Classical Competition, Keynesian Adjustment and Composite Dynamics: A Critical Perspective

by

Graham White

No. 214 February 1995
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Abstract

Recent literature on a classical cross-dual dynamics has argued the need to supplement these dynamics with short-run dual adjustments interpreted, for the most part, as Keynesian. This paper provides a critique of the implied interpretation of Keynes's insights into the nature of capitalism; and suggests, in line with other recent interpretations, an alternative Keynesianism incorporating short-run and long run aspects. Issues raised in relation to the task of integrating classical cross-dual dynamics and this alternative view of Keynesian are also explored.

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CLASSICAL COMPETITION, KEYNESIAN ADJUSTMENT AND COMPOSITE DYNAMICS: A CRITICAL PERSPECTIVE

I Introduction

The present paper is intended as a critical discussion of certain aspects of recent literature dealing with classical competitive processes and in particular with the stability of normal prices. The main purpose of that literature is to determine whether or not there is a sufficient economic basis for the supposition, important in classical political economy, that conditions of free competition would ultimately generate a uniform rate of profit across industries. At a formal level this literature therefore consists of attempts at modelling the process by which actual market prices are regulated by normal prices (alternatively, long-period prices, natural prices or prices of production), viz., the set of relative prices consistent with a uniform rate of profit.

The specific aspects of this literature with which the present paper is concerned are the attempts to construct a "composite dynamics", comprising of so-called "cross-dual dynamics", representing the classical notion of competition, together with what appear to be regarded as "Keynesian adjustments". One particular type of problem which arises with such composite dynamics is that the interpretation of Keynesian appears to be of a marginalist variety (viz., that Keynesian results in the analysis of output and employment depend on price rigidities) and is therefore, at least in the view of the present writer, inadequate representation of Keynes's fundamental insights into the nature of capitalism. More significantly, recent reappraisal of the significance of Keynes's theory of output and employment for the long-run as well as the short-run lead not only to the explicit rejection of such marginalist interpretations of Keynesian results; but also, as a consequence, to questions about the appropriate nature of a composite classical-Keynesian dynamics.

Hence, the purpose of this paper is not only to question the adequacy of the interpretations of Keynesian in current research on composite dynamics, but also to

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1 The most up-to-date surveys of this literature are to be found in Boggio [1990] and Caminati [1990], both part of the proceedings of a symposium on "Convergence to Long-Period Positions" held in Sienna in 1990.

2 One should note that the use of the term "classical" in the present discussion is that used in the literature on cross-dual dynamics (and which refers to the approach to value and distribution which reaches its highest stage of development in the work of Ricardo and of Marx and which was subsequently revived in 1960 in Staff's Production of Commodities by Means of Commodities) and is quite different from Keynes's (and that of most Keynesians) use of the term. See also Garegnani [1983a].
suggest a more plausible means of integrating the classical view of competition and a Keynesian long-run dynamics.

The discussion begins in section II with a brief overview of classical competition as captured by models of cross-dual dynamics; with section III outlining the nature of the attempts to integrate these dynamics with Keynesian adjustments. Section IV provides a more critical perspective on these attempts in the light of critiques of marginalist value and distribution theory, and, by implication, critiques of marginalist approaches to output and employment. In sections V and VI the positive side of those critiques - in particular, the reappraisal of Keynesianism that they have stimulated - is then brought to bear on questions about integrating a Keynesian view of output and employment, both short-run and long-run, and the classical view of pricing and distribution embodied in models of classical competition. Section VII provides a brief conclusion.

II - The cross-dual dynamics of classical competition

The main question examined in the literature on classical competition is whether in a system where commodities are produced by means of commodities, free competition would act to bring about a convergence over time of relative market prices and relative outputs in line with their respective equilibrium values: viz., relative prices consistent with a uniform rate of profit and output proportions consistent with balanced growth. In a simplified circular production system (excluding joint production) these equilibria are given as solutions to the two equation systems, in matrix form,

\[ p^* = (1 + \pi^*) \cdot p^* \cdot A \]

\[ y^* = (1 + g^*) \cdot A \cdot y^* \]

\[ \ldots (1), \]

where \( A \) is the interindustry coefficient matrix (including wage good requirements associated with a given real wage), \( \pi^* \) and \( g^* \) being scalars representing the uniform rate of profit the uniform rate of growth respectively; while \( p^* \) and \( y^* \) are the vectors of normal prices and balanced growth proportions respectively. The solution to the price system which entails a uniform rate of profit has as its dual balanced growth at the rate \( g^* \). The rate of profit \( \pi^* \) and the rate of growth \( g^* \) are equal, assuming no consumption out of profits, since both systems of equations share the same (technical) coefficients, viz., the matrix \( A \).

