl (1999, pp. 123-138).

[4] This aspect will be further discussed in subsection 3.2.

future is fundamentally uncertain. In order to clarify this aspect, let us for a moment come back to the parallel between logical time and space. The distance in space between two points (e.g. two cities) can be known at all times; in the same way, the distance between any given point and the final state of a process taking place in logical time can always be derived *a priori*. Past, present and future events are known with the degree of certainty that underlies the model's logic; if they are unknown, the risk associated with each event can always be computed. One way or the other, borrowing Kaldor's (1934) terminology, the outcomes are always determinate.

Conversely, outcomes in historical time ought to be regarded as fundamentally indeterminate, with history and experience affecting the formation of expectations as well as economic decisions and actions. As argued by Robinson (1978*a*, p. 127), "human life does not exist outside history and no one has correct foresight of his own future behaviour, let alone of the behaviour of all the other individuals which will impinge upon his". Therefore, in an economic environment characterised by fundamental uncertainty, a logical-time representation of a process of accumulation is untenable, in so far as it is not possible to determine where expectations and choices will drive the system from present to future stages. Unlike some physical phenomena, the process of decision making under uncertainty could be interpreted as stochastic and non-ergodic (Davidson, 1982): over an infinite horizon, the space and time averages of the stochastic process will not coincide. However, when carried to the extreme, this 'ontological view of fundamental uncertainty' (Lavoie, 2014, p. 75) leaves little to no space for economic modelling.[5] How can we express cause and effect relationships when – as in the case of long-run growth – cause and effect are always separated in historical time? Therefore, in order to escape the temptation of 'analytical nihilism' (Coddington, 1982) and to better facilitate assessment of whether or not post-Keynesian growth theory is ahistorical,[6] the next section will distinguish between two levels of historical time.

[5]See also Caravale (1992). The extreme in question is sometimes associated with G.L.S. Shackle's 'kaleidic' vision of the economy and/or some strands of critical realist thinking in economics (e.g., Lawson, 1994).

[6]As noted by Lavoie (2014, p. 82), "one must admit that some defenders of fundamental uncertainty [...] have left their readers with the impression that uncertainty only allows nihilistic conclusions. But this is not the impression of the majority of post-Keynesians". In particular, most post-Keynesian economists are currently more inclined to accept the view of Setterfield (1995) according to which, while no model can be neither truly historical nor truly realistic, this does not hinder the theoretical and empirical usefulness of economic modelling.

2.3 Higher- vs. Lower-Level Historical Time

As the nuances associated with the concept suggest, the development of economic theory that is fully and properly consistent with historical time is a formidable task. Indeed, it is possible that no less a person than Joan Robinson herself would have agreed with this sentiment. Hence according to Mongiovi (1994):[7]

> [the] tension between what [Robinson] demanded of economic theory and what her own method would allow her to accomplish, helps to explain the despair that troubled her final years. (Mongiovi, 1994, p. 274)

In response to this problem, Setterfield (1995, p. 24) proposes a distinction between two *levels* of historical time: a 'lower level' that can be successfully characterised by methods and concepts already familiar to economic theorists (and the use thereof); and "a higher (and more radical) level which cannot be conceptualised [...] but only approximated by practical concepts." In other words, suppose we begin by conceding that the flux of real historical time as it exists in lived experience (high-level historical time) is not amenable to analysis using the prevailing methods and concepts of economic theory. These same methods and concepts, properly used, may nevertheless be capable of reflecting *some* of the properties of high-level historical time. This subset of the properties of high-level historical time is what constitutes low-level historical time. The 'play' of history evident in low-level historical time is neither as full nor as complete as it is in high-level historical time, then, but nor is it entirely absent.[8]

The essence of low-level historical time analysis is its emphasis on practicality. It purposely sets aside some of the dynamics characteristic of high-level historical time in favour of focusing on others and in so doing, facilitates the use of familiar tools in economic theory in a manner that *better approximates* (rather than seeks to *fully reflect*) the historical nature of the economist's object of analysis. In this way, the pursuit of economic theory consistent with low-level historical time is no more (or less) than an example of *abstraction*, which process is necessarily characteristic of all theorising. The particular purpose served by abstraction in this

[7] See also Harcourt (1986).

