

# SAMUELSON'S NEOCLASSICAL SYNTHESIS IN THE CONTEXT OF GROWTH ECONOMICS, 1956-1967

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# Samuelson's Neoclassical Synthesis in the Context of Growth Economics, 1956-1967<sup>1</sup>

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**Abstract:** Samuelson (1952: 60) introduced the term «neoclassical synthesis» and used it later in the 1955 3<sup>rd</sup> edition of *Economics: An Introductory Analysis* to refer to a “consensus” among American economists. In the 1960s when growth theory emerged as a major issue, Samuelson modified his view and in the 6<sup>th</sup> edition of *Economics*, the term assumed a specific meaning. As long as it was assumed that the economy was managed on a Keynesian-basis in the short-run, the neoclassical growth model was considered the most appropriate tool to analyze full-employment growth. This “new” approach of the synthesis was challenged in debates on income distribution dynamics and expectations, opposing the protagonists in the Cambridge controversy. We draw on original archival material from Duke University and Cambridge University in the UK to try to clarify some of the hidden dimensions of Samuelson's synthesis and the debates it triggered.

**Keywords:** Samuelson, Sen, Kaldor, Neoclassical Synthesis, Instability, growth, expectations.

**JEL Codes:** A1, B2, B3, D5, E1

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## Introduction

Paul Samuelson (1952: 60) coined the term “neoclassical synthesis”<sup>3</sup> to refer to the economic theory unification process enabled by mathematics<sup>4</sup>. He employed it in his 1955 3<sup>rd</sup> edition of *Economics: An Introductory Analysis* to claim that the vast majority of American economists were in agreement that monetary and fiscal policy could and should be used to secure full employment, and that Keynesian theory, understood as the income-expenditure model, could be the missing link between microeconomics and macroeconomics (De Vroey and Duarte 2013)<sup>5</sup>. Over the next few years, the meaning of the term evolved and in the 6<sup>th</sup> edition of *Economics*, Samuelson argues that provided the economy is “managed” on a Keynesian basis (a model that he does not clarify) then the neoclassical growth model developed by James Tobin (1955), Robert Solow (1956) and Trevor Swan (1956) was the most appropriate tool to analyze the growth process<sup>6</sup>.

Solow made it clear that his model was of “full employment economics” (1956: 91) and that his analysis assumed that “all the difficulties and rigidities which go into modern Keynesian income analysis have been shunted aside” (ibid). Solow’s model led many to believe that in the absence of such rigidities - as liquidity trap and factors prices rigidities - the system would converge naturally to its long-run growth path. This interpretation has remained dominant despite warnings from Frank Hahn (1960), Amartya Sen (1970) and Hukukane Nikaido (1975) who demonstrated that most trajectories would be destabilizing regardless of the degree of factor substitutability. It is for this very reason that Sen considered the neoclassical growth model and the synthesis to which Samuelson refers to be built on fragile foundations.

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<sup>3</sup> We thank Kevin Hoover for this reference.

<sup>4</sup> There is no explicit reference to the neoclassical synthesis in *Foundations* (1947) although the possibility was introduced of a unified analytical framework that encompassed different economic subfields. (Backhouse 2014: 2).

<sup>5</sup> De Vroey (2016) claims that Samuelson never went beyond that “loose” and “almost metaphorical way” of defining the synthesis (ibid. 46).

<sup>6</sup> Samuelson’s separation in *Foundations* between on the one side static maximum problems and on the other maximizing dynamic theory was attacked vigorously by Lucas in the 1970s. Lucas believed that this separation was untenable and concluded eventually that the neoclassical synthesis was a dead end (Boianovsky 2019). It should be noted that the way that Lucas understood neoclassical synthesis was different from Samuelson’s synthesis developed in the context of early growth models (i.e. in the 6<sup>th</sup> edition) and discussed in this paper.

Cambridge (UK) economists such as Nicholas Kaldor, Joan Robinson and Luigi Pasinetti suggested different ways to integrate Keynesian theory and growth analysis, mainly via the incorporation of income distribution effects. However, Samuelson rejected these so-called “neo-Keynesian” growth theories as a serious alternative. In his opinion, all these models assume implicitly that changes to the income distribution automatically stabilize the full employment growth path, thereby ultimately and dangerously reducing the case for Keynesian government interventions. It was precisely to clarify this point that Samuelson launched systematic attacks on what he called “Kaldorism.” At the same time, he also targeted Robinson who using slightly veiled terms had referred to him and most American economists as “bastard Keynesian[s]”<sup>7</sup> who allegedly were proposing “silly models” in which full employment was achieved through market-based adjustments<sup>8</sup>.

These debates took place in the early 1960s in the context of the capital controversy, and while they mainly brought the same protagonists, they should be disentangled. To demonstrate that those debates can be addressed independently, one needs only to recall that Samuelson, Kaldor and Robinson argued about the stability of growth models which all assume homogeneous capital<sup>9</sup>.

