Harrod's Contribution to Growth Theory: A Commemoration

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It is the golden jubilee of the publication of Harrod's seminal contribution to growth theory, "An Essay in Dynamic Theory" in the *Economic Journal* of March, 1939. Subsequent surveys of growth theory including Hahn and Mathews (1964) regard this as the starting point for the "modern" revival of interest in growth theory, and as the yardstick model by which all subsequent growth models are evaluated. This is in spite of the independent development of a similar model much earlier by Fel'dman (1928, reproduced in Domar, 1957) and contemporaneously by Domar (1946).

Solow (1988, p. 307) in his Nobel Prize address gives a direct acknowledgement to the Harrod-Domar model as the catalyst which resulted in the development of the Neo-classical growth model and which was therefore indirectly responsible for the Cambridge capital controversies. On the subject of the Nobel Prize, Eltis (1987a, p. 596) states that "it is almost certainly because of Harrod's rediscovery of growth theory in the 1930s and his notable contributions to it that Assar Lindbeck, the Chairman of the Nobel Prize Committee, chose to state that he was among those who would have been awarded a Nobel Prize in Economics if he had lived longer."

A re-reading of the essay today is striking in that it is a very tentative, incomplete and exploratory piece of analysis. Harrod states that "the following pages constitute a tentative and preliminary attempt to give an outline of dynamic theory" (1939, p. 14). The analysis by modern journal standards is very verbose (nineteen pages), imprecise, not mathematically sophisticated, and devoid of footnotes and references. While giving the appearance of being a tentative first representation of the ideas, the article was an extension of an earlier work (Harrod, 1936) and the result of an extensive correspondence and debate with Keynes, the then editor of the *Economic Journal* (see Keynes, 1973, pp. 320-50). Subsequently the mode was more fully developed in Harrod's 1948 lectures on *Towards a Dynamic Economics*.

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Keynes was not taken with the drafts and amendments to Harrod's essay. In his last letter to Harrod before the publication of the essay, Keynes stated "I still find the exposition half-baked and prolix" (Keynes 1973, p. 339). In his correspondence with Pigou he went further: "As regards the Harrod articles, please do not include it amongst those articles I have accepted because I agree with it! I do not think there has ever been an article about which I have corresponded with the author at such enormous length in an effort to make him clear up doubtful and obscure points and to reduce its length" (Keynes 1973, p. 320).

The differences between Harrod and Keynes have been carefully documented by Kregel (1980) who suggests that Harrod's purpose was to demonstrate that through dynamic theory he could "provide the theoretical basis to convince Keynes of the importance of the trend in the analysis of cycles" (Kregel 1980, p. 102). However, given the editorial doubts raised by Keynes with respect to the warranted rate of growth, the bulk of the 1939 essay is concerned with an explanation and illustration of the warranted rate of growth, with a relative absence of any business cycle applications. Attention was thus focussed on the warranted rate of growth which for Harrod was fixed only at one point in time, not through time. As a consequence "Harrod's knife-edge, in the sense of a unique growth path based on the assumptions that the savings and/or capital-output ratio are fixed over time, has never existed in Harrod's written work (Kregel 1980, p.119).

It seems then that for fifty years the Harrod model has largely been misrepresented and misinterpreted. For Kregel it is not a growth theory as such. It is relevant at one point in time rather than through continuous time, and its major purpose was to apply the Keynesian analytical framework towards an evaluation of the business cycle. Even if the persuasive Kregel interpretation is accepted, Harrod's essay despite the misunderstanding is responsible for a rich legacy.

The Harrod model was seen to be a revival of the Classical and Marxian concerns with accumulation, growth and dynamic development combined with the then newly emerging Keynesian analytical concepts. Harrod in fact was one of those to whom Keynes had sent proofs of his *General Theory* for comment and advice. Although the Keynesian framework was represented in terms of comparative statics and short term public policy evaluation, the Harrod model could present the conditions necessary to sustain product market equilibrium and full employment in a growing economy. In his subsequent elucidation of dynamic theory Harrod acknowledged the challenge to render the essentially "static" Keynesian framework dynamic (1948, p.10).

Given a fixed propensity to save, a fixed capital-output ratio and a given increase in the labour force, the dynamic questions are: What are the conditions necessary to sustain product market equilibrium in a growing economy (the warranted rate of growth)? Is this equilibrium necessarily stable? What are the consequences of deviations from this warranted growth path? What is the possibility of a "golden age" - that is, simultaneous product market equilibrium and full employment in a growing economy? Although Allen regards the model as too rigid and too over determined (with the three key variables independent and no correction mechanism) he does acknowledge that "it sets the hypothetical but useful standard by which all other models are assessed." (1968, p. 270) In contrast, Domar (1957, p. 26) regards the simplifications combined with the "heroic" assumptions as essential for generating powerful insights into the inner tensions of a growing economy.

For Baumol (1959, ch. 4) it is the inflammable combination of Classical dynamics with the Keynesian accelerator principle, and implicitly volatile investor expectations, that renders the model so dramatic in its implications. That the implications of the model once fully digested had a lasting and dramatic impact upon the economics profession was hardly surprising. If the three independent variables are regarded as fixed through time, then the Harrod "knife edge" problem emerges by suggesting that growth paths are highly unstable, that the warranted rate of growth is not a natural or sustainable growth rate, and the attainment of full employment in a growing economy will be purely co-incidental.