[8] See also Chick (2022) on the notion that there are different 'types' of history, some of which are amenable to analysis using familiar theoretical tools.

case is – as is so often the case – tractability: theorizing in terms consistent with low-level historical time simplifies the complex, evolutionary dynamics of historical time sufficiently as to make theorizing practical. On this view, it is with good reason that:

> [while t]he creative act and the crucial decision are fundamental to economic evolution [...] [b]y reason of their intractability, they are the areas least attended to in economic theory. Economic theory is faced with enormous complexity, especially, but not exclusively, to do with time and openness. Complexity is made manageable by imposing constraints on what adjustments are allowed and what can reasonably be kept constant. (Chick and Caserta, 1997, p. 227-8)

In fact, it is conceivable that the notion of equilibrium itself is (or can be) compatible with low-level historical time.[9] While definitions of precisely what constitutes an equilibrium vary, however defined, equilibrium is commonly understood as a 'state of rest' – a state from which a system will display no tendency to deviate in the absence of exogenous shocks. Hence even if an equilibrium is path-dependent (a product of the adjustments taken towards it),[10] this suggests that equilibrium is essentially an 'end to history'. Once achieved, the equilibrium configuration determines the future timepath of the system (again, in the absence of shocks) so that the sequence of events entailed by this timepath – the history of the system – does not 'matter': it exerts no independent influence over what happens next, there being no endogenous tendency to deviate from the trajectory imposed by the equilibrium configuration. A state of equilibrium thus appears inconsistent with the most basic property of historical time, that earlier states of the world influence later ones.[11]

The notion of equilibrium described above is, however, consistent with what Chick and Caserta (1997, p. 224) define as 'final' equilibrium, which can be contrasted with their concept of 'provisional' or (per Setterfield, 1997*b*) 'conditional' equilibrium. Provisional or conditional equilibria are "state[s] of rest brought about by [...] temporary suspension of [some of the]

[9]This quest for 'rescuing' equilibrium as an organizing concept, and so escaping the antagonism between history and equilibrium, is also evident in the work of authors such as Caravale (1992) and Chick (2022).

[10]See, for example, Lang and Setterfield (2006).

[11]The idea that state of equilibrium would be self-perpetuating in this fashion is the basis for the Robinsonian objection to the use of equilibrium in post-Keynesian growth theory. A similar concern was voiced by Asimakopulos (1991, p. 156) in his critique of Harrod's concept of the warranted growth path.

forces of change endogenous to a system" and that, as such, "await subsequent redefinition by forces endogenous to the sequential progression of the economy through historical time" (Setterfield, 1997*a*, p. 84).[12] In other words, "provisional equilibrium provides a reference point [...] which may eventually be transformed, [by] the very decisions which bring about provisional equilibrium, into something else, with a new provisional equilibrium [...]. It is the reference to a system which contains in it the seeds of its own development and change that is the force of the word provisional" (Chick and Caserta, 1997, p. 225). In order to be of practical value, whatever is held constant in order to bring about a state of provisional equilibrium must remain so for a period of sufficient duration for the analysis to be descriptively useful. What variables are candidates for such treatment? One is the capital stock (K), additions to which take 'time to build'. Hence in a closed economy with no active government sector, a flow equilibrium is brought about when investment (I) equals saving (S), and this state is commonly understood to be achievable with $I > 0$ *and* $K = \overline{K}$ despite the fact that (by definition) $\Delta K = I - \delta K$ (where δ denotes the rate of depreciation of the capital stock). Aside from the fact that flow relations and the stock adjustments to which they inevitably give rise operate in different time frames, institutions or conventions – which are relatively enduring (i.e., inert) but ultimately transmutable in response to the very outcomes to which they give rise (see, for example, Cornwall, 1990) – are another source of provisional equilibria. Hence "[c]hange may be forestalled by [...] the sheer force of inertia, which in terms of human decision-making is usefully described as the maintenance of conventions" (Chick and Caserta, 1997, p. 226). In an environment of historical time and uncertainty, conventional behaviour proliferates and so, as a result, does the possibility of provisional equilibrium.[13]

In light of these various considerations, the question that now arises is: to what extent has post-Keynesian growth theory developed in a manner consistent with Joan Robinson's concern with analysing economic systems in historical time? It is to this question that we now turn.

[12] We refer hereafter to provisional equilibrium in reference to this concept.

[13] See also Crotty (1994) on the related concept of 'conditional stability' in economic systems.

3 The Integration of Lower-Level Historical Time into post-Keynesian Growth Theory: A Taxonomy

It is undeniable that the vast majority of post-Keynesian growth theory focuses on stability analysis and comparative statics in the context of (seemingly) standard equilibrium analysis, rather than on the explicit framing of adjustment processes in historical time.[14] In this respect, it appears to differ little from its orthodox counterpart. But in fact, progress has been made in post-Keynesian growth theory towards analysing growth in a manner consistent with low-level historical time – that is, in a manner that captures some (if not all) of the dynamics of historical time and in so doing, departs meaningfully from standard equilibrium analysis. In order to begin substantiating this assertion, it is worth repeating Robinson's claim that:

> A model applicable to actual history has to be capable of getting out of equilibrium; indeed, it must normally not be in it. (Robinson, 1962, p. 25)

In what follows, we identify and discuss three classes of post-Keynesian growth models that are variously 'capable of getting out of equilibrium' – models associated with the notion of provisional equilibrium (subsection 3.1) – and/or that are 'not normally in [equilibrium]' – models based on traverse analysis (subsection 3.2) and 'shifting equilibrium' models (subsection 3.3).[15].