Section 1 sheds some light on how the meaning of neoclassical synthesis evolved in successive editions of Samuelson’s *Economics*. Section 2 discusses Samuelson’s critiques of the neo-Keynesian growth models. Section 3 describes the young Amartya Sen’s challenge of the synthesis. The content of these debates is referred to occasionally in published works but emerged clearly in the correspondences between Samuelson, Kaldor and Sen, and in

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<sup>7</sup> Antonella Rancan revealed via the SHOE list that the term was first used by Sydney Weintraub in correspondences. The information is mentioned by Backhouse (2011: 5).

<sup>8</sup> “[...] the bastard-Keynesian model is not only silly. It is seriously defective in logic. Any arbitrarily fixed quantity of money (demarcated in any relevant way) is compatible with full employment, in conditions of short-period equilibrium, at some level of money-wage rates, the level being lower the smaller the postulated quantity of money, and the larger the labour force to be employed. This is supposed, in the pseudo-Keynesian argument, to justify the contention that falling wages and prices are good for trade.” (Robinson 1962: 691).

<sup>9</sup> In addition, in a letter he addressed on 4 October 1963 to Kaldor, Samuelson disentangles the two debates stressing that “(...) the specific issues under debate now are not M.I.T. -Cambridge or Keynes-Classical alternatives, but rather 1936 Keynes versus Widow Cruse [of Keynes’s *Treatise of Money*].” (from Samuelson to Kaldor, November 8, 1963).

unpublished papers written by Samuelson and Sen<sup>10</sup> which mostly underlie the analysis in the present article.

## 1. Walking a tightrope

In the 3<sup>rd</sup> edition of *Economics*, Samuelson outlines his vision of a “mixed economy” which he describes as a “neoclassical synthesis” (Samuelson 1955: vi) in which Keynesian demand management secures full employment and the price system operating under the usual neoclassical analysis governs allocation (Pearce and Hoover 1995, Boianovsky and Hoover 2014). Although the objective of “healthy, progressive growth” is mentioned, the focus is on the short run in which by “means of appropriately reinforcing monetary and fiscal policies” a “mixed-enterprise system can avoid the excesses of boom and slump” (Samuelson 1955: 360).

Along those lines, Samuelson concludes that agreement between ‘Keynesian economists’ and ‘anti-Keynesian economists’ had been reached in the US, so that “90 percent of American Economists” had “worked toward a synthesis” (Samuelson 1955: 212). The need to distance himself from his “Keynesians friends” (Samuelson 1988) might explain why Samuelson perceived the term ‘neoclassical synthesis’ as a defensive measure against the sort of McCarthyite attacks aimed at Lorie Tarshis for instance, by William Buckley publishing *God and Man* at Yale<sup>11</sup>.

In addition, practical concerns related to winning the Cold War clearly added strength to the political dimension of Samuelson’s vision and gave him an opportunity to highlight the superiority of “resolute free societies” over socialist economies “to dissipate the ancient fear of mass unemployment.” To avoid any risk of linking neoclassical synthesis to socialism, Samuelson even went so far as to thank the Russian economists for not having “mastered modern elementary economics” (1955: 709) and understanding the neoclassical synthesis.

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<sup>10</sup> We refer here to the correspondence found in Paul A. Samuelson’s Papers, The David M. Rubenstein Rare Book and Manuscript library, Duke University, and Nicholas Kaldor’s Papers Collection (NK/1/31/397 to 407 the Cambridge (UK) King’s College Archives Center.

<sup>11</sup> We thank Robert Dimand for drawn attention to this point. The political dimension underlying the neoclassical synthesis is mentioned by Backhouse (2015: 146-150). See also Giraud (2014) who argues that Samuelson’s *Economics* was the result of a political negotiation.

In the 6<sup>th</sup> edition of *Economics* in which Samuelson introduces a new chapter on the theory of growth (Samuelson 1964: vi), the neoclassical synthesis takes on a new meaning and is described as the idea subscribed to by most economists that through judicious government intervention and planning the economy would behave in the long-run according to the neoclassical growth model:

In the 1950s there grew up a new emphasis on models of capital accumulation and technical change. [...] Particularly in the writings of such American economists as Solow, Tobin and myself, attention was focused on a managed economy which through skillful use of fiscal and monetary policy channeled Keynesian force of effective demand into behaving like a neoclassical one. (Samuelson 1963b: 340)

This point is best understood by starting from Harrod's dynamic theory to which Solow contrasted his own growth analysis. Harrod was concerned about the output dynamics resulting from adjustments between *ex ante* investment and *ex ante* saving. In accordance with what he called the "instability principle", he concluded that as soon as *ex ante* saving fell below the level of *ex ante* investment, output would be stimulated because producers would react to unexpected and undesired inventory reductions. Conversely, he believed also that once *ex ante* saving exceeded *ex ante* investment, output would reduce. Solow was aware that such adjustments would be self-aggravating<sup>12</sup>, or to put it in Harrod's language that no adjustment would occur between the actual growth rate (the rate at which actual output was changing) and the warranted growth rate (the rate at which both *ex ante* investment and *ex ante* saving were changing). Once the actual growth rate became less than the warranted growth rate, the gap would be reinforced, and *vice versa* if the actual growth rate exceeds the warranted growth rate<sup>13</sup>.