The essence of classical competition is captured in the literature in a disequilibrium setting by what are called "cross-dual dynamics" (hereafter CDD), which, in their most basic form, involve four elements. The first element is the proposition that relative growth rates between sectors are determined by differentials in sectoral profit rates; this first element representing the process of intersectoral capital mobility generated by differences in sectoral rates of return. The second element is the proposition that market prices are determined by the degree of excess demand. It is typical of most CDD literature however that there is no further requirement that the resulting price changes directly feed back on excess demands, in turn (possibly) acting to reduce the extent of excess demands. In so far as such feedback operates in CDD models, it does so indirectly, through the effects of relative price changes on profit rate differentials and in turn on intersectoral capital mobility.\(^4\)

The third important element of CDD models is the link between intersectoral capital mobility, expressed in terms of relative sectoral growth rates, and the sectoral pattern of excess demands. In the simplest representation of CDD, with constant returns to scale, no saving out of profit and a given real wage (subsumed within the economic system's technical coefficients), the rate of growth of demand for each commodity is determined by output growth rates. That is, demand for each commodity is determined by the requirements for that commodity as input and hence on the basis of planned outputs in the various sectors of the economy. In discrete time form, demand for commodity \( i \) at the end of period \( t \) in the \( n \)-commodity case is therefore determined according to the expression

\[ D_i = a_0 Y_i (1 + r_i) + a_1 Y_{i-1} (1 + r_{i-1}) + \ldots + a_n Y_n (1 + r_n) \]

\[ \ldots (2), \]

where \( r_i \) is the end-of-period \( t \) planned rate of growth of output. Neglecting inventories (and equating current output and current supply) relative output growth rates therefore determine not only quantity supplied in each sector, but also demand for each

\[^3\] Strictly speaking these two equation systems are such that the solution to each system is independent of the solution to the other. The solutions for (3.2.1) and (3.2.2) are given by

\[ p^* \cdot (eI - A) = 0 \] and \[ (eI - A) \cdot y^* = 0, \]

\[^4\] Hence, in any period, the effect of excess demand on relative price need not entail "market clearance". Of course, in so far as there is no market clearance, there are no implications for inventories. Hence, more sophisticated CDD models have price changes geared to inventory movements to some desired level of inventories (cf. e.g. Frank [1985] and Dumenil and Levy [1985, 1987] and [1989]. See also Campanelli [1990] pp 22-27) with regard to CDD models which assume market clearance by prices.
commodity. In combination with the second element of CDD, relative growth rates will then determine market prices.

The fourth and final element of CDD models is the link between relative prices and profit rate differentials. Given the coefficient matrix $A$ of equation (1) and assuming constant returns to scale, the rate of profit in each sector will depend exclusively on profit per unit output and thus on the behaviour of relative prices.

These four elements together represent the causal chain running from prices to quantities to prices. Changes in relative prices give rise to changes in differentials between profit rates, in turn giving rise to changes in relative growth rates between sectors. The latter changes in turn react back on relative prices (via changes in the sectoral pattern of excess demands) and hence on relative profit rates.

Though the above description of disequilibrium processes represents the simplest view of CDD explored in the literature, it nonetheless represents the essence of how this literature views those dynamic forces of competition, supposed by the classical economists and Marx to lie behind the gravitation of actual prices around normal levels.\textsuperscript{5}

### III Cross-dual versus dual dynamics and Keynesian adjustments: composite dynamics

As already noted, the essence of classical competition captured in CDD has prices (relative prices and hence profit rates) determined by quantities (excess demands) and quantities (outputs and demands) determined by prices (profit rates and hence relative prices). However, a more recent aspect of the literature on CDD is the claim that, while these dynamics capture the essence of the view of competition in the work of the Classics and Marx, they are at best preliminary in so far as they abstract from certain other real world adjustment processes. This argument points in particular to the need for a "composite dynamics" which integrates CDD with so-called "dual" (as distinct form cross-dual) processes; viz., prices directly affected by prices and quantities directly affected by quantities.\textsuperscript{6}

With regard to quantities, the use of dual adjustment in models of composite dynamics is mainly expressed in terms of the influence of excess demand (e.g. Flaschel and Semmler [1985] and Semmler [1990]) or alternatively, movements of actual in relation to desired inventories (as a measure of excess demand, e.g. Dumenil and Levy [1985], [1987], [1989] and [1990]) on the level of production. Thus in a model of composite dynamics, excess demand can act on both prices and quantities.\textsuperscript{7} There may also be longer-term dual quantity adjustments in the case of investments, such as investment being dependent on the behaviour of capacity utilization (e.g. Dumenil and Levy [1985], [1989] and [1990a]). With regard to price signals, the most common justification of dual adjustment is the use of mark-up or target return pricing (e.g. Boggio [1980], [1985a] and [1985b]), so that at given mark-ups or target rates, commodity prices are directly affected by cost (and hence, in circular production systems, by price) changes. In the case of dual adjustment in price determination, cross-dual adjustments - necessary in order that intersectoral competition bring profit rates into uniformity - would arise through the mark-up or target rate of return itself being influenced in some manner by excess demands (i.e. quantity signals, e.g. Boggio [1980] and [1985]).