3.1 Provisional equilibrium

Two common sources of conditionality, giving rise to provisional equilibria, can be identified in post-Keynesian growth theory as it is commonly articulated:[16] constancy of animal spirits; and acceptance of the possibility of inequality between the actual and normal rates of capacity utilization.

[14] Standard equilibrium analysis can be associated with final equilibria that are defined and reached independently of the path taken towards them.

[15] The reader is reminded that our focus here is on models rooted in equilibrium analysis and that, on the face of it, conflict with Joan Robinson's concerns with historical time. An alternative approach to theorizing growth would be to eschew equilibrium analysis and attempt to reformulate growth theory on the basis of path-dependent organizing concepts such as hysteresis. Even concepts such as hysteresis need not, however, exclude the possibility of equilibrium outcomes – on which see Lang and Setterfield (2006) and, in the context of Kalecki-Robinson growth theory, Bassi et al. (2022)

[16] See, for example, Lavoie (2014, Ch. 6) for a canonical statement.

Throughout post-Keynesian growth theory, and following Robinson (1956), the accumulation function that describes the rate of accumulation as a function of the rate of capacity utilization and/or the rate of profit is understood to involve parameters that are contingent on firms' animal spirits. Animal spirits are, in turn, usually taken as given. Following Chick and Caserta (1997, p. 230), what this implies is that any equilibrium derived from these systems is a 'temporary' equilibrium in the sense of Hicks (1939): an equilibrium contingent on unaltered expectations which, in the context of post-Keynesian theory, involves not only realised short-run expectations (an actual rate of capacity utilization equal to the expected rate, for example) but also a given state of long-run expectations – a condition satisfied in post-Keynesian growth theory by the assumed constancy of animal spirits.[17]

Moreover, the temporary equilibrium so identified is clearly a provisional equilibrium in the sense defined in subsection 2.3, capable of generating endogenous change (rather than being endlessly self-replicating in the absence of exogenous shocks). This follows from its dependence on constant animal spirits, which condition is far from guaranteed in the presence of repeated experience of the same outcome. Hence as argued by Setterfield (1997*b*, p. 67), in an environment of strategic interaction subject to fundamental uncertainty (such as a goods market contested by multiple capitalist firms), the mere experience of the tranquility associated with the absence of change in equilibrium may arouse suspicion that 'things are too quiet'. This, in turn, may prompt a change in animal spirits and hence a behavioural innovation: a 'preemptive strike' on the part of some firms designed to 'get ahead' of some imagined similar behaviour on the part of competitors and so establish a first-mover advantage. Of course, no such similar behaviour on the part of competitors need ever have been in the making – but that is beside the point.[18] The change in animal spirits just described – analytically, a change in one or more of the parameters of the accumulation function – will disturb the equilibrium position previously established and create a new equilibrium configuration, all in response to experience

[17]This is not to say that all post-Keynesian growth theorists pay sufficient attention to this property, nor the resulting conditionality of the temporary equilibrium identified below. Indeed, in some cases, efforts to reconcile the equilibria derived from post-Keynesian growth theory with the properties of a 'fully-adjusted position' that bears hallmarks of the classical long period might be construed as questing for a *final* equilibrium as defined earlier.

[18]On the role of imagination or creativity in the formation of expectations under conditions of fundamental uncertainty, see, for example, Dequech (1999, pp. 418-19).

of the original equilibrium itself. This is the hallmark of a provisional equilibrium and as the account just provided makes clear, the conditional constancy of animal spirits on which it rests forges a direct correspondence in post-Keynesian growth theory between historical time and uncertainty in decision making of the sort envisaged by Robinson (1978*a*, p.127).

The second source of conditionality in the equilibria derived from post-Keynesian growth theory involves acceptance of a possible discrepancy between the actual and normal rates of capacity utilization in equilibrium. An equilibrium in which the actual and normal rates of capacity utilization differ is not fully adjusted, and if the normal rate is understood as a structural variable that is derived independently of the actual rate, and if there is no tolerance on the part of firms for any permanent departure from a particular point value of the utilization rate that is taken to be normal,[19] then the equilibrium so-described need not persist: firms may undertake subsequent behavioural change (specifically, changes in their rates of accumulation) designed to restore the actual rate of capacity utilization to its normal rate.

