

Harrod and the Cambridge Keynesians

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Abstract

Harrod and the first generation of the Cambridge Keynesians were Keynes' direct disciples and learned from him, not just specific theories, but a certain style of economic reasoning and expression. In this paper, I discuss the extent to which Harrod conforms to the characteristics of the Cambridge Keynesians as identified by Pasinetti, and find that, by and large, he was in agreement with them. And yet despite their common roots in Keynes and their shared adherence to his general approach, I find that on a number of fundamental theoretical issues there were sharp differences. The first relates to the assumption of a long-run full employment equilibrium in macroeconomics. The assumption has no place in Harrod's thinking but is central to the Cambridge Keynesian distribution theory. The second issue has to do with appropriate theory for the rate of profit. Employing the full employment equilibrium assumption and a concept of the aggregate quantity of capital, the Cambridge Keynesians developed an equation that has the rate of profit depend only on the natural rate of growth and the rate of saving out of profit. Harrod, on the other hand, held that Keynes' liquidity preference theory of interest, together with the concept of the marginal efficiency of capital, obviates the need for a separate theory of the rate of profit that relies on an aggregate measure of capital. Finally, the third issue has to do with a misunderstanding on the part of Harrod's Cambridge critics of the methodological status of his fundamental equations, leading them to reject the warranted rate of growth as an unrealistic representation of the path of the economy through time. I argue Harrod is partly to blame for this misinterpretation because he left his theory incomplete, lacking the more complete econometric model that he had envisioned.

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1. Introduction

One could reasonably expect Harrod and the Cambridge Keynesians to have much in common. The original core of the Cambridge Keynesians overlap with the members of the Circus,¹ a group of young economists who helped Keynes refine his ideas as he moved from the *Treatise* to the *General Theory*. Harrod was close in age to the members of the Circus and had spent a term in Cambridge as a student of Keynes in 1922. In subsequent years he corresponded frequently with him on matters of economic theory and like the members of the Circus, was excited about contributing to his revolutionary economics. But Harrod was in Oxford and not part of the intense discussions among the young economists in Cambridge that continued in the so-called “secret seminar” in Kahn’s rooms at King’s College for many decades.

In his address to the conference commemorating the 25th anniversary of the *Cambridge Journal of Economics*, Luigi Pasinetti (2005) surveys the progress of the Cambridge Keynesians since the 1930s. The same theme was developed more fully in his 2007 book *Keynes and the Cambridge Keynesians*, subtitled *A “Revolution in Economics” to be Accomplished* (Pasinetti 2007). His discussion revolves around a number of features that he claims characterize the Cambridge Keynesians.

Reviewing the nine features² identified by Pasinetti, one is hard pressed to find any that Harrod would find objectionable. And yet, Harrod’s substantive contributions to economics were never fully embraced by his colleagues in Cambridge. His greatest achievement, the specification of his fundamental equations for dynamic economics, was recognized as a good starting point, but both Joan Robinson and Nicholas Kaldor believed they had found flaws in his analysis. Much like neoclassical growth theorists, the Cambridge Keynesians concluded that dynamic economics could proceed without Harrod’s novel concept of the “warranted rate of growth.” Similarly, Harrod denied a role in his own thinking for what is arguably the central theoretical contribution of the Cambridge school: their theory of income distribution between profits and wages, and the associated theory of the rate of profit.

In this paper, I explore how starting from a shared appreciation of Keynes’ contribution and agreeing on the various methodological issues listed by Pasinetti, Harrod and the Cambridge Keynesians ended up with such disparate theories. I argue that the Cambridge Keynesians, much like the neoclassical economists, failed to appreciate the methodological status of Harrod’s fundamental equations. Moreover, in developing their theory of distribution, the Cambridge Keynesians are working with a dichotomy between the short-run and long-run that has no place in Harrod’s taxonomy. Harrod, for his part, can be criticized for providing only a rough

¹ Richard Kahn, James Meade, Austin Robinson, Joan Robinson and Piero Sraffa made up the Circus.

² In the original address there were eight features, his book lists an additional one.

suggestion on how a complete macrodynamic theory could be constructed, leaving room for misinterpretation.

2. Harrod and Pasinetti's List

i) Realism

The first feature on Pasinetti's list of characteristics defining the Cambridge Keynesian approach is realism: the idea that "reality (and not abstract) rationality is the starting point for economics theory" and that "theory needs to be based on factual evidence and not only to be empirically tested at the end" (Pasinetti 2007, 219–20). Pasinetti is distinguishing the Cambridge approach from the three step axiomatic-deductive strategy whereby one specifies assumptions with an eye to mathematical tractability, uses mathematics to draw out the implications of the assumptions, and then tests the implications against reality.