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<sup>12</sup> See Assous (2015) and Hoover and Halmayer (2016) for an account of Solow's understanding of Harrod's instability analysis.

<sup>13</sup> Harrod's view of the trade cycle was based on the argument that movements away from the «warranted growth path» could be checked because the warranted rate would "chase" the actual rate upwards or downwards: "If the former eventually overtakes the latter a new equilibrium is achieved and if the former goes beyond the latter forces are generated setting up a reverse movement" (Harrod 2003: 1198–1199). The way that expectations and income distribution were supposed to change during the adjustment process was essential to explaining the behavior of the warranted rate of growth, and showing ultimately that cycles are generated endogenously according to an endogenous trend (Sember, 2010; Assous, Bruno and Dal Pont Legrand, 2014). Tinbergen and Marschak pointed to the difficulties inherent in modeling Harrod's theory of cyclical growth. Despite these difficulties, Harrod persisted with the idea that actual and warranted rates of growth would diverge naturally. However, he claimed that the divergence would be weaker than Robinson and others had suggested in 1939. In 1973, he resorted for the first time to the notion of corridor. Hagemann (2009) stresses that Harrod coined that term as a substitute for the "knife edge" notion. Bruno and Dal Pont Legrand (2014) show that Harrod's model was capable of generating several dynamics (in and out of the corridor) if the warranted growth rate ceased to be considered constant. Nevertheless, in the 1960s, Harrod focused on growth dynamics, and

Unlike Harrod, Solow and Samuelson promoted growth models which assumed permanent full employment of the factors of production (the 7<sup>th</sup> assumption in Solow's 1956 paper) and relied on identifying *ex ante* investment and saving. Growth issues were hence addressed in the context of economies that grow at the natural rate. While both Solow and Samuelson considered that the neoclassical growth model complemented Keynesian analysis, this was precisely because both of them believed that it applied to economies where the "Keynesian force of effective demand" had been managed and "laissez faire Harrodian discrepancies" had "lose much of their terror and relevance" (Samuelson 1976: 754). Therefore, it was by deliberately ignoring the dynamics between the actual and warranted rates of growth that Solow and Samuelson moved away from Harrod's instability analysis. In one sense, Samuelson's neoclassical synthesis made it possible to deal with growth while simultaneously stressing the relevance of Keynesian policies.

This vision was subscribed to by several economists. Trevor Swan made it clear in the opening paragraph of his path-breaking 1956 paper on the neoclassical growth model that the whole of his analysis assumed that "the great puzzle of effective demand" had been solved and that "all savings are profitably invested" (Swan: 335). A few years later when reflecting on "golden ages", Swan (1964: 4) noted that his "illustration" was "Keynesian" in the sense that the "authorities have read the *General Theory* or that they are socialists who don't need to; in other words ... that whatever is saved is invested." (ibid)<sup>14</sup>

Similarly, Meade's (1961: ix) exposition of neo-classical growth theory which assumes "ideally successful" monetary and fiscal policy at every point in time would manage to guarantee full employment. In this book, Meade underlines that he confined himself "to watching this process of growth on the assumption that the growing system remains in equilibrium" (ibid: 3)

Most importantly, the neoclassical synthesis represented an opportunity to address long-run issues without assuming that the economy would adjust "automatically" towards a state of

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in that perspective, the natural rate of growth became for him the central problem. His main contribution (highlighted also by Sen (1961)) was his "Second Essay in Dynamic Theory" published in 1960 – where he clearly identifies the natural growth rate as the "welfare optimum" rate. The search for the optimal saving rate then was joined by one of the most prominent economists in that period.

<sup>14</sup> In 1958 Swan was a visiting professor at MIT. Presumably, he discussed this point with Solow.

full employment. Were that the case, assuming government intervention would no longer be essential<sup>15</sup>. On returning from England in 1964, Solow was adamant on that point, as evidenced in a letter addressed to Sen that same year:

I got a little annoyed in Cambridge last year by the indiscriminate use of 'Keynesian' adjective meaning 'mine' and 'neo-classical' to mean 'yours'. To the extent that 'neo-classical' describes the belief that a capitalistic economy tends automatically to full employment, I am no neo-classical and neither is James Meade. (Solow to Sen, October 26, 1964)

Like Solow, Meade was aware that by not paying attention to stability issues, he was "ignoring all the dynamic problems involved in ensuring that our economy does not leave the path of equilibrium growth" (Meade 1961, fn 1: 4). In addition, by doing so, he was ignoring the problem highlighted by Arrow (1967) that there was no guarantee that an economy that had artificially reached a full employment situation would behave like an economy that had achieved full employment naturally.