However, these adjustments need not occur immediately. In fact, there is good reason to suppose they will not. In Harrodian dynamics, the operation of Harrod's instability principle is activated by discrepancies between the actual and warranted rate of growth and concommitant departure of the actual rate of capacity utilization from its normal rate. But as noted by Asimakopulos (1991, p. 161), an important qualification to the operation of the instability principle involves the *reaction time* required for firms to respond to these discrepancies. According to Harrod (1939), firms will not alter their rates of accumulation in response to any and every observation of difference between the actual and warranted rates of growth (and hence the actual and normal rates of capacity utilization). Only differences that are sufficiently persistent – specifically, those that exceed the reaction time – will trigger a behavioural response. Applying this thinking to the case of the typical equilibrium configuration in post-Keynesian growth theory suggests that the latter will exhibit the properties of an equilibrium (a state of rest) for some specific period of calendar time, but will (or may) be disturbed subsequently by endogenous responses to the equilibrium configuration itself – specifically, changes in the

[19] As is well known, there is a large post-Keynesian literature in which either one or both of these statements is contested – including discussions of hysteresis in the normal rate of capacity utilization. Here, we set aside the complications introduced by this literature for the sake of simplicity.

rate of accumulation provoked by a desire to restore capacity utilization to its normal rate. In sum, under the conditions described, the equilibrium outcome described in post-Keynesian growth theory will persist but not endure indefinitely: endogenous responses to the conditions it describes (changes in the rate of accumulation in response to the inequality of the actual and normal rates of capacity utilization) will disturb the equilibrium. Once again, the equilibrium associated with post-Keynesian growth theory is revealed as provisional.[20]

The conditionality of equilibrium in post-Keynesian growth theory is illustrated in figure **??**, where equilibrium is established at point E (u^*, g^*), the point of intersection between the accumulation function g^i and the schedule depicting those rates of accumulation consistent with the equality of investment and saving (g^s). If cumulative experience of equilibrium outcomes elicits a change in animal spirits, and if this alters the value of the intercept parameter γ_1, it is clear from inspection of figure **??** that the g^i schedule will shift and a new position of (provisional) equilibrium will emerge. Alternatively, if experience at point E of $u^* \neq u_n$ is sufficiently persistent to trigger a change in firms' accumulation behaviour designed to reduce or eliminate the interval between the actual and normal rates of capacity utilization, the g^i schedule will once again shift establishing a new position of (provisional) equilibrium. What figure **??** thus reveals is that while equilibrium outcomes in post-Keynesian growth theory might *appear* to be final equilibria consistent with standard equilibrium analysis, they are revealed as provisional upon proper interpretation that takes into account the behavioural foundations of the underlying theory.[21]

3.2 Traverse analyses

In recent years, post-Keynesian growth theory has moved its focus from the analysis of medium-run processes towards long-run modelling. This shift was particularly motivated by a revived interest in the role played by autonomous non-capacity-creating components of aggregate demand in determining long-run growth trajectories.

[20] The particular source of its conditionality in this case – its non-correspondence to a fully adjusted position – is the reason why some authors prefer to refer to the equilibrium achieved in post-Keynesian growth theory as 'medium term' rather than 'long term', despite the fact that growth theory is normally thought to correspond to the long term. See, for example, Chick and Caserta (1997, pp. 231-4).

[21] Again, this is not to say that all practitioners of post-Keynesian growth theory are equally attentive to this property of their models.

The role attached to autonomous and semi-autonomous components of demand is anything but new. In particular, their role in output determination traces back to Luxemburg's notion of external markets, which encompasses the public and external sectors (Luxemburg, [1913] 2015; Kalecki, 1967). Semi-autonomous demand components also include expenditures that are not financed by enterprises' outlays, as pointed out by Fiebiger (2018). The more general definition of autonomous expenditures is provided by Serrano (1995, p. 67), who identifies them with all "those expenditures that are neither financed by contractual wage income nor can create capacity".[22] By focusing on the external sector, a first super-multiplier model was developed by Hicks (1950), followed by later attempts by Ackley (1963) and Monza (1976). In the 1990s, Serrano (1995) published a fully-developed version of an autonomous demand-led growth model – the Sraffian Supermultiplier model – whose dynamics and properties have since been discussed by Freitas and Serrano (2015). Allain (2015, 2018), Lavoie (2016), and Nah and Lavoie (2017) have more recently attempted to incorporate the key features of the Sraffian Supermultiplier model in a Kaleckian framework, giving rise to a flourishing theoretical as well as empirical literature on the role of autonomous demand components in driving an economy's output level and growth rate.[23]

As advocated by Serrano (1995), supermultiplier models constitute a macroeconomic attempt to conjugate the Keynesian principle of effective demand in the long run with the Classical theory of distribution, based on a normal rate of profit prevailing at the fully-adjusted position (Garegnani, 1962; Vianello, 1985). Accordingly, in models of both Sraffian and Kaleckian fashion, the exogenously-given growth rate of autonomous demand drives long-run accumulation towards the fully-adjusted position that brings about the equality of the actual and the normal rates of capacity utilization ($u_t = u_n$).