Harrod would agree on the importance of realism. Throughout his career, he took both a philosophical and a practical interest in induction and empirical investigation. His 1938 presidential address to the economics section of the British Association was on the scope and method of economics. His ruminations on philosophic issues culminated in a book, *Foundations of Inductive Logic*, that he regarded as "the greatest of his achievements, and his claim to immortality" (Brown 1980, 29).

In his presidential address, Harrod (1938, 386) states its purpose is to "emphasize the limitations of deduction and the importance of observation of the facts." Later he would caution against the growing trend of de-emphasizing the realism of the assumptions when he writes:

Theoretical economists sometimes present a long list of assumptions with the air of someone laying the dinner-table; in their minds the meal is to consist in the manipulation of the formulae expressing the assumptions. In economics the choice of appropriate assumptions is often the more important of the two stages. (Harrod 1956, 312)

In order to improve one's judgment as to the selection of assumptions, Harrod believed it was important to have strong grounding in the institutional and quantitative aspects of the economy. He was a proponent of survey and field studies, taking an active part in the Oxford Economists' Research Group, which conducted systematic interviews of entrepreneurs to establish facts regarding investment and pricing decisions (Daniele Besomi 1998).

Harrod's correspondence with Keynes about his presidential address reveals that he had more sympathy than Keynes for the newly burgeoning field of econometrics. In his 1948 lectures on dynamic economics, he went as far to say: "I am convinced that economic theory will only make good progress to the extent that it can transform itself into econometrics" (Harrod 1948, 14).

Keynes, in contrast, was highly critical of Tinbergen's early efforts in the field, famously describing econometrics as "statistical alchemy." However, in response to Harrod's defense of Tinbergen, Keynes conceded that econometrics was useful to ascertain the magnitude of theoretical constructs like the multiplier and the interest elasticity of investment. Keynes echoes Harrod's position when he writes: "The specialist in the manufacture of models will not be successful unless he is constantly correcting his judgment by intimate and messy acquaintance with the facts to which his model has to be applied" (Moggridge [1973] 1987b, 300).

The objection that Keynes had to econometrics was its pretension to be providing the quantitative researcher with the power to make economic predictions by furnishing numerical estimates of the parameters in a model. From Keynes' point of view, econometrics is not much more than historical description, and any predictions based on parameter estimates need to incorporate judgments based on one's knowledge of background factors not included in the model, since the values of the parameters are susceptible to change through time.

ii) Non-ergodicity

Models with changing parameters relate to the idea of non-ergodicity that Pasinetti includes as another characteristic of the Cambridge Keynesians. The term was popularized by Paul Davidson (1982) to capture what Keynes was getting at when he wrote by way of criticism of Tinbergen that "the economic environment is not homogenous over a period of time" (*ibid.*, 189 n. 6). Davidson's position is that non-ergodicity invalidates the rational expectations research program, since past data cannot be used to forecast the future.

Non-ergodicity also relates to the distinction made by Joan Robinson and others between logical and historical time. If one accepts that the economic system evolves over time in an essentially unpredictable way, the scientific pretensions of much econometric work are unjustified. Although Harrod was enthusiastic about econometrics in principle, he did not follow through in a complete econometric specification of his theory, so it is uncertain how he would have dealt with the issue of non-ergodicity.

iii) Causality

Pasinetti (2007, 226) notes that "the question of historical time opens up the notion of causality." He recognizes that if one is working with a system of simultaneous equations, as is common within mainstream economics, the relative importance of causes is not important. The problem he sees with a model made up of a system of equations in which variables are mutually determined is the "unjustified sharp distinction which considers any specific variable as *either* totally unimportant (and in this case to be neglected) *or* of some importance and in this case to be considered exactly on the same level as, and symmetrically to, any one of the other variables" (*ibid.*).

Relative to the Cambridge Keynesians, Harrod was somewhat less critical of the simultaneous equation model that makes up mainstream general equilibrium theory. This may in part be explained by a more conservative temperament reluctant to throw away past achievements. Harrod believed Keynes was inclined to overstate the revolutionary nature of his contribution, remarking that “this may have done some harm to the progress of economic theory, which should consist of a system of harmonious concepts” (1973, 63-4).

Instead of abandoning earlier theories, Harrod proposed that economic theory be divided into four compartments. First there was the division between microeconomics and macroeconomics, and then each of those could be divided into statics and dynamics. According to this scheme, the neoclassical theory of value and distribution in the form of a system of simultaneous equations could be partitioned into microeconomic statics, quite apart from his macroeconomic dynamics. He was satisfied that the model could stay as long as it did not pretend to be able to deal with topics better covered in the other compartments.