What is most interesting about such composite dynamics, at least for the purposes of the present discussion, is the association of certain types of dual adjustments with Keynesianism. More precisely the argument has been put - seemingly in keeping with the view of Keynesianism of mainstream economics - that dual quantity adjustment can be interpreted not only as Keynesian but, in addition, as short-run; short-run that is, relative to the long-run classical dynamics (i.e. CDD) involving price adjustments to quantity signals.\textsuperscript{8}

Thus, for example, according to Dumenil and Levy, "[the analysis of] a short-term equilibrium [i.e. market clearing] by quantities ... is closer to the Keynesian point of view than to the neoclassical perspective (where markets clear via prices)" ([1990a] p. 234). Moreover, "[a]lthough Keynesian economists repeatedly attempted to extend the limits of their perspective to the long-run, a "Keynesian equilibrium" is a short-term equilibrium by quantities. The consideration of a long-term equilibrium by quantities...

\textsuperscript{5} It is clear that the inspiration for this characterization of competition is to be found in the work of Smith ([1981] Ch. VII), Ricardo ([1951] Ch. IV) and Marx ([1974] Ch. X and [1975] Ch. XI). Though formal consideration of the stability of natural, normal or production prices is not a part of this earlier work, that work does contain the ingredients for later models of cross-dual dynamics (cf. Flaschel and Semmler [1985] pp.3-6, Semmler [1985a] Ch.II and Egpny [1974] pp.45-60).

\textsuperscript{6} The use of the word "direct" here is important, since in CDD prices are influenced by prices, and quantities by quantities, though these influences are "indirect". In this strict sense, the term "cross-dual dynamics" is a misnomer, as noted, for example, by Caminati ([1990] p. 24).

\textsuperscript{7} Indeed, if there is no presumption that price movements clear markets, then, as noted above, production levels would presumably have to be influenced by excess demands.

\textsuperscript{8} It should be noted that the desire to include so-called Keynesian elements in the description of the system's dynamics is not the only rationale behind the consideration of dual adjustments (cf., Caminati [1990], pp. 37-40, as well as Torre [1990] pp. 222-226). It should also be noted that, at least in relation to the determination of prices, dual adjustment corresponds more to what became known as post-Keynesian in the tradition of writers such as Kalecki, Steindl etc.
Semmler has added, in relation to models of classical CDD, that, so far as short-run adjustments go, "[s]uch formulation ... are considered unsatisfactory from recent macroeconomic perspectives, particularly in the Keynesian tradition" ([1990] p. 194). Indeed, it is clear from Semmler's discussion that Keynesian (though not necessarily Keynes is to be interpreted as fixprice-type analysis (cf. ibid. note 5) or, in more recent terms, as so-called "New Keynesian". Indeed, as argued in Torre [1990] (p.225), dual adjustments in the context of circular production systems provide a useful means of looking at precisely the type of interdependencies between sectors which were seen as the essence of Keynesianism in the general disequilibrium literature (e.g. Clower [1969], Barro and Grossman [1971], and Malinvaud [1980]).

Finally, the short-run interpretation of Keynesianism suggested by the literature on composite dynamics has been related to the problems of stability encountered in some CDD models. Specifically, it is claimed (with some support from work on composite dynamics) that "asymptotic stability requires that the adjustments of the classical type proceed at sufficiently low speed. [Stability requires that] excess demand is not allowed to have a rapid influence on prices (either because its immediate influence falls mainly on output, or because prices depend mainly on cost), and capital transfers respond slowly to profit differentials. This fits quite well with the ... economic interpretation, in terms of short-run and long-run, of the Keynesian and of the classical adjustment processes (Camini [1990] p. 39)".

Thus, for the most part, the "dual" quantity adjustment characteristic of traditional Keynesian analysis is interpreted as short-run; while the cross-dual adjustments of classically-inspired models are interpreted as long-run. Put another way, the typically mainstream view of Keynesianism as characterising short-run quantity adjustments to quantity imbalances in a capitalist economy, finds its place in the dual-side of models of composite dynamics. More significantly, so-called Keynesian adjustments in models of composite dynamics appear to have a similar character to the type of mechanism interpreted as Keynesian within marginalist framework - e.g. sticky prices (for whatever reason), giving rise to price adjustments only in response to cost adjustment and output adjustments in response to demand movements.

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9 In this regard, Dumenil and Levy distinguish between on the one hand Keynesian models and on the other hand disequilibrium analysis with involuntary inventory movements resulting from the lack of market clearance in the short-run (cf. Dumenil and Levy [1990a] pp. 230-232).