Finally, the neoclassical synthesis allowed a departure from the logic of the "Harrod-Domar" model which was based on the alleged fixity of technology and the absence of a substitution between labor and capital<sup>16</sup> as famously pointed out by Solow who argued that labor and capital were smoothly substitutable. The main limitation of the "Harrod-Domar" model was that because it did not examine capital/labor substitution, it suggested that economic policy would fail completely to deepen capital and raise per capita income<sup>17</sup>. Once full employment is reached, society has no choice but to "accept the growth rate that fate meets out to it." (1961: 809, n. 1; see also 1964: 788). Instead, the neoclassical growth model with its flexible capital-output ratio offers "sanguine hope" of growth-promoting macroeconomic policy:

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<sup>15</sup> Because they postulate full-employment Samuelson and Solow considered there was no need to address the question of convergence to the full employment equilibrium.

<sup>16</sup> See Hoover and Halmayer (2016) for a critique of Solow's interpretation of Harrod's theory.

<sup>17</sup> "Of course, this mechanism presupposes that there is no fixity of the capital output ratio. Many American economists, including Hansen, Gerhard Colm and Robert Eisner, have questioned the practical validity of this hypothesis. They point to the sluggishness of capital formation following the 1956-7 equipment boom as proof that any deepening of capital contrived in the short run would likely be unsustainable and would tend to be followed by investment sluggishness. No final judgment is possible. Chronic deficits in America's international balance of payments have inhibited the use of expansionary monetary policy and so a test case has not been possible" (Samuelson 1963a, p. 341-2).

One of the consequences of the neoclassical synthesis was the sanguine hope that a modern society could increase its rate of growth at full employment by coaxing out a deepening of capital through expansionary monetary policy, while using an austere enough fiscal policy to prevent demand-pull inflation. These combined devices could, in effect, lower the share of full employment income going to consumption and yet not jeopardize full employment itself. (Samuelson 1963b: 341)

Thus, the neoclassical synthesis broke with the gloomy vision of "Social prophets of our day, such as Schumpeter and Toynbee, to say nothing of the earlier Veblen or Spengler [who] thought of the mixed economy as 'capitalism in an oxygen tent'" (Samuelson 1970: 712). In fact, neoclassical synthesis offers a new view which contradicts the single dominant global and declining economic perspective of those "social prophets" (ibid).<sup>18</sup>

However, Samuelson's optimism was tempered by two results of the neoclassical growth model. First, it quickly became clear that the rate of growth in the neoclassical growth model was independent of the saving rate: increased investment (or saving) rates have a temporary impact on the rate of growth. They deepen capital but because of diminishing returns to production factors, the rate of growth returns eventually to its initial level. Meade, unlike Samuelson who had not immediately noticed this, was ready to acknowledge that "paradoxical conclusion" (Meade 1961: 42-45, 110-13).<sup>19</sup>

The second result can be drawn from Solow's empirical account of technical progress, so-called total factor productivity (TFP) analysis. Solow (1957) concluded that technical progress accounted for the unexplained component of growth, a somewhat surprising conclusion: "The challenge to the neoclassical growth model was simply that technical progress had hitherto been taken to be an exogenous factor, and an exogenous factor does not amount to a substantive explanation. The lack of explanatory force was highlighted by the common practice of referring to technical progress measured this way as a 'residual'" (quoted in Hoover and Boianovsky, 2013)

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<sup>18</sup> «It is true that the Great Depression of the 1930s was one of the worst the capitalism system has ever known; but it is also true that a mixed economic system subsequently replaced rugged individualism and laissez faire. The mixed economy introduced fiscal and monetary policies to moderate business cycles and control chronic slumps. We live in a world no prophet ever predicted!" (Samuelson 1967: 707).

<sup>19</sup> See Hoover and Boianovsky (2014).

For some time, Samuelson wondered whether the neo-Keynesian models developed in the early 1960s could offer an alternative; however, he quickly began to question their internal consistency and empirical relevance.

## 2. Debunking Kaldorism: Samuelson's interpretation of "Neo-Keynesian" growth models

Samuelson believed that adjustments between the warranted and natural rates of growth were better explained by changes in the capital-output ratio than by changes in the saving rate resulting from shifts in the income distribution as in "neo-Keynesian" growth models.<sup>20</sup> Nevertheless, for him, the real issue was unrelated to the discussions surrounding these mechanisms. His point was that Kaldor had not succeeded in providing a proper analysis of the adjustments between the actual and warranted growth rates<sup>21</sup>. Even worse, Kaldor alleged failure was to have developed an "equilibrating theory" based on self-adjustments between these two growth rates:

[Kaldor] very clearly adheres to a theory of full employment brought about by equilibrating shifts in the distribution of income; and on this occasion I am not concerned with the merits and demerits of a macro versus neoclassical theory of distribution, but rather with the developments in employment analysis since the *General Theory*. (Samuelson 1963b: 343)

What was striking to Samuelson was that Kaldor, "far from being branded in Cambridge<sup>22</sup> as a 'renegade'" for having resorted to "an equilibrating theory of income distribution" was apparently supported by economists such as Robinson and Pasinetti<sup>23</sup>. In a letter to Kaldor written in 1963, Samuelson comments on the reasons for this conclusion. « In the course of revising my text [of *Economics*] I decided to write a new chapter in the fashionable growth models. I was desirous of doing justice to different viewpoints, not merely my own; and so for the new appendix I first wrote down an exposition of what most people understand to be your

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<sup>20</sup> Cf. Punzo (2009) and Assous, Dal Pont Legrand and Hagemann (2016).

<sup>21</sup> A point raised in passing by Hahn and Matthews (1964).

<sup>22</sup> Here Cambridge UK.

<sup>23</sup> Along the same lines, Samuelson explained to Sen that "At Berkeley in January I gave a provocative debunking of Kaldor, hoping to provoke Scitovsky and Lipsey (visiting professor 1963-4) into a defense. But Kaldor appears to have no defenders, except for himself; and it is not clear to me that he defends his 1955, 1957, 1961 alternative theory of distribution although he may think he is defending it » (Samuelson to Sen, June 23, 1964).

macroeconomic theory of distribution” (Samuelson to Kaldor 1963, October 4)<sup>24</sup>. It was with the aim therefore of clarifying his reading that Samuelson wrote a six-page paper in which he concluded that all models developed by Kaldor between 1955 and 1962 are flawed because they are "incomplete", "inconsistent" and "empirically invalid"<sup>25</sup>.

In reviewing the literature (yours) and in writing down the exposition, I was once again struck with what I have always considered since 1956 to be logical and empirical gaps in your simplified theory of distribution. The occurrence of Pasinetti's mathematical version only called attention to the same doubts. Since I have been expressing these doubts in lectures for years and in correspondence with friends like Frank Hahn, I thought I had better write some of them down. I certainly don't intend to publish them until I have benefit of people criticism pointing out where I have misinterpreted the models discussed. (ibid)

Samuelson's paper is organized in three parts. The first is devoted to Keynes's (1936) *General Theory* interpreted with the help of the Keynesian cross, the second focuses on Kaldor's (1955) theory espoused in his *Review of Economic Studies* (1955-56), and the third concentrates on Pasinetti's (1962) *Review of Economic Studies*.

Samuelson's one-dimensional Keynesian system involves exogenous real investment and planned saving as functions of the actual level of income  $S(Q)$ . In this crude model, provided the propensity to save remains lower than 1 and the actual level of output is lower than the full-employment level  $Q^*$ , a unique and stable equilibrium is reached whose dynamics is described as follows

$$\alpha^{-1} \frac{dQ}{dt} = \underline{I} - S(Q), Q \leq Q^* \quad (1)$$

where coefficient  $\alpha^{-1}$  is the inverse of the speed of adjustment of output  $Q$ . When the speed of adjustment is close to zero, all "adaptations are infinitely fast and equilibrium is instantaneously reached and ever maintained" (ibid: 1). Conversely, the higher is  $\alpha^{-1}$ , the slower is the adjustment to equilibrium. In Samuelson's view, equation (1) is a "complete" system from which the unknown  $Q$  is determined in terms of an exogenous level of investment

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<sup>24</sup> As Samuelson explains in another letter, his objective "not to find fault with Kaldor but with what many think to be Kaldorism. Under my name, the latter is (I claim) subject to severe criticism." (Samuelson to Kaldor, November 8, 1963).

<sup>25</sup> This paper dated 1963 was unpublished although parts of it are integrated in Samuelson (1963b) which Samuelson refers to in a letter addressed to Sen, saying that: "Kaldorism versus Keynesianism duplicates some of the discussion in my 'Inconsistent and Incomplete Theory of Distribution'" (Samuelson to Sen, June 2nd 1964).

$\underline{I}$ , provided «full-employment inflationary gap, demand-pull inflation, and other complications” (ibid: 1) are eliminated.

Using this model, Samuelson attempts to clarify the role of income distribution effects by examining two cases. If "by Clark-Marshall reasoning of diminishing returns and marginal productivities", the elasticity of substitution between labor and capital is assumed to be lower than 1, the profit share will fall as output increases. Similarly, if one assumes competition is imperfect, any rise in the degree of monopoly will cause the profit share to increase as output will increase. In that situation, based on the "Kaldor-Kalecki hypothesis" that the propensity to save out of profits is greater than the propensity to save out of wages, the following system is obtained:

$$\alpha^{-1} \frac{dQ}{d\alpha} = \underline{I} - S(Q, \pi) \quad (1)'$$

$$\pi = \pi(Q) \quad (2)'$$

where  $\frac{dS}{dQ} > 0$  and  $\frac{dS}{d\pi} > 0$  and  $\pi$  is the profit share.