But while accepting a place for a general equilibrium model within economics, Harrod was conscious and wary of a trend towards excessive formalization of the model. He writes of “the eroding process, tending to narrow down static economics, taking the life out of it and departing widely from the intentions of its authors” (Harrod 1948, 6). Harrod likened models to maps: “a simultaneous chart or survey of the economic field, and the main work of the cartographer is analysis and classification” (Harrod 1938, 387). He recognized that the work of the economist is not done simply by setting out an abstract model. The model rather serves as a guide to aid the investigator in providing a complete causal explanation of the phenomena under consideration.

iv) Internal consistency

Harrod’s stress on the importance of “maps” to guide our thinking relates to another item on Pasinetti’s list: the importance of economic logic with internal consistency. The impetus for Harrod’s dynamic model was, in fact, the logical inconsistency that he detected in static models, including Keynes’, with positive saving and investment. If capital is accumulating one cannot take its level as part of the *ceteris paribus* background of the theory, and hence the need for a radically different type of theory. Harrod (1939, 15) claimed “a new method of approach—indeed a mental revolution—is needed” to deal with the growth of economic output and capital, in a logically consistent way.

v) Macro before micro

Harrod’s mental revolution sought to bring back what Baumol (1970) has called the Magnificent Dynamics of the classical economists like Ricardo and James Mill. Here again Harrod finds himself on the same ground as the Cambridge Keynesians. Pasinetti notes another of the distinctive features of the school is their putting macroeconomics ahead of microeconomics. An alternative way of framing this

feature is to say they reject the notion that macroeconomics needs to be grounded in neoclassical microeconomics.

As noted above, Harrod thought of microeconomics and macroeconomics as existing independently of one another in separate compartments. For Harrod, aspects of Keynes' theory properly belong within macroeconomic dynamics and if viewed through the lens of traditional microeconomics, it would be misunderstood. For instance, Harrod (1973, 65) writes: "Some commentators have suggested that Keynes' system depends on wages being flexible downwards, as indeed they usually are these days. This shows a complete lack of intellectual grasp of his system."

vi) Malthus for inspiration

Related to the idea of the primacy of macroeconomics is the inspiration that the Cambridge Keynesians take from Malthus. For Keynes, the parts of Malthus's economics that he found most attractive were his ideas about underconsumption creating an insufficiency of aggregate demand. Among economists trained to think in general equilibrium terms the so-called paradox of saving was considered a fallacy that only those without proper education in economics would embrace. Keynes, however, sided with the "brave heretics" like J.A. Hobson, who followed Malthus in continuing to argue that saving would not always propel the economy forward. Joan Robinson (1949, 80) recognized the importance of Harrod's work for the development of Malthus's insights, remarking that Harrod's dynamic analysis represents the "missing link" between Keynes and Hobson.

vii) Appropriate analytical framework

Pasinetti stresses the importance for the Cambridge Keynesians of going beyond criticism of mainstream economics and developing an alternative framework. Harrod believed that in setting out his fundamental equations he was contributing to such a framework. He thought Keynes had not fully escaped from a static analysis, and that his theory needed to be recast in dynamic form. In the simplest form, ignoring international trade, Harrod's fundamental equations relate the rate of growth in output, $\Delta Y/Y$ or G , to the average propensity to save, S/Y or s , and the incremental capital-output ratio, $I/\Delta Y$ or C , such that

$$G = \frac{s}{C} \quad (1)$$

Expressed as,

$$\frac{\Delta Y}{Y} = \frac{S/Y}{I/\Delta Y} \quad (2)$$

one sees that the equation is equivalent to the accounting identity $S = I$. Indeed Harrod sums up his model as the dynamised version of the saving investment identity.

Harrod understood that his equation was a tautology and not susceptible to refutation. But it was the basis for his map--his system of classification in which he presents his definitions of the actual, warranted and natural rates of growth. The actual rate of growth is simply that rate that one observes at a point of time. The warranted rate is a hypothetical rate that would be achieved if people were saving at their desired levels and producers were content with the amount of investment they were carrying out; it is an equilibrium rate but not necessarily one that brings along full employment of resources. The natural rate of growth represents the highest rate of growth that is possible given the growth of the labor force and of technical knowledge.

The use to which Harrod puts his model is in the analysis of divergences between the actual, warranted and natural rates of growth. The danger that Hobson and Malthus pointed to results from a situation in which the warranted rate is above the natural rate.