10 Let the present discussion be interpreted as a purely semantic matter about the meaning of the term Keynesian, it is worthwhile emphasizing that it is readily admitted here that the dominant view of Keynesianism since the General Theory is one which hinges crucially on assumptions about price rigidities. Notwithstanding this fact, the present discussion becomes more than semantic as soon as one accepts the claim that the Keynesian result of unemployment equilibrium can be explained independently of price rigidities.
idea that Keynes's principle of effective demand - the independence of investment in relation to the propensity to save (and with it Keynes's unemployment equilibrium) and the hallmark of the positive theoretical contribution in the General Theory - is short-run precisely because of a "slowness" in the movement of prices in response to disequilibria, vis a vis the movement of quantities. But just as this short-run interpretation of Keynes has been undermined, for precisely the same reasons, the possibility of extending Keynes's principle of effective demand into the long-run has opened up.

At the heart of the critique of marginalist demand and supply approach to the explanation of value and distribution - which provides the theoretical basis for its short-run view of Keynes's contribution - is recognition of the interdependence between production processes characteristic of circular production processes of the Sraffian type. As is well known, this critique was aimed primarily at the notion that there existed in an circular production system a systematic relation between relative factor prices and the most profitable factor intensities. Calling this notion into question would also call into question the traditional basis for strictly decreasing demand functions for factors of production with respect to the relative prices of those factors (cf. Garegnani [1970] and [1978-79]).

In turn, this critique threw into question the basis of traditional arguments that Keynes's equilibrium at less than full-employment was applicable only to the short-run because it ignored long-run price adjustments particularly in factor markets; and that the conventional theory could be relied on to explain output in the long-run. This critique thereby revived interest in the possibility of extending Keynes's principle of effective demand to long-period analysis.

At the very least, this critique suggests that the consideration of Keynesian theory merely in terms of short-run or fast-moving dual adjustments is inadequate. Hence, dual adjustments, in so far as they are interpreted as short-run, while pushing the theory in a more realistic direction, cannot be regarded as capturing the essence of the Keynesian insight into the nature of capitalism.

Representing Keynes's insight in terms of short-run dual adjustments also appears inadequate in view of the fact that the classical economists from which Sraffa and the whole CDD literature draws its primary inspiration failed to provide an adequate theory of output (Marx of course being the exception). In the view of the present writer, what is more relevant to the construction of a composite dynamics, embodying a Keynesian view of output (and one which has a long-run aspect), is the fact that CDD as described in section II above do not necessarily preclude Say's Law, at least in the form that the latter takes in classical political economy. In fact, the competitive forces captured by models of CDD are not necessarily inconsistent with the assumption, found in the works of the classical economists that investment is ultimately governed by the propensity to save.11

Indeed, the simplification introduced in some earlier models of CDD (e.g. Hosoda [1985], Flaschel and Semmler [1985] (with fixed capital) and [1987] (with joint production), Boggio [1985a], Kuroki [1985] and Franke [1985] that excess demands sum to zero over the economy provides a means of dispensing with questions about the determination of investment and aggregate effective demand failures. Consider for example the two-sector, circulating capital case with no consumption out of profit and an exogenously given real wage. The labour requirement can therefore be expressed as a given quantity of the wage good. For the purposes of the exercise, assume that demand at the end of period t is a function of output during t plus the planned change in output from t to t+1. Exogenous influences on investment are ignored so that gross investment demand for commodities 1 and 2 can be expressed in value terms as

\[ I_1^t p_1 = a_{11} Y_1^t (1+\tau_1) p_1 + a_{12} Y_2^t (1+\tau_2) p_2 \]

\[ I_2^t p_2 = a_{21} Y_1^t (1+\tau_1) p_1 + a_{22} Y_2^t (1+\tau_2) p_2 \]

where \( J_i \) and \( Y_i \) refer to gross investment and output in the ith sector respectively. \( a_{ij} \) the unit input requirement of \( i \) in \( j \) and \( \tau_i \) refers to the planned growth rate of output between \( t \) and \( t+1 \). Taking commodity 2 as the numeraire \((p_2 = 1)\), gross investment, expressed in terms of commodity 2, for the system as a whole is given by

\[ I_1^t p_{12} + I_2 = a_{11} Y_1^t (1+\tau_1) p_{12} + a_{12} Y_2^t (1+\tau_2) p_{12} + a_{21} Y_1^t (1+\tau_1) + a_{22} Y_2^t (1+\tau_2) \]

where \( p_{12} \) is the relative price \( p_1/p_2 \). The requirement that excess demands sum to zero can be represented, again in terms of commodity 2, as

\[ I_1^t p_{12} + I_2 = a_{11} X_1^t (1+\tau_1) p_{12} + a_{12} X_2^t (1+\tau_2) p_{12} + a_{21} X_1^t (1+\tau_1) + a_{22} X_2^t (1+\tau_2) \]

11 In fact, one type of criticism directed at attempts to tie together the classical view of competition and a Keynesian approach to the theory of output has been based precisely on the classical economists' use of Say's Law (cf. Nell [1983] p. 114). However, to argue that the characterisation of investment in simple CDD models does not necessarily rule out Say's Law is not to suggest that the characterisation of competition leading to the formation of normal prices must entail Say's Law, or that the concept of normal prices (certainly in the Sraffian sense) itself is necessarily associated with Say's Law. On this last point see also Roncaglia [1978] pp. 23-27 and 134-137.