Because of their reliance on the Classical long period, these models identify in each time step a 'final' equilibrium towards which the economy tends *in the long run*. Joan Robinson – as well as Kalecki and early post-Keynesians – have always expressed a certain skepticism about

[22]The significance of these expenditures being non-capacity-creating is that in addition to contributing to current demand independently of income, they do so without contributing to potential output – i.e., without affecting current supply conditions. This is an important property in long-run models wherein the traditional 'driver' of demand – investment – is both a source of additional demand *and* a source of additional productive capacity.

[23]For a derivation and comparison of the two sets of models, see Gallo (2022*b*).

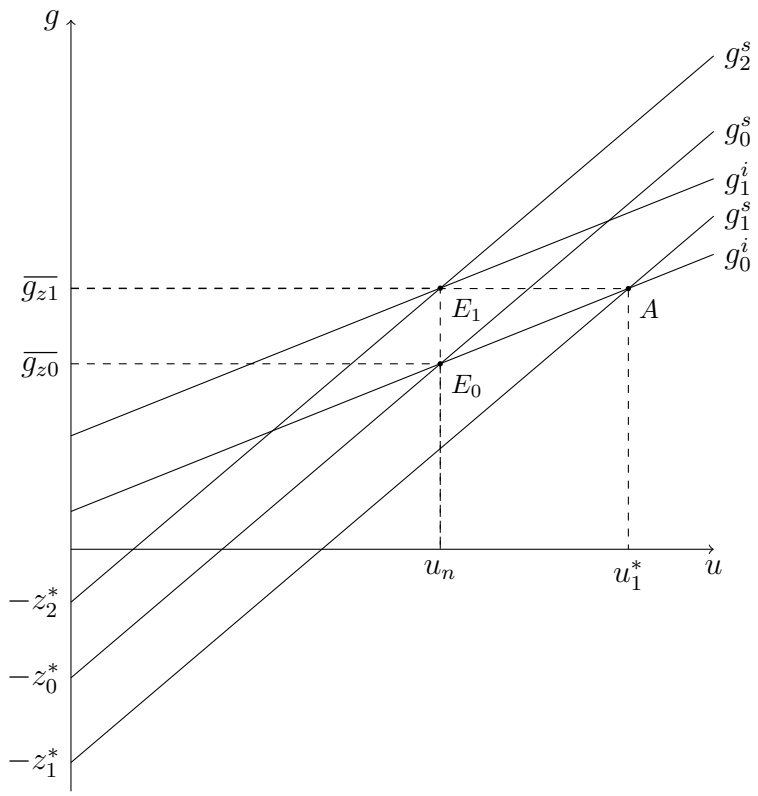
this conception, famously wondering whether the long period is anywhere to be seen in past or future situations or if instead it "float[s] above historical time as a Platonic Idea" (Robinson, 1979, p. 180). Indeed, the relationship between long-period analysis and historical time is far from straightforward and deserves greater attention.[24] While the existing literature has extensively focused on the stability properties of supermultiplier models and on the difference between level and growth effects from one steady-state position to another, relatively little attention has been paid to the behaviour of the models outside of their respective equilibria, i.e., to the path that the system takes during the traverse.

For illustrative purposes, let us briefly discuss how the amendend neo-Kaleckian models of Allain (2015) and Lavoie (2016) behave while moving between equilibrium positions. Figure 1 illustrates the impact of an increase in the growth rate of autonomous demand on the utilization of productive capacity and rate of accumulation.[25]

[24] This is a particularly delicate matter, as the controversy surrounding long-period positions has constituted the main source of mistrust between Sraffians and other post-Keynesian strands. Most of the trouble comes from the alleged dichotomy between the idea that the long-run trend is either (i) "a slowly changing component of a chain of short-period situations" (Kalecki, 1971, p. 165) or (ii) predetermined *ex ante* regardless of short-period movements and hence path-independent. As argued by Lavoie (2013), the latter notion derives from the wrong identification of fully-adjusted positions as final equilibria towards which the economy will inexorably converge. By breaking this straitjacket, even in theories of long-run growth relying on the long-period method, "the trend that describes long-period positions is determined *ex post*, and is dependent on actual short-run sales [...]; in other words, there is path dependence" (*ibid.*, p. 43). As argued in the remainder of the article, this is particularly true in supermultiplier models after re-focusing attention on the analysis of the traverse, given that the parameter space is likely to change during the adjustment process (Blecker, 2013; Setterfield, 2002).

[25] For ease of exposition, we focus here only on the Allain-Lavoie model and merely sketch the adjustment process. For a more complete exposition, see Lavoie (2016, pp. 186–187).