If the warranted rate is above the natural rate, the actual rate must be below the warranted rate for most of the time, and the centrifugal forces pull it further down, causing frequent periods of unemployment. (This is the dynamised version of the stagnation thesis.) (Harrod 1959, 455)

viii) Instability

Harrod's equation for the warranted rate allows one to see how even a small exogenous change in growth can generate instability. If the growth rate were to rise above the warranted rate, a higher level of investment would be necessary. A higher level of investment would cause the growth rate to rise even more through the operation of the multiplier, pushing the economy further from equilibrium. Similarly, if the growth rate were to fall below the warranted rate, entrepreneurs would be more prone to scale back their investment plans, creating a contractionary effect. Harrod called these tendencies centrifugal forces.

Solow (1956, 65) used the term "knife edge" to describe the instability in Harrod's model but Harrod was unhappy with this interpretation and took pains to set the record straight: "So, once again, I must protest against a description which gives an entirely false impression of my views. ... I hope that we shall hear no more of the 'Harrod knife-edge'" (Harrod 1970, 741); and then a few years later, "I have to protest against the knife-edge nomenclature, because it sounds totally unrealistic and even a trifle ridiculous, and might distract the reader's mind from giving serious attention to what I have to say about instability" (Harrod 1973, 33).

Harrod's objection to the term was the suggestion that even a small deviations from the equilibrium would lead to a violent movement away from the warranted rate of growth. He imagined the movement to be much more gradual and prone to all kinds of frictions, more like the top of a flat dome than a knife edge: "the amount of friction depends on built-in procedures, degree of conservatism, sensitivity to current changes day-by-day, uncertainties about the future, sensitivity to changes of expectations, the kind of phenomena that affect expectations, etc. It needs empirical study, rather than theory, to evaluate the amount of friction" (Harrod 1970, 740).

ix) Social concern

The perceived instability of an unregulated economic system brings us to the final item on Pasinetti's list of the characteristics of the Cambridge Keynesians. It is a deeply felt social concern arising from their belief that the free market cannot be relied upon to bring about prosperity and well-being, that economic policies are necessary to improve economic outcomes. On this point, as well as the others discussed above, there is not much difference between Harrod and the Cambridge Keynesians. Temperamentally, Harrod was more conservative, which shows up in his wish to preserve the neoclassical theory of value in a separate compartment of microeconomic statics, as well as in some of his political opinions. But as far as constructive economic theory goes, Harrod and the Cambridge Keynesians are agreed on the necessity of a stepping outside a general equilibrium framework and developing a realistic causal macrodynamics that recognizes the problems of underconsumption and the inherent instability of modern economies.

And yet, despite all these commonalities, fundamental differences in their theoretical contributions are evident. Most importantly the Cambridge Keynesians were critical of Harrod's concept of the warranted rate of growth, and denied it a place in their schema.

3. Criticisms of Harrod

As Daniele Besomi (1999, 198–215) documents, Harrod’s work on economic dynamics has been widely misinterpreted. Harrod has suffered the fate of being frequently cited (usually in conjunction with Domar) but rarely read in the original. In the 1960s and beyond, a distortion of his original intent was codified in macroeconomics textbooks³ within the chapters covering long run growth theory, where the three fundamental equations were collapsed into one, and taken to represent a long-run growth path. The prevailing idea was that in the long-run, resources are fully employed, so only Harrod’s equation for the natural rate of growth needs to be considered.

The neoclassical critique of Harrod’s concept of the warranted rate of growth with unemployment is that factor prices will adjust to insure full employment of labor. If workers are unemployed, the wage rate will fall relative to the interest rate, and lead firms to substitute labor for capital. Solow (1994, 47) writes:

The standard neoclassical model, of course, resolves the problem by making the output-capital ratio the endogenous variable. ... It fits well with the rest of economics; the possibility of increasing the output-capital ratio by substituting labor for capital is a comfortable and sensible device, especially on a longish time scale. The implied adjustment mechanism is plausible and familiar. ... The assumptions about diminishing returns that are required to make this mechanism work come easily to most economists. Substitution along isoquants is routine stuff.

But even at the level of taxonomy, Harrod’s vision is violated, when macroeconomics is divided into short-run business cycle theory and long-run growth theory. As discussed above, Harrod believed the appropriate classification for macroeconomics was into statics and dynamics. His original interest was in the area of short-run fluctuations, and the debate between Hayek and Keynes (Harrod 1959, 451). His insight was that to disentangle the confusions in the controversy, it was necessary to move beyond a static analysis. He notes that in the discussions of the cycle, theorists tend “to regard the phenomena of their study in terms of transitions from one static equilibrium to another.” He continues:

It may be that they would be greatly assisted if they could regard them as departures from or oscillations about a path of growth; but they can only do this effectively if the laws governing increase are as precisely formulated as the static laws. We need a system of fundamental equations using simplifying assumptions—cf. the frictionless surface, etc.—in which rates of increase will themselves figure as unknown terms. (Harrod 1938, 403)

³ Harrod’s model is gradually disappearing from the textbooks as the dynamic general equilibrium approach engulfs the discipline. But it occasionally makes a re-appearance, in distorted form, in other places; *e.g.*, Piketty (2014, 230–31).