It should also be noted that Say's Law referred to here is not the Say's Law of marginalist theory (cf. Garegnani [1983a] pp. 23-39 and also Milgrom [1982] pp. 46-57). Indeed, the marginalist proposition that investment adapts to the level of saving via the rate of interest is clearly inconsistent with the multi-commodity approach to the determination of prices and the general (uniform) rate of profit in the work of the classics and Marx and revived in Sraffa [1960] (cf. Garegnani [1970]).
so that equations (4) and (5) yield
\[ Y_f p_{12} + Y_2 = I_f p_{12} + I_2 \]

Thus total sales revenue is equal to total gross investment both measured in terms of commodity 2. Deducing the replacement requirements for each sector from both sides of equation (6) gives
\[ Y_f p_{12} - (a_{11} Y_f + a_{12} Y_f) p_{12} + Y_2 - (a_{21} Y_f + a_{22} Y_f) = (a_{11} Y_f + a_{12} Y_f r_f) p_{12} + a_{21} Y_f r_f + a_{22} Y_f r_f \]

The left-hand side of (7) obviously represents total (net) profit for the system and thus, by assumption, total saving; while the right-hand side of (7) represents aggregate intended net investment. In other words the budget constraint represented by equation (5) implies that producers plan to invest an amount equal to the value of the surplus of outputs over input requirements and therefore equal to total profits.

In view of the fact that the key aspect of investment in the CDD studies of stability is its sectoral composition, this assumption about aggregate investment - i.e. determined by aggregate flow of profit - is analytically convenient, as a first step. However, for the purposes of examining a composite dynamics, and most importantly, a dynamics which seeks to capture Keynes's insight, this assumption is clearly unacceptable. This follows a fortiori in the view of the fact that the critique of marginalist referred to above is sufficient to dispense with any suggestion along marginalist lines that the scale of aggregate investment is ultimately governed by the economy's saving propensity, assuming sufficient flexibility of prices.

The more significant point relates to what is regarded here as Keynes's key theoretical contribution in the General Theory: the principle of effective demand, viz., the proposition that investment is determined independently of the propensity to save (Keynes [1973] pp.23-34). The task of bringing together the Keynesian insight and the classical competitive process may therefore be viewed more appropriately as the task of incorporating into models of CDD a determination of aggregate investment consistent with its independence in relation to the level of saving; and consistent also with the proposition that the pattern of sectoral rates of accumulation is linked to the hierarchy of sectoral profit rates. Put more simply, what is missing in the account of CDD and what provides the basis of the bridge between classical and Keynesian views is a determination of the scale of aggregate investment. \(^{12}\) It is here, rather than in terms of a need to consider sticky or slow-moving prices that effective demand failures can be considered alongside the classical view of competition. \(^{13}\)

**V Keynesian adjustment and the long-run**

What then can one consider as the essential Keynesian elements of a generalised disequilibrium dynamics? In answering this question it is useful to recall the point made above that the critique of marginalist value and distribution theory not only casts doubt over the short-run interpretation of Keynesian; by implication it also raises the question of what a long-run Keynesian approach to the theory of output would look like.

At least part of the answer to this last question is to be found in various attempts \(^{14}\) over the last ten years to develop a long-run version of the principle of effective demand; for the most part, in terms of the proposition that changes in the scale of productive capacity play an integral part in the long-run adjustment of output in line with the level of effective demand, and hence of saving in line with the level of investment. One immediate implication of this proposition is of course a link between the scale aggregate investment and anticipated long-run demand conditions; with this links summarised in terms of a desired relation between the scale of productive capacity and the anticipated long-run profile of demand. In turn, a key task in developing a composite classical-Keynesian dynamics then becomes one of explaining how this dependency of aggregate investment on long-run demand conditions is manifest at the sectoral level in combination with the influence of differentials in sectoral profit rates on investment.

We shall return below to the difficulties involved in this task and how these difficulties have been approached in particular in the work of Dumenil and Levy, who appear to have gone as far as most in this regard. However it is necessary beforehand to dwell briefly on some different (though not unrelated) implications of long-run Keynesian research for a composite dynamics.

These different implications relate to the relatively unexplored area (cf. the comment in Dumenil and Levy [1990a] pp. 275-276) of connections between disequilibrium.

\(^{12}\) This "openness" of investment determination in the treatment of disequilibrium in CDD is analogous to the separability between the analyses of value and distribution and the analysis of output in the classical determination of equilibrium values (cf. Garegnani [1984] and Eatwell and Milgate [1983]).