By substituting (2)' into (1)', this system can be made equivalent to (1) with  $S(Q) = S(Q, \pi(Q))$ . However, as Samuelson shows, it implies a steeper saving schedule and hence a "more stable" equilibrium. As a result, for the same speed of adjustment  $\alpha^{-1}$  the system, “SETTLES DOWN FASTER TO THE UNDER-EMPLOYMENT EQUILIBRIUM defined by (1). It has built-in stability *against*<sup>26</sup> a rise to full employment, and a fall to great depression levels: it stays at the multiplier level given by the exogenous  $\underline{I}$ .”<sup>27</sup> (ibid: 2).

Samuelson considers that Kaldor's 1955 system can be reduced to equation (1)' with the coefficient  $\alpha^{-1}$  tending to zero. The problem then, was that the system was no longer complete: «it is one equation for two unknowns,  $Q$  and  $\pi$ , output and relative shares” (ibid: 3). Of course, "if (one) read the mathematics and 99 per cent of the words in the 1955 article", the problem can be overcome simply by postulating full employment and permanent equality between  $Q$  and  $Q^*$ . However, to do so, in Samuelson's opinion, meant a "monstrous retreat from the *General Theory*<sup>28</sup> (1936) back to Keynes' *Treatise* (1930) or even J. B. Say” (ibid: 3).

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<sup>26</sup> Original italics.

<sup>27</sup> Original capitalization.

<sup>28</sup> Original underlining.

On the basis of the remaining 1% of the content of Kaldor's 1955 paper, Samuelson suggests adding a behavior equation whereby any shortfall in full employment leads to a continuing decline in money prices relative to money wages, and eventually in the share of profits. This adjustment will persist until the full employment saving level is reduced to the exogenously given level of investment which is described by the following system:

$$\alpha^{-1} \frac{dQ}{d\alpha} = \underline{I} - S(Q, \pi) \quad (1)''$$

$$\beta^{-1} \frac{d\pi}{dt} = Q - Q^* \quad \beta > 0 \quad (3)$$

where equation (3) shows that "profits fall at a rate roughly proportional to excess capacity i.e., to the level of unemployment,  $L^* - L$  [where  $L^*$  designates labor force], or the correlated deviation from full-employment output  $Q - Q^*$ " (ibid: 4). Naturally, an equilibrium defined by  $Q = Q^*$  will be reached at a speed that depends on the adjustment constant  $\beta^{-1}$  (ibid: 4). Substituting the coefficient  $K$  for  $\beta^{-1}$ , Samuelson notes:

This last behavior equation involving the function identified by the honorific symbol  $K$  is a Kaldor innovation and is quite necessary if this system is to lead to full employment equilibrium. Conversely, provided is empirically sufficiently large, the system can be shown to be unique and stable. (1963b: 344)

Samuelson believed that the problem was that such a "result is at variance with the observed short – and long-run facts of experience in mixed economies like the US – and I would venture to add, Germany, Sweden, Holland, Britain, and the leading Commonwealth countries" (Samuelson to Kaldor, November 8, 1963)<sup>29</sup>. More importantly, this result requires the conclusion that the economy self-adjusts to full-employment:

The mechanism of Jean Baptiste Kaldor<sup>30</sup> seems to involve an extremely Invisible Hand. In particular one should not mistake the commonsense tendency of corporate profits to fall sharply when businessmen experience a drop in sales that they had not counted upon when contracting their overhead expenses, for the strong Kaldor equation 2 [equation (3) in Samuelson's unpublished paper]. The

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<sup>29</sup> Samuelson (1963b: 344) wrote that: «I know of no evidence [...] that profit margin get eroded endlessly at a less-than-full employment plateau of production and capital stock. This, I believe, is important in revealing the Achilles heel so some versions of Kaldorism".

<sup>30</sup> In a letter Samuelson sent to Kaldor, he confessed the poor taste of one of his comments when he referred to Kaldor as Jean-Baptiste Kaldor but never withdraw his argument "I once jestingly referred to you as Jean-Baptiste Kaldor. With equally poor taste I could refer to you as "Milton Friedman Kaldor". Of course, calling names does not solve scientific issues" (letter from Samuelson to Kaldor, November 8, 1963).

empirical validity of the one does not testify to the validity of the other. (Samuelson 1963b: 345)

Similarly, Samuelson does not hesitate to ridicule Kaldor's economic policy implications.