Harrod's idea for the fundamental equations was to capture the forces acting on a growing system, *at a point in time*, in order to better understand short-run fluctuations. He used the analogy of a train traveling down the track at a constant velocity, versus one moving from a stationary position (Harrod 1934, 478). The set of forces acting on the train while it is in motion are different from those when it is at rest. And yet one can still consider those forces at a point in time.

The neoclassical division of macroeconomics into long-run and short-run analyses is also evident in the work of the Cambridge Keynesians. In a seminal article in which he gives credit to Joan Robinson for working out similar ideas, Kaldor (1955, 94–95) divides macroeconomics into the two standard compartments: short-run static theory in which aggregate demand is a consideration in determining output, and long-run dynamic theory in which output is growing at the natural rate (determined by the growth in population and technology.) By assuming full-employment, Kaldor's Keynesian distribution theory makes a radical departure from Harrod's model.

Both Kaldor and Harrod regarded Keynes' analysis in the *General Theory* as incomplete and attempted to extend it into the "long-run." But whereas, Kaldor conceived the long-run as a state of full employment, for Harrod it only meant that capital was accumulating.

Kaldor employs Kalecki's idea of decomposing output into wages and profits so that the savings investment identity becomes:

$$s_p P + s_w W = I \quad (3)$$

where where s_p is the average propensity to save out of profits P , s_w is the average propensity to save out of wages W , and I is the level of investment. Isolating P on one side, and dividing by a given level of output leads to the conclusion, that the profit share is determined by the rate of investment relative to output and the propensity to save out of wages and profit.

$$\frac{P}{Y} = \frac{1}{s_p - s_w} \times \frac{I}{Y} - \frac{s_w}{s_p - s_w} \quad (4)$$

The weakness in Kaldor's model, however, is its reliance on the assumption of an exogenously given level of output. If output is variable, then the equation amounts to nothing more than an algebraic rearrangement of an accounting identity. But if output is given, the equation cannot be used to analyze Keynesian problems of unemployment and insufficient aggregate demand, or be used to criticize Harrod's concept of the warranted rate of growth.⁴

⁴ Problems with Kaldor's distribution theory did not escape the notice of Robert Solow who wrote to Frank Hahn in 1959: "Nicky's model simply will not stand up

Nevertheless, Kaldor proceeds to reason that in the long-run, under the condition of full employment, an increase in investment must result in higher prices and profit margins, while a decrease in investment must result in lower prices and profit margins.

Hence the "warranted " and the "natural" rates of growth are not independent of one another ; if profit margins are flexible, the former will adjust itself to the latter through a consequential change in P/Y [profit divided by output].

This does not mean that there will be an inherent tendency to a smooth rate of growth in a capitalist economy, only that the causes of cyclical movements lie elsewhere-not in the lack of an adjustment mechanism between s [the average rate of saving] and Gv [the rate of growth multiplied by the capital-output ratio]. (ibid., 97)

Similarly, Joan Robinson (1956) makes the case that if certain conditions are fulfilled (neutral technical progress, a constant savings ratio, a tolerable rate of real wages and a situation of tranquility), a full employment rate of growth should arise. A major part of her criticism was that Harrod did not properly account for the endogeneity of the incremental capital-output ratio. Ironically, Robinson's conclusion is the same as that reached by the neoclassical economists with whom she argued so fiercely on other issues related to capital. The path that she travels to reach it, however, is slightly different. Robinson (ibid., vii) relates her objection to the idea of a warranted rate at less than full employment to what "Hayek called the 'Ricardo effect'—the relation of real wages to the most profitable 'length of the period of production.'" The idea was that as the economy grows, the real wage increases which affects both the average propensity to save and the optimal mix of labor and capital. The change in the real wage affects the demand for capital goods through its influence on their cost of production. Robinson (ibid., 406) is led to conclude that in equilibrium "the actual rate of growth and the natural rate of growth are equal to each other, and the warranted rate of growth has accommodated itself to them."