Figure 1: The effect of an increase in autonomous demand growth in the Allain-Lavoie model



Source: authors' representation, based on Lavoie (2016, p. 186)

Let us start under the (restrictive) assumption that the economy is in its fully-adjusted equilibrium E_0. At time $t = 0$, the growth rate of autonomous demand increases from $\overline{g_{z0}}$ to $\overline{g_{z1}}$, producing a downward shift of the saving function as a consequence of an increase in the autonomous demand-capital ratio (from z_0^* to z_1^*). Facing increased demand, firms utilise their productive capacity more intensively, up to the point u_1^* (at point A). In the process, more optimistic entrepreneurs will revise upward their expected growth rate of sales, which is captured by the intercept of the investment function g_i. This adjustment – which Lavoie (2016) calls the 'Harrodian mechanism' – will produce an increase in the growth rate of capital until it eventually exceeds the growth rate of autonomous demand. At this point, the value of z will begin to decrease. This process will continue until the fully-adjusted equilibrium is re-established at point E_1, where the equilibrium rate of accumulation is compatible with the higher growth rate of autonomous demand with which we began ($\overline{g_{z1}}$), there exists a new and lower autonomous demand-capital ratio (z_2^*), and $u = u_n$.

By numerically solving the systems of differential equations that regulate out-of-equilibrium dynamics in the amended neo-Kaleckian model of Allain (2015) and Lavoie (2016) sketched above and in the supermultiplier model of Freitas and Serrano (2015), Gallo (2022*b*) shows that both models share a very slow pace of adjustment. In other words, the convergence from one steady-state to another may be long enough to be economically meaningless. Under a reasonable parameter calibration, the long-run traverse (the movement from E_0 to A and then E_1) requires a period of about 30 years in the Allain-Lavoie model, while – through a different adjustment mechanism – it is even longer in the Sraffian supermultiplier model of Freitas and Serrano (2015), requiring a period of about about 50 years.

Because more changes are likely to affect the growth process in the time between a change in today's conditions and the establishment of a new equilibrium over a 30 to 50 years time span, the determination of economic outcomes and growth processes should therefore be regarded as heavily influenced by history. This view is consistent with Robinson (1962, p. 17), who notes that "it is absurd, though unfortunately common, to talk as though 'in the long run' we shall reach a date at which the equilibrium corresponding to today's conditions will have been realized". As suggested by Gallo (2022*b*), supermultiplier models of both Sraffian and Kaleckian fashion should hence refocus attention on the traverse path, thus thinking as if the models are not normally in their steady-state equilibria. This view is consistent with Cornwall (1991, p. 107), who stresses that economists ought to "concern themselves with the relative speed with which the assumed exogenous forces change in the real world compared to the speed with which the economy converges on an equilibrium". If – as is the case in supermultiplier models – the speed of adjustment is not sufficiently rapid to justify reference to final equilibrium positions only, then more attention should be given to the values that the relevant variables of a system take *during the traverse* rather than to their *potential* steady-state values (Fisher, 1983; Henry, 1987; Park, 1995; Lavoie, 2016; Gallo, 2022*a*).

In order to have a clearer understanding of the relation between these sets of models and the real world, demand-led growth theorists ought to interpret fully-adjusted equilibria as no more than centers of gravity towards which an economy tends *in the moment* the exogenous forces of growth change, but that could be altered at later stages during the traverse. By

assessing analytically and/or numerically the law of motion of a model outside of its equilibrium, demand-led growth theorists ought, therefore, to embrace the idea that 'life is a traverse' (Halevi and Kriesler, 1992, p. 229 and Harcourt, 1982, p. 218). This would allow them to better reconcile the logical-time dynamics of stable equilibrium models with real-world processes of accumulation taking place in historical time. Drawing upon the discussion in subsection 2.1, time is a reversible process if the focus is merely placed on the stability of the long-run equilibria, becoming irrevocable – and thus historical – only when the analysis of the traverse comes into play and is allowed to dominate.

Traverse analyses vindicate a crucial point raised by Joan Robinson, who argued that "there is much to be learned from a priori comparisons of equilibrium positions, but they must be kept in their logical place" (Robinson, 1962, p. 25) before subsequently suggesting that models that seek to explain real-world phenomena should not normally be in a state of rest. By building on this point, traverse analyses ensure that the long period ceases to be a 'Platonic Idea' and instead becomes embedded in a framework in which disequilibrium (and ongoing disequilibrium adjustment) is the norm rather than the exception.