Dobb notes that "the ideological implication of a theory that defined an equilibrium growth path only to emphasise that this was characterised by knife edge instability is quite clear; and for this reason it is scarcely surprising that many economists, especially American economists, were at considerable pains to blunt its damaging implications." (1973, p. 230). Solow (1988) admits that it was the Harrod model which generated his interest in growth theory, largely because of its seemingly implausible implications with respect to the growth path in capitalist economies and its lack of a self correction mechanism, notably varying factor proportions: "I was trying to track down and relieve a certain discomfort that I felt with their [Harrod, Domar] work." (1988, p. 307)

Subsequent modifications to Harrod's theory have been well documented and include allowing for variable factor proportions; the impact of income distribution on the propensity to save; inbuilt ceilings and floors to limit the divergence from the warranted rate of growth; multi-sector models; and much more mathematically rigorous and elegant models (see the surveys by Hahn and Mathews, 1964; Kregel, 1972; and Sen, 1970). Much of the subsequent development in growth theory sought to overcome the "knife edge" problem through making one or more of Harrod's key independent variables endogenous, and hence providing for an inbuilt correction mechanism which would return the economy towards the equilibrium growth path.

Moreover, the Harrod model and the interest generated in longer term growth issues also encouraged empirical analysis of the sources of growth through the growth accounting tradition which continues to the present. (See Maddison, 1982)

Another lasting contribution of the model is that it forms one of the foundations of the modern Post Keynesian framework (see Eichner and Kregel, 1975). The Harrod model with its concerns with dynamics and its foundation of Keynesian analytical concepts has been modified to allow for income distribution (as suggested by Kaldor, 1957) as one of the arguments determining growth paths in the economy through time.

Apart from developing a concern with dynamic method, Harrod's contribution was not devoid of normative implications. Both the 1939 article and the 1948 elucidation are concerned with the public policy implications of not achieving the warranted rate and of deviations between the warranted and natural rate growth paths. This business cycle analysis was, as Kregel (1980) suggests, the prime purpose of the model. The 1939 article discusses the role for public works programmes and interest rate policies in manipulating "the proper warranted rate so that it should be equal to the natural rate" (1939, p. 32), while acknowledging the difficulties inherent in such an exercise. In his preface to his 1948 lectures Harrod stated that "sooner or later we shall be faced once more with the problem of stagnation, and ... it is to this problem that economists should devote their main attention." (1948, p.v). The same sentiments are expressed by Domar in the foreword to his book of readings: "I believe that a Capitalist society has an inherent deflationary tendency, counteracted, but not necessarily eliminated, by technological and other changes." (1957, p. 5) This gives some credibility to Solow's claim that the Harrod/Domar model was "the product of the depression of the 1930s" (1988, p. 308) and had an inbuilt pessimistic concern with stagnation and instability.

Ironically, such concerns are just as relevant today. The October 1987 share market crash emphasised the volatility of expectations and the interdependent instability of Western economies. Harrod of course could not have foreseen the extent of integration and the growth of international capital markets with the associated large short term international capital flows, though his 1939 essay did consider the impact of the open economy upon the warranted rate of growth. Moreover, western economies have endured over a decade of stagnation and stagflation. In Australia the exigencies of poor trade figures and sustained high unemployment rates have promoted a public discussion of growth policies, especially those related to savings and investment (see EPAC, 1986; and Drake and Nieuwenhuysen, 1988). More recently, Baumol (1986) has advocated the need for a greater emphasis within the economies profession upon dynamic analysis and the growth paths of capitalist economies over the longer term — the very issues raised by Harrod (even if inadvertently) fifty years ago. In his review of the Harrod-Domar growth model, Eltis (1987b, p. 604) comments that "in the 20th century in leading western economies there have been prolonged periods when more savings would have been beneficial, and others with every appearance of inadequate effective demand. The Harrod-Domar growth model is still one of the few which actually predicts this, so it still deserves serious attention."

The above survey of the direct and indirect impact of Harrod's growth theory remains a matter of record. What is interesting about the contribution has been its interpretation and application in the light of the intention and direction of Harrod's original article. Years later Harrod explicitly distinguished between dynamic theory and growth theory (Harrod 1960, p. 277), and in a subsequent exchange with Joan Robinson (Harrod 1970, p. 741) he dismissed the "knife-edge" as being representative or important in his dynamic system. It seems through timing (proximity to the Depression and World War II, and the impact of the newly emerging Keynesian framework) and adjustment to Keynes' editorial protests, that Harrod's essay on dynamic method was interpreted as a theory of economic growth, that monetary instability was extended into continuous instability, and that long term trends in the economy replaced short term cyclical concerns. There is not doubt, given Domar's contribution (1946), that the revival in growth theory in the post-war period would have occurred even if Harrod's article had been interpreted according to his intentions.

Even though the 1939 article has been misinterpreted, the misinterpretation has inadvertently proved to be a catalyst for many major developments and controversies in economic theory and measurement over the last fifty years.*

* Thanks to Barry Gordon for encouragement, and to the comments of anonymous referees of the *HETSA Bulletin*.

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