Robinson later retracted the argument presented in *The Accumulation of Capital* against Harrod's warranted rate of growth and presented another line of argument. In her *Essays on Economic Growth* she writes:

Harrod not only takes the share of saving in income as given but also postulates that the rate of profit is somehow settled in advance; with a given spectrum of possible techniques, the rate of profit determines the capital/income ratio. Thus for Harrod, s/v is determined independently of g .

under scrutiny. When it is not self-contradictory it is more or less completely arbitrary"(quoted in Backhouse 2014, 262).

There is then only one value of g (the 'warranted rate of growth') that is compatible with equilibrium. When the actual rate of growth is less than this 'warranted' rate, the realised rate of profit is below the postulated equilibrium level, which pushes the actual rate still lower. Vice versa when the actual rate is above the 'warranted' rate. This knife-edge is created by the postulate that the equilibrium rate of profit is determined independently of the rate of growth. (Robinson 1962, 12 n)

The problem with Harrod's central idea of the warranted rate identified by both his neoclassical and Cambridge critics was his supposed assumption of fixed parameters for the capital-output ratio (v)⁵ and the average saving rate (s). Their mistake, however, was their failure to recognize that the equations apply to a hypothetical point in time, in which it makes sense to take them as given. Rather they thought Harrod's equations were mapping a process of growth through time. He protested against the criticism that he assumed fixed parameters on a number of occasions but because of a failure to appreciate his framework, his protests were ignored.

The interpretation of his theory that has his warranted rate of growth rate resting on a "knife edge" also derives from the idea of constant parameters through time. For instance, Baumol (1970, 54-5) sought to rid the theory of the knife-edge by replacing what he took to be an unrealistic assumption about entrepreneurial behavior. The supposed assumption was that entrepreneurs would act so as to keep the capital-output ratio constant through time, so that with every change in the rate of growth of output there would be an immediate reaction by entrepreneurs to change their rate of investment. Harrod, however, never gave any indication that he believed entrepreneurs would behave in such a mechanical fashion and attempted to set the record straight:

I have suggested that, despite a continuing experienced shortage of capital, fixed and/or circulating, entrepreneurs may abate their rate of ordering, because they regard the current tempo of advance of demand for their products as abnormal and not capable of being sustained indefinitely. But I suggest that it would be pushing this argument much too far to regard it as obviating the instability principle. (Harrod 1959, 464)

Much like Pasinetti (2007, 275) with his separation theorem, Harrod is making a distinction between his model, and his interpretation of the real world. In Harrod's analysis a key ingredient to be leavened with his equations is judgment based on observed empirical regularities. His interpreters tended to miss the role of empirical judgment in his method, seeming to believe that the equations incorporated all the empirical judgments that Harrod thought should be made.

⁵ Harrod actually never used v , the capital-output ratio, as a parameter. The parameter in his equations, represented by C , was the change in capital relative to the change in output, *i.e.*, the *incremental* capital-output ratio.

While the neoclassical critics placed their focus on the incremental capital-output ratio, the Cambridge Keynesians stressed the supposed constancy of average propensity to save. They adopted Kalecki's insight that the propensity to save will be typically higher for capitalists than for workers, so that a change in distribution would change the average. They argued that Harrod was incorrect to ascribe instability to the warranted rate of growth because as income and the profit share increases, the average propensity to save increases reducing the expansionary effect; similarly a decrease in income would lead to less saving out of income, thus limiting the contractionary effect. Harrod felt the need to protest:

There is all the difference in the world between expressing the amount that people desire to save as a fraction of income and affirming that they desire to save a constant fraction of income. The basic growth equations are rigid and precise, and it would be a "howler" to introduce into them a sloppy generalization about what determines the desires of people to save. (Harrod 1973, 170-71)

Along the same lines, when Robinson points to the effect of the rate of profit on the desired incremental capital-output ratio (C_r), Harrod (1970, 738) writes in his defense: "As the 'model' had the virtue of great simplicity, it seemed to be desirable to pinpoint it, and not to revert to an elaborate analysis of the conjugation of various possible profit shares with alternative growth paths." The misunderstanding, again, was one of his critics expecting more from his equations than he intended. Harrod (1963, 404) conceded that "it is proper, of course, to take both s and C_r to be flexible in relation to the rate of interest," adding "the difficulty is to discover the correct theory of interest."

4. The Theory of Interest and Profit

The area in economics in which Harrod and the Cambridge Keynesians diverge most distinctly is the theory regarding the distribution of income among factors of production. In his seminal article, Kaldor's (1955) claims that Keynes did not have a theory of distribution and seeks to fill the gap. He develops a theory of the division of output between wages and profits, and a theory of the rate of profit on capital, that is central to the post-Keynesian research program (Eichner and Kregel 1975, 1295).