\(^{13}\) Though of course in traditional marginalist theory sticky prices on the one hand and the independence of investment in relation to saving on the other are two sides of the same coin.

dynamics associated with classical competition and cyclical fluctuations in economic activity. In relation to the extension of the principle of effective demand into the long-run, it has been demonstrated by Garegnani ([1990] pp. 50-53) that it is the existence of a desired excess capacity which provides the elasticity for the economic system to generate capacity (saving) to match an expanding effective demand (investment) without changes in the normal distribution of income, associated with normal prices. The existence of such desired excess capacity in turn would seem to imply expectations on the part of producers of persistent fluctuations in economic activity; and therefore would ultimately seem more appropriate to an economy actually experiencing such persistent fluctuations (cf. Ciccone [1986], Garegnani [1990], White [1995]). Accepting this view, one is led to the suggestion that producers would estimate profitability on the basis of movements in demand that are cyclical in nature. Some of the most important and interesting questions then relate to what this implies about the way prices are viewed in models of CDD.

There are two aspects to this last question, regarding the implications about the nature of prices in models of CDD. The first aspect concerns the nature of the equilibrium relative price vector, or more precisely, the conditions under which such an equilibrium vector is realised. Supposing that producers explicitly provide for fluctuations in demand in their estimates of rates of profit (e.g. by reference to the utilization of a productive capacity most profitable to expected demand conditions, including the likely pattern of fluctuations in demand, as suggested for example in Ciccone [1986] and White [1995]), could normal prices, generating a uniform rate of profit, actually prevail in a cyclically disturbed system. Such a possibility appears, at least at first sight, to sit oddly with the association between normal prices and steady growth present in models of CDD. In other words, it is not immediately clear that the system's behaviour implied by a long-run extension of Keynes' principle of effective demand fits neatly with the long-run equilibria underlying models of CDD.

However, the issue is more complex than this simple comparison of long-run Keynesian and long-run classical equilibria suggests. What the link between normal prices and steady, balanced growth in models of CDD does exclude is the possibility of a changing growth rate though uniform across sectors occurring simultaneously with prices yielding a uniform rate of profit (at least with given technology). It follows that so long as that system does not settle down to a period of steady growth, normal prices could never actually prevail.

This association of normal prices and steady growth is evident from equations (1) above. With a unique solution \( \pi^*, g^* \) to the two equations, provided technical conditions (matrix \( A \)) are given, then so long as normal prices prevail growth not only has to be at a uniform rate across sectors, but that rate itself must remain constant. This result is also evident from a consideration of the nature of disequilibrium CDD, as outlined in section II above. In order that a situation characterised by a uniform rate of profit be one of rest, relative prices must remain constant. Such constancy requires absolute prices to expand uniformly; but if excess demands are assumed to sum to zero then the only growth rate of absolute prices that could satisfy this requirement would be zero. Hence all excess demands must equal zero and must remain zero in order that normal prices be an equilibrium. This requires that within each sector demand and output expand at the same rate, and thus, in a circular production system, output must expand at a uniform rate across sectors. With zero excess demands, planned output growth is realised in each sector (i.e. input requirements are met for each sector) so that the planned growth rate will equal the actual growth rate in each sector. This growth rate in turn will be constant as relative prices remain unchanged and thus the uniformity of profit rates is undisturbed (ignoring changes in either technique or real wage rate).

Thus, assuming convergence towards normal prices and a uniform rate of profit, the economic system must simultaneously "approach" a situation of constant balanced growth. For any set of prices to be an equilibrium set balanced growth must prevail: and balanced growth, in models of CDD, can only prevail with a set of prices yielding a uniform rate of profit.

The interesting question is whether the above result should be taken to imply that normal prices are irrelevant for the analysis of a cyclically disturbed system. What has been said so far does not preclude the possibility suggested by Boggio that the balanced growth path associated with normal prices represents the trend around which the system oscillates in the course of the cycle, "so that the work of such a path remains relevant" (Boggio [1985b], p.85). The difficulty with this argument however lies in the identification of a dynamic equilibrium path characterised by balanced growth and the trend in a system subject to unsteady growth. One important message from much of the literature on cyclical growth theory after the 1930s was that the association of a dynamic equilibrium path and the secular trend was at the very least problematic. As suggested by Harrod ([1939]) and demonstrated later by Kalecki ([1962]), the (i.e. Harrod's) warranted growth path is ephemeral; once the system slips off it, it disappears. Its relevance to the explanation of the trend in a cyclical system is therefore severely limited.

[^15]: This is the case even if excess demands are expressed in terms of the discrepancy between stocks of finished goods and a desired ratio of stocks to output.
A more interesting position on the relevance of normal prices is adopted by Vianello:

"We may say, expressing ourselves in the words of Harrod, that a ... situation [where normal prices prevail] is such that "producers will be content with what they are doing" ....... It follows that, if the rate of accumulation and the rate of profits observable in [such] situation[s] are assumed to be constant through time, the economy is placed on a "warranted" path ......."