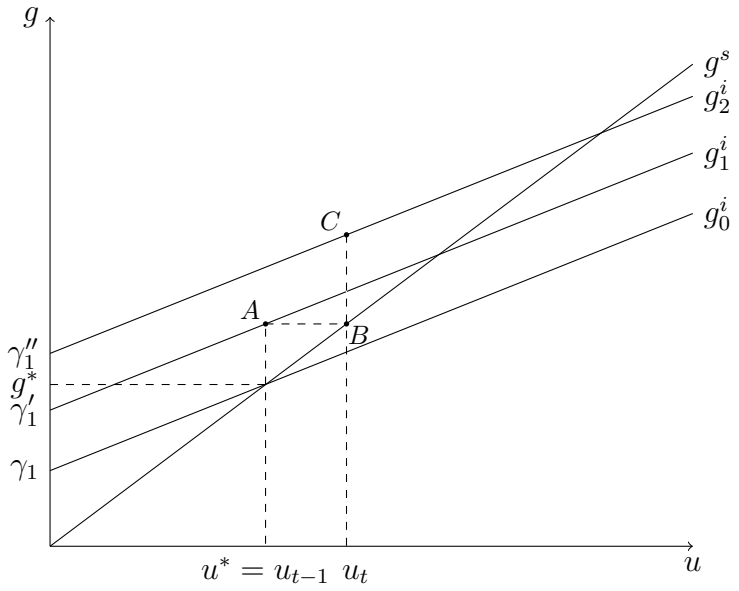
3.3 Shifting equilibrium

As noted earlier, post-Keynesian growth models feature accumulation functions characterised by constant animal spirits, the latter being an important component of the state of long-run expectations in the theory of decision making under uncertainty. At the same time, they allow for differences between expected and actual values of the utilization and/or profit rates that, in the presence of the Keynesian stability condition, are resolved by adjustments towards equilibrium. In the parlance of Kregel (1976), these are models of stationary equilibrium: short-run expectations (of the rates of utilization and/or profit) may be disappointed, but this disappointment has no effect on the state of long-run expectations (animal spirits). In a model of *shifting equilibrium*, however, disappointed short-run expectations and animal spirits interact: failure to establish a position of equilibrium (where expectations are realised) causes not only conventional equilibrating adjustments, but also changes in the structural determinants of equilibrium itself, as a result of which the latter shifts. The resulting dynamics describe the

"actual path of an economy over time chasing an ever changing equilibrium – it need never catch it" (Kregel, 1976, p. 217).

To see how the dynamics of shifting equilibrium work in post-Keynesian growth theory, consider figure 2. Suppose that having previously functioned at the equilibrium position u^*, g^*, a shift in the accumulation function from g to g' (associated with an initial increase in γ_1 to γ_1') occurs in the current period. As a result, the rate of accumulation at u^* is elevated (as at point A), in response to which two adjustments will now occur. First, the rate of capacity utilization increases to u_t in response to the excess demand at point A where $g > g^s$ (i.e., the actual rate of accumulation exceeds the rate consistent with $I = S$). This moves the economy to point B and, as a result of the Keynesian stability condition, closer to the position of equilibrium consistent with $g = g^s$ at the intersection of the g_1^i and g^s schedules. Second, in response to the disappointment of expectations created by $u_t > u^e = u_{t-1}$ animal spirits are stimulated, raising the intercept term in the accumulation function from γ_1' to γ_1''. The economy thus finds itself at point C – and the equilibrium of the system shifts to a position consistent with the intersection of the g_2^i and g^s schedules. The sequence of events just described will now repeat itself and the associated recursive interaction of disappointed short-term expectations and animal spirits will continue in a manner that may or may not result in convergence to a position of equilibrium. The appeal to animal spirits in the foregoing account makes clear the connection between adjustments in historical time and uncertainty in decision making – a hallmark of Robinsonian historical time – that models of shifting equilibrium seek to establish. In keeping with this connection, there is no reason to think that the shift from γ_1' to γ_1'' in figure 2 (as opposed to some other value of $\gamma_1 \neq \gamma_1''$) could be anticipated *a priori*. The dynamics of this system are not intended to replicate the determinacy that was associated earlier with final equilibria and standard equilibrium analysis.

Figure 2: Shifting Equilibrium in a post-Keynesian Growth Model



Source: authors' representation

At any point in time, the system described above and depicted in figure 2 has a stable provisional equilibrium acting as an attractor,[26] but these forces of attraction need not dominate the system's dynamics. Convergence to equilibrium need never occur, instead of which the system will 'chase a moving target' that is never caught, simultaneously moving towards and shifting its equilibrium configuration in a cumulative process of *pseudo-instability*.

Unchecked, this pseudo-instability will prove explosive. But it need not produce ever-increasing (or ever-decreasing) rates of growth and capacity utilization if it is bounded above and below. This boundedness may arise if the cumulative processes associated with the revision of short-run expectations and animal spirits are endogenously self-limiting (Setterfield and Budd, 2011; Setterfield and Gouri Suresh, 2015; Kemp-Benedict, 2020). Consider, for example, the situation illustrated in figure 2 as depicting the onset of a virtuous circle of pseudo-instability, associated with ever-improving animal spirits as short-term expectations are continuously but positively disappointed. This virtuous circle may be interrupted and reversed (giving rise to a deflation of animal spirits that shifts the accumulation function downwards) if the sense arises

[26]The equilibrium is, of course, provisional because it is both strictly temporary (in the Hicksian sense defined earlier), and within time will be reconfigured by dynamics endogenous to the system (the subsequent revision of animal spirits associated with the shifting equilibrium mechanism).