Surprisingly, Sraffa's (1960) model, which also plays an important role in the economics of the Cambridge school, requires that one of the distributional variables be taken as given from the outside. Sraffa's (ibid., 33) judgment was that one should consider the rate of profit to be determined "outside the system of production" by the money rate of interest. In this judgment, he was in line with Keynes, but not with the post-Keynesians.

Keynes argued that the rate of interest on money, determined by liquidity preference in relation to the supply of money, "rules the roost" and that investment is adjusted so that the marginal efficiency of capital (MEC) comes into equality with

it. The MEC is the closest thing to a rate of profit to be found in Keynes' analysis. He defines it as "the rate of discount which would make the present value of the series of annuities given by the returns expected from the capital-asset during its life just equal to its supply price" (Keynes [1936] 1964, 135). Keynes remarked in correspondence that "the discovery of the definition of the marginal efficiency of capital ... in my own progress of thought ... was absolutely vital" (Moggridge 1987a, 549). The beauty of the formulation is that it does not involve any aggregate measure of capital, which he recognized as impossible to define in any precise way. Keynes (*ibid.*, p. 36) held the view that "our precision will be mock precision if we attempt to use partly vague and non-quantitative concepts as the basis of a quantitative analysis."

Harrod shared Keynes' aversion to employing a measure of the total stock of capital in his basic model. In contrasting his model with that of Evsey Domar, he writes:

I have never made any reference, explicit or implicit, to the amount of outstanding capital. These omissions were not accidental, but deliberate and the result of careful thought before I composed my *Essay*. These various values, of which I took no cognisance, will, of course, have to be brought in and play their part in a complete dynamic theory; the omissions were due to the desire to achieve great generality as befits a very fundamental proposition. (Harrod 1959, 453)

Along the same lines, in his response to Robinson's article "Harrod After Twenty-One Years," Harrod writes:

In my book to which she refers I deliberately avoid the use of this concept [the total stock of capital]. It does not occur in my fundamental equations. That is no reason why Professor Robinson should not use it for the development of her own theories, or even for the criticism of mine. But when she says that the equilibrium growth rate of output = I/K , this implies that the incremental capital-output ratio, viz., that pertaining to I in year [sic], is equal to the average capital-output ratio in the economy. I would say that this assumption is highly unlikely to be true in most cases ... I believe that it was partly a desire to be safeguarded against such pitfalls that caused me to avoid the use of the concept in my basic dynamic theorems. (Harrod 1970, 739)

The Cambridge Keynesians, in contrast, were prepared to use a concept of a total stock of capital (K) and define the rate of profit, as total profits divided by total capital. The rate of profit in a growing economy is obtained by combining equation (3) with a distorted form of Harrod's fundamental equation in which the incremental capital-output ratio (C) is replaced with the capital-output ratio (v). By assuming the economy is on a full employment growth path, the rate of growth becomes an exogenous variable.

Kaldor (1955) shows that under the assumptions a) that the economy reaches a long-run equilibrium at which the economy grows at the natural rate and b) that saving out of wages is zero, the rate of profit is the ratio of the natural rate of growth to the average propensity to save out of profits⁶:

$$\frac{P}{K} = \frac{g_n}{s_p} \quad (5)$$

For Harrod, however, there was no sense in which the natural rate is a long-run equilibrium. For Harrod the appropriate classification for macroeconomics was into statics and dynamics, and dynamics was defined as the field in which the rate of growth is the unknown, or endogenous, variable. The natural rate of growth enters the analysis as a ceiling on the actual rate of growth, while the warranted rate was to provide an analogue for Keynes' static idea of an underemployment equilibrium, that is, it was "simply the dynamised version of Keynes' excess or deficiency of aggregate demand in relation to what is required for full employment" (Harrod 1959, 456).

Robinson also broke from Harrod and Keynes in her adoption of the post-Keynesian long-run theory of the rate of profit. She began as a faithful disciple of Keynes accepting that the interest rate was a monetary phenomenon that governed the rate of profit (Robinson 1951), but by the end of her career, she had reversed Keynes' causation in saying that "over the long run the interest rate that rentiers can exact is dominated by profits that entrepreneurs can earn, not the other way around" (quoted in Pivetti 2005, 81).

5. Conclusion

Harrod and the first generation of the Cambridge Keynesians shared the experience of engaging personally with Keynes. They were his disciples and learned from him, not just specific theories, but a certain style of economic reasoning and expression. Pasinetti's (2007) list of characteristics of the Cambridge Keynesians captures this distinctive style.