But if a "warranted" path is formed by an uninterrupted succession of situations, it does not follow at all that a situation [where normal prices prevail] should necessarily be part of an uninterrupted succession of similar situations deployed along a "warranted" path" ([1985] p.81).

In other words, situations where normal prices prevail need not be points on a warranted growth path, despite the fact that in such situations balanced growth must prevail. As such, fluctuations of relative prices and rates of profit in relation to normal levels need not entail fluctuations of quantities around a path exhibiting constant, balanced growth.

The association of normal prices and balanced growth in models of CDD can also be viewed from another perspective. Recall that this association is linked to a particular characterisation of price setting in disequilibrium. An equilibrium vector of relative prices can only prevail where the sectoral pattern of excess demands remains unchanged. Since prices in each sector are tied to excess demand, any disturbance to the pattern of excess demands - and hence any interruption to steady balanced growth - will disrupt the prevailing vector of relative prices.

The question arises as to the extent to which an alternative conception of disequilibrium price setting would render unnecessary any link between normal prices and steady growth; and here we confront the second of the two aspects referred to above (p. 11) regarding the implications of a long-run Keynesian view for price-setting in models of CDD. If, as suggested above, the rate of profit relevant to decisions concerning capital mobility is calculated on the basis of a normal rate of capacity utilization - and one which makes explicit allowance for demand fluctuations - then it also follows that producers estimate the profitability of investment in different sectors only after having taken into account the temporary, cyclical fluctuations in demand and hence in rates of capacity utilization. The intuition behind this argument is that a temporary peak or trough in the rate of capacity utilization and hence in the ratio of realised profits to the value of capital would not indicate a "normal" state of affairs nor serve therefore as a reliable indicator of the rate of return attainable.16

If this is the case, then it would appear inconsistent to assume - as is done in most models of CDD 17 - that producers take the opposite view with regard to variations in profit rates due to temporary, short-run changes in relative prices. In other words, if, in their estimation of the rate of profit for the purpose of investment, producers make allowance for the existence of fluctuations in profit rates during the course of the cycle, then they presumably make allowance for both the short-run variations in utilization rates and the short-run variations in relative prices which make up those fluctuations in profit rates? If this assumption is plausible, then it is equally plausible to suppose that the profit rates which enter into the determination of intersectoral capital flows have an allowance for cyclical movements in both prices and quantities built into them. In this case, it is not clear why normal prices could not act as a centre of gravity for actual prices in a system subject to periodic fluctuations.

However, this possibility may rule out a significant part of the characterisation of disequilibrium in most models of CDD; certainly in so far as those models are designed to depict the dynamics behind the gravitation of prices in relation to normal levels. It would no longer be possible to argue that normal prices are brought about by means of quantity changes affecting the relevant profit rates through the effect of the former on the pattern of excess demands, in turn affecting short-run relative prices. If the relevant profit rates are not based on temporary cyclical variations in both prices and quantities, then, although changes in short-run excess demands may influence prices and in turn realised profit rates, they need not necessarily lead to changes in the rates of profit which "matter", viz., the rates of profit used as a guide for decisions about capital mobility. In turn, changes in the pattern of sectoral rates of accumulation - even assuming there are no restrictions on such changes - need not respond to short-run changes in relative prices.

Interestingly (and, at first sight, paradoxically), the present argument that a long-run interpretation of the Keynesian approach places the analysis in the context of a cyclically disturbed system - and thus points to the need for an analysis where the profit rates relevant to classical competitive forces are long-run rates of return - provides some indirect support for "slow-moving" price dynamics such as those in models of composite dynamics. In particular, the present argument provides support for assuming slow effects of profit rate changes on intersectoral capital mobility, such as so-called


17 The exception is Baggio [1985].
"derivative control" - where capitalists make some explicit allowance for short-run variations in profit rates - employed in Flaschel and Semmler [1985] and [1987] and in Semmler [1990]; or the slow movement of target rates of return in response to excess demands in Boggio [1985b]. In these cases, the relevant profit rate signal is a long-run variable. Whether or not short-run excess demands are fully reflected in short-run price movements and profit rate volatility is a secondary question. The significant point is that the decision about mobility of capital is based on a long-run view of profitability and by implication is treated as a longer-run decision.

It should be stressed however, in respect of this last point, that this support for slow-price dynamics of models of composite dynamics does not reflect support for the view that the Keynesian insight amounts to the prevalence of short-run quantity adjustments in response to quantity imbalances. On the contrary, the support for slow price dynamics referred to above arises out of a recognition that an important Keynesian "quantity" dynamic is at work in the long-run as well as in the short-run; and that this dynamic is more appropriately located in the context of a cyclically disturbed economic system.

VI Long-run Keynesianism, composite dynamics and the theory of investment

The discussion so far highlights two points. The first point is that the dual adjustments characteristic of models of composite dynamics are inadequate as a representation of the Keynesian insight; and, indeed, are potentially misleading about the nature and significance of that insight in a manner similar to traditional marginalist thought. The second point it that extending the Keynesian principle of effective demand into the long-run provides some ground for rethinking the nature of the effect of relative price changes on intersectoral capital mobility - an effect integral to all CDD models (viz., the fourth and first elements of CDD referred to in section II).