that 'the good times are ending' – that the most recent improvement in performance relative to expectations compares unfavourably with such improvements in the recent past. A process of this nature will produce a turning point – and since the dynamics described up to this point are symmetric,[27] the result is the possibility of aggregate fluctuations or, more specifically, cyclical growth.[28]

As with the 'life is a traverse' perspective discussed in the previous sub-section, the theory of cyclical growth just described departs markedly from the focus on equilibrium outcomes that dominates post-Keynesian growth theory. It does so in ways that diminish the role of equilibrium as a point of reference for the actual outcomes of an economic system and in so doing, it promotes a vision of the growth process that displays greater fidelity to historical time, events in the past (the disappointment of short-run expectations) affecting the structure of and hence the long-run outcomes associated with the system. Note, however, that as in the traverse models discussed in the previous sub-section, equilibrium continues to play an important role in the dynamics of a shifting equilibrium system, even if the system never achieves a state of equilibrium. In this way, the Robinsonian notion that "equilibrium has no meaning unless you are in it already" (Robinson, 1973, p.262) is true, in the sense that disequilibrium conditions prevail indefinitely: a state of equilibrium will not describe the actual configuration of the system at any point in time, with capital dynamics and expectations being incompatible with it. Otherwise, equilibria remain important as attractors, but without this implying the determinacy associated with final equilibria and standard equilibrium analysis; in other terms, while the system might approach equilibrium, it will never reach it. The role of equilibrium in traverse and shifting equilibrium analyses is thus similar to that envisaged by Hahn (1973, 1987), for whom it is unnecessary for a system to 'get into' equilibrium in order for equilibrium itself to be an interesting and useful concept. This is because the usefulness of equilibrium arises from its role as a critical point in a theory of economic dynamics, without there being any necessary expectation that observed outcomes will ever actually conform to a position of

[27] Note that a sense that the 'worst is over' that boosts animal spirits could arrest and reverse a prior series of cumulative declines in the rates of growth and utilization.

[28] See Setterfield and Budd (2011) and Setterfield and Gouri Suresh (2015) for complete models of the cyclical growth process described here, that include various other mechanisms capable of checking and reversing pseudo-instability.

equilibrium.

4 Conclusion

This paper has discussed the nature and relevance of historical time in Joan Robinson's work, assessing whether or not the subsequent 'Kalecki-Robinson' tradition in post-Keynesian growth theory has coherently pursued her research agenda. In so doing, we distinguished between two levels of historical time – a higher level and a lower one – as suggested by Setterfield (1995). High-level historical time cannot be conceptualised analytically and thus postulates a clear incompatibility between time and equilibrium analysis – in line with Robinson's argument in *History versus Equilibrium* (1978*a*, Ch. 12). Conversely, low-level historical time better captures the ideas expressed in other works by Robinson (1956, 1962, 1980): by focusing on practicality, it sets aside the radical concerns associated with high-level historical time in favour of the use of familiar tools in economic theory in a manner that *better approximates* the historical nature of the accumulation process. In this sense, the distinction between high-level and low-level historical time can be interpreted as a trade-off between 'historicalness' and tractability – with low-level historical time analysis offering a compromise that foregoes neither one of these in favour of the other.

By acknowledging that the majority of post-Keynesian analysis is nowadays more inclined to accept the compromises of abstraction rather than the analytical nihilism to which its ontological foundations can give rise (Lavoie, 2014, p. 75), we then focused on the links between low-level historical time and growth models in the 'Kalecki-Robinson' tradition. Accordingly, we summarised the existing literature by identifying three main classes of models, depending on the relation they postulate between history, time, and equilibrium: models that are variously 'capable of getting out of equilibrium' – associated with the notion of 'provisional' or 'conditional' equilibrium – and/or that are 'not normally in equilibrium' – traverse-based models and 'shifting equilibrium' models. In this respect, it ought to be noted that all three classes of models share common features of tractability, since all of them are rooted in conventional equilibrium theory and comparative static/dynamic methods. At the same time, the interpretation of equilibrium and its role as no more than an 'attractor' or 'centre of gravity' are

consistent with Robinson's views, at least insofar as the latter (per Robinson, 1962, p. 25) accept the incorporation of low-level historical time into growth theory as progress towards a more historical orientation in macrodynamics.

While the models in the 'Kalecki-Robinson' tradition surveyed in this paper differ in their precise analytical structures, adjustment mechanisms and implications – none are innately right or wrong – they are all equally capable of accounting for history as a process which normally takes place outside of the realm of logical-time equilibrium analysis. In this sense, they invite a 'horses for courses' approach to macrodynamic analysis within the domain of low-level historical time, suggesting that this approach constitutes a promising avenue for contemporary post-Keynesian growth theorists to more fully pursue Joan Robinson's research agenda.

Disclosure statement

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