If only Kaldor's syllogisms were empirically valid, how nice the world would be. Raising labor's share in the national income would be child's play. By following an austere budget policy of surplus financing, which even the late Montagu Norman would consider orthodox, you could introduce an additive constant on the left-hand side of equation (1) which would be sufficient so squeeze profits down to a much-reduced level. Who believes that possible? Anyone who subscribes to the above Kaldorian system should. (ibid)

Finally, Samuelson emphasizes that "The bizarre long-run flexibility of prices relative to wages" which he identified in Kaldor's 1955 article and Pasinetti's 1962 mathematical article was a key-component in neo-Keynesian growth models.

my criticisms of Pasinetti's dynamic growth version of your system directly asserts that "in the framework of a long-run dynamic growth model," your system lacks an equation to create full employment and that when we supply the equation relating to "flexible price/wage margins of residual profits" the result is at variance with the observed short-and long-run facts of experience in mixed economies. (Samuelson to Kaldor, 8 November 1963)

Sen (1963a) agreed with Samuelson about the need to clarify the "so-called" neo-Keynesian theory of income determination proposed by Kaldor, Robinson and Pasinetti<sup>31</sup>. However, he did not think that equation (3) in Samuelson's unpublished paper captured either Kaldor's or Pasinetti's arguments: "In fact the only statements about prices changing vis-à-vis money wages that I can find in Kaldor or Pasinetti seem to be made in the context of an already postulated full employment" (Sen 1964:2) . He added that the problem was that "in a theory meant to explain actual income distribution, simply postulating full employment (or a high

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<sup>31</sup> According to Sen, one needs to distinguish between two Kaldors "not classified according to his models, but classified according to his moods. There is Kaldor-at-ease and there is Kaldor-if-pressed. The Kaldor-at-ease just does not want to bother about the unemployment problem when discussing either long run growth or income distribution and just assumes full employment without wanting to worry about what brings this about. (...) But then nasty people (e.g. Samuelson, Bob Solow, Joan Robinson) get at him from different angles and start asking whydoassumewhatyouassume, and Kaldor-if-pressed is born. And he starts giving out explanation of his full-employment assumption, some times directly in terms of the labour market, some times in terms of the Representative firm cost structure, some times in terms of the Treatise, some tomes in terms of a very high 'endogenous' rate of growth. But what he really wants is "full employment and don't argue". (November 16, 1963).

enough investment to lead to full employment) is not a very happy assumption, even though time has dimmed our memory of the *General Theory*" (ibid). Ironically, it is precisely by recalling that neoclassical growth models were also based on that postulate that Sen overcomes the fragile foundations of the neoclassical synthesis.

### 3. A neoclassical synthesis or a clever dodge

In several papers published in the early 1960s, Sen questions the neoclassical growth model. Following the "qualifications" section in Solow's 1956 paper, Sen ponders on how the "Solow-Swan model" would work in the case of a "liquidity trap" where the money rate of interest remains fixed. If, Sen argued, prices are allowed to vary, the fixity of the money rate of interest would not prevent the real rate of interest from changing. This is because rigidity of the money rate of interest does not necessarily imply rigidity of the real interest rate (defined as the difference between the money rate of interest and the expected rate of the price change). As a result, the warranted growth rate would be allowed to converge to the natural growth rate. In that case Sen concludes, the neoclassical growth model holds up quite well.

Sen's second issue is more challenging. He was well aware that the neoclassical growth model was based on the postulate that the actual rate of growth remains permanently equal to the warranted rate of growth. He pointed out that this hypothesis was at the core of Samuelson's definition of the neoclassical synthesis; Samuelson believed that "judicious government intervention and planning" would bring the actual and warranted growth rates "in line with each other". In the absence of policy intervention and "control", Sen inferred that the neoclassical growth model could not do better than to trace a full employment path. "This is less heroic but also less objectionable" (Sen 1970: 23-24). To "describe what would in fact happen in a capitalist economy" (Sen 1970: 24) required to include an independent investment function and say more about expectations<sup>32</sup> while observing what happened if the actual rate of growth is no longer permanently equal to the warranted growth rate.

Sen's intention was not to propose a new growth model but to provide an overview of the difficulties that would arise with a departure from Solow's assumptions. In the introduction of his 1970 book, Sen asks the reader to consider that investment depended on changes to actual income according to an "accelerator" relation. For instance, if for a given level of actual income there is excess demand for goods, entrepreneurs will assume they have not produced enough

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<sup>32</sup> On that specific issue, see Assous and Dal Pont Legrand (2020).

and will decide to increase their production levels. This decision based on the multiplier, implies a rise in the level of aggregate demand which will lead entrepreneurs to revise their expectations and invest more. The result will be a bigger rather than a smaller gap between actual demand and actual output levels. In Harrodian terms, this means that the actual growth rate will diverge persistently from the warranted rate of growth. When that adjustment occurs, investors “instead of feeling that they expected too much” will “feel” that their expectations were too low (Sen 1970: 12). So, whatever induces the warranted growth rate to move towards the natural growth rate will raise issues about the equality of the actual and warranted growth rates.