I discuss above the extent to which Harrod conforms to each of the characteristics, and find that, by and large, he was in agreement with them. I find the differences that did emerge were mostly a result of his more conservative, less confrontational, temperament. Harrod wished to conserve within the discipline, the neoclassical general equilibrium model of an exchange economy. His solution to its inconsistency with the Keynesian approach was to quarantine it within a separate compartment in economic theory. He maintained that there was no inconsistency because the neoclassical theory covered a different domain.

⁶ Pasinetti (1962) shows the same equation holds even if the average propensity to save out of wages is greater than zero.

And yet despite their common roots in Keynes and their shared adherence to his general approach, I find that on a number of fundamental theoretical issues there were sharp differences between Harrod and the Cambridge Keynesians. The first relates to the assumption of a long-run full employment equilibrium in macroeconomics. The assumption has no place in Harrod's thinking but is central to the Cambridge Keynesian distribution theory. The second issue has to do with appropriate theory for the rate of profit. Employing the full employment equilibrium assumption and a concept of the aggregate quantity of capital, the Cambridge Keynesians developed an equation that has the rate of profit depend only on the natural rate of growth and the rate of saving out of profit. Harrod, on the other hand, held that Keynes' liquidity preference theory of interest, together with the concept of the marginal efficiency of capital, obviates the need for a separate theory of the rate of profit that relies on an aggregate measure of capital. Finally the third issue has to do with a misunderstanding on the part of Harrod's Cambridge critics of the methodological status of his fundamental equations, leading them to reject the warranted rate of growth as an unrealistic representation of the path of the economy through time.

The assumption of a full employment level of income was something Harrod had reason to think about carefully, as it was an issue over which he and Keynes argued fiercely in correspondence. The point of contention was whether the "classical" theory of interest was logically coherent. Harrod argued that if one assumed a full employment level of income, the theory made logical sense—although he agreed that the assumption of full employment needed to be abandoned, and that the implications of doing so were significant. He says to Keynes: "I think you are saying—and rightly—that the inclusion of dependent variability of level of income necessitates radical reconstruction" (Moggridge [1973] 1987a, 553). But he discouraged Keynes from denying to the classical view a "logical and water-tight view, albeit one which neglected the most important features of the situation" (*ibid.*, 532).

Keynes, however, in his stubborn realism, could not even entertain the assumption of a given level of income, insisting that it was dependent on the other variables in the model. In light of the Keynes-Harrod correspondence on the classical theory of the rate of interest, it is surprising that Kaldor (1955) begins his Keynesian model of distribution with the assumption of a full-employment level of income. The key to understanding the apparent contradiction is to realize that for Kaldor and his followers, Keynes' analysis of aggregate demand affecting output only pertains to the short-run, and a separate theory applies to the long-run. Similarly, Keynes' theory of interest could be construed as applying in the short-run, with "real" variables (the natural rate of growth and the propensity to save out of profits) governing it in the long-run.

For Harrod, however, the long-run and short-run distinction play no role in his overall schema. His 1938 address on methodology reveals his mindset as he was digesting Keynes' theory and refining his own. He remarks on the importance of classification, "a highly respectable scientific activity of which economists have no

need to be ashamed” (Harrod 1938, 392-93). The classification that he hit on for macroeconomics was between statics, into which Keynes’ model fits, and dynamics, in which the dependent variable is the rate of growth of output.

Harrod interpreted Keynes’ model as being essentially static since the dependent variable was the level, and not the rate of growth, of output; but still he recognized suggestions hinting at a dynamic model. It is the tension between the static and dynamic components in Keynes’ theory that has led to intense debates about what he really meant. Hicks’ static IS-LM model became the standard interpretation of his theory but Post Keynesian writers, and eventually even Hicks (1980, 139) himself, argue that much in Keynes is lost in this construction.

It was in the spirit of settling on the “map” for macroeconomic dynamics, that Harrod formulated his fundamental equations. At one point he suggests that his fundamental equations are analogous to Fisher’s quantity theory equation, $MV = PT$ (Harrod 1948, 80). As such, they are not meant to chart the movement of the system through time, but rather simply indicate the way in which the key variables must fit together.

I argue that Harrod’s critics failed to understand the methodological status of his fundamental equations when they criticized him for assuming that the parameters of the system are constant through time. Harrod is partly to blame for this misunderstanding because he never completed the task of fleshing out the model with equations that did chart the system through time. He saw promise in econometrics for this purpose but never managed to pull it through to completion. In *Economic Dynamics* written over three decades after his original formulation, he stresses that “we are still only on the threshold of the subject” (Harrod 1973, vii). Thus Pasinetti’s conclusion about the work of the Cambridge Keynesians, that there is a revolution is “still to be accomplished,” could be said to apply equally to Harrodian macrodynamics.

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