Suppose said Sen, that entrepreneurs were to adopt more capital-intensive technologies which allowed the warranted growth rate to converge with the natural growth rate. As the adjustment unfolded, the actual growth rate would decrease, and entrepreneurs would anticipate a fall in aggregate demand and would invest less. This would result in the natural and the warranted growth rates moving in the same direction while the mechanism responsible would simultaneously move the actual growth rate away from the warranted growth rate. In the neoclassical growth model, actual growth occurs at the natural rate only after the warranted rate has shifted to equal actual growth, i.e. only after achieving equilibrium. Therefore, this adjustment depends on elimination of the problems outlined by Harrod in the case of actual growth diverging from the warranted rate of growth i.e. the problem of unfulfilled expectations:

Thus what Solow and Swan do consist not merely of relaxing the assumption of fixed coefficients, but also of changing the expectational assumption. This robs Harrod's warranted growth path of its unstable equilibrium property, even before its reconciliation with the natural growth rate is started. (Sen 1963b: 279)

Sen considers this point as highly problematic. In line with Samuelson's thinking, Sen recognized that a feature integral to the neoclassical growth model was the model's necessary reliance on judicious government interventions which were at the heart of Samuelson's understanding of the neoclassical synthesis. But "if growth theory is to have any relevance to policy" (Sen 1963a: 279), it needs to explain how the economy achieves a full employment path which would be impossible without the introduction of an investment function and specification of expectations. The fact that the neoclassical growth model denies this option and builds a model deprived of an independent investment function was clearly identified by Sen as a “dodge”, but “Like all clever dodges it has its usefulness, but it is easy to outlive that” (Sen 1963b: 280).

There is no evidence that Samuelson rejected Sen's argument. Simply, one can say that from the 1970s (i.e. after the 10<sup>th</sup> edition of *Economics*), Samuelson dropped the term "neoclassical synthesis". There are many potential reasons why Samuelson took this decision at a time when the *New Classical Economics* was gaining popularity, and strong attacks were being launched against old Keynesianism. In that new context of a deep renewal of macroeconomics, the synthesis notion perhaps appeared less appropriate.

## Conclusion

It is clear that Samuelson's synthesis is a shifting concept which took on various meanings. The present paper set out to examine the specific meaning Samuelson attributed to this notion in the context of early growth models. Drawing on unpublished manuscripts, our investigation reveals that although neoclassical growth theory on which the synthesis was based was being debated, Samuelson felt it necessary to debunk Kaldorism.

Analysis of the drivers of this confrontation sheds some light on the different perspectives pursued by Kaldor and Samuelson but reveals also that far from being a somewhat vague concept (i.e. encompassing a large range of tools), the synthesis defined in the context of early growth models, was much more fragile than advocated by Samuelson. The various debates led Sen, Solow and Samuelson to recognize that the main threat to the synthesis stemmed not from the "other Cambridge" but from its (fragile) foundations. Indeed, when growth theorists began to focus on the behavior of the long-run stable equilibrium growth path, the price was revealed as the waiving of any investment functions. This "clever dodge" made it possible temporarily to make reconcile the neoclassical growth model with short-run Keynesian policies. Nevertheless, this dodge reflected a major fragility.

More generally, the concern voiced strongly by Samuelson reflected his undoubted willingness to defend his theoretical position, especially in the period of turbulence generated by the capital controversy which cannot be fully separated from his own political convictions. Indeed it is clear that Samuelson believed wholeheartedly in the essential role of government interventions to guide the economy on the "right" long run-path. In the early 1960s, he not only expressed his (theoretical and empirical) skepticism towards Kaldor's research on growth but also his real anxiety<sup>33</sup> that Kaldor's work could be interpreted as threatening Keynesian policies. In his effort to debunk Kaldorism, i.e. to clarify and then to attack the very significance of

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<sup>33</sup> Samuelson seems to be the only person who was anxious about the potential destructive power of Kaldor's model. For instance, Frank Hahn did not share at all his pessimism.

Kaldorism, Samuelson emphasized that such a view is dangerous because it had no need to resort to any self-adjustment mechanism likely to ensure full-employment. There was certainly an empirical and political concern in Samuelson's reaction to Kaldorism. Indeed as he mentioned, "As an American I find it a little ironic that just in the decade when our problems of unemployment have seemingly become chronic, Nicholas Kaldor has been reverting to a theory of full-employment (...)" (Samuelson 1963b: 343).

In addition, in the context of the capital controversy, it is impossible to overlook the irony of Samuelson's attack on Kaldor for resorting to this same mechanism. The arguments he raised against Kaldor makes clear that he questioned the distinction - which had been progressively accepted through the capital controversy debates – between genuine (Cambridge-UK) *versus* "bastard" (Cambridge-MIT) Keynesians<sup>34</sup>.

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<sup>34</sup> Cf. Boianovsky (2019) for an analysis of Samuelson's approach to dynamics and his use of the term "Synthesis".

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