From a long-run Keynesian perspective, the discussion above also implies an important distinction between short-run and long-run changes in quantities: the former manifesting themselves in terms of cyclical changes in capacity utilization; the latter taking the form of changes in the scale of productive capacity. Such a distinction requires considerable modification of the basic model of CDD, as described in section II above. The most obvious modification is to allow for what Dumenil and Levy call "direct control of outputs" ([1985] p.141), where producers do not passively ignore changes in inventories but instead react by varying output in line with some desired ratio of inventories to output. In times of excess demand and inventory rundown, outputs are adjusted upwards and conversely for excess supply and inventory accumulation. In a model with fixed capital one can further assume that such short-run changes in output occur not through changes in the capital stock but rather through changes in capacity utilization.

The important point is that, although this direct control of outputs is not part of the CDD that is supposed to represent the essence of the classical view of competition (viz., mobility of capital between sectors in search of the highest rate of return), it nonetheless provides a useful (and realistic) way of locating these dynamics within the context of situations characterised by variations in capacity utilization; and thus potentially within the context of a cyclically disturbed system. The link with the cycle is in fact more concrete than the simple suggestion that direct control provides a role for variation in utilization and thus potentially for a feature of cyclical experience. It is well known, since Metzler's work in the 1940's (Metzler [1941], [1946]), that the combination of an inventory accelerator - where output varies in line with changes in stocks in order to maintain a desired inventories to output ratio - with the Keynesian income-expenditure multiplier can give rise to cyclical movements in aggregate demand and output. In this case the picture that emerges is one of short-run output responses giving rise to cyclical variations in demand and capacity utilization; while capital movements between sectors in line with differentials in profitability give rise to long-run output responses. This significance of this sort of structure has been explored in numerous papers by Dumenil and Levy (e.g. [1985], [1989] and [1990a], hereafter D-L). In this way, D-L's analysis brings the study of composite dynamics nearer to the world where cycles in activity are a normal feature; and in doing so, provides one of the more promising platforms for grafting onto a model of classical competition a long-run Keynesian dynamics.

Yet this same structure, which allows for a clearer distinction between short and long-run quantity movements, poses a problem for the characterisation of that part of CDD whereby profit rate differentials impact, via intersectoral capital mobility, on excess demands, and hence on relative prices. This problem arises once intersectoral capital mobility is cast in terms of differential rates of growth in productive capacity and once we sever the direct correspondence (which exists in simpler CDD) between output growth and capacity growth by allowing capacity utilization to vary. Profit rate differentials will affect rates of capital accumulation. But what matters for changes in relative prices (and hence for the feedback effect of mobility on profit rates) are output growth rates; since prices and hence profit rates are tied to excess demands (both in D-L's models and in other versions of CDD). However, it is the assumption that utilization and not just output is tied to inventory disequilibrium which in D-L's model allows for capital accumulation on the basis of profit rates to impact on excess demand along the lines suggested by models of CDD: utilization responds positively (negatively) to excess demand (excess supply). The problem with this assumption however is that its
rationale is unclear: why should producers choose to affect the level of output indirectly through a change in capacity utilization and not directly when capital stocks are changing? If on the other hand, output instead of utilization responds directly to inventory disequilibrium, then, even if accumulation rates are tied to differentials in profit rates, the resulting changes in capital stocks would simply entail changes in utilization and not outputs, since outputs are already determined.

Thus, in getting closer to an account of the economic system which provides a clearer distinction between its short-run and long-run dynamics, one finds additional grounds for rethinking the determination of relative prices contained in models of CDD. In a cyclically disturbed system, with short-run quantities geared to quantity signals and capital mobility represented in terms of differential rates of capital accumulation, through what mechanism is capital mobility supposed to correct excess demands in the direction suggested by the classical account of competition? What seems to be required here too is a reconsideration of CDD; and one which allows for a link between differential rates of change in the scale of productive capacity between sectors and relative prices and profit rates.

There remains the wider issue, mentioned above in passing, as to the determination of investment in a composite dynamics consisting of both a long-run Keynesian dynamic and the CDD of the classical competitive process. As also noted above, the key task in this regard involves incorporating into the characterisation of investment at the sectoral level not only price signals - viz., differentials in profit rates - but also quantity signals in the form of expected demand levels, including the nature of the fluctuations in those levels.

Here too it is worthwhile briefly considering the position adopted by D-L, specifically their explanation of investment. In general this explanation revolves around the mobility of capital in line with differences in sectoral profit rates, where intersectoral capital mobility is represented by the existence of a "centre" which has the sole function of allocating financial capital between the three sectors. At the end of each period, each sector transmits undistributed profits to the centre which reallocates exactly the total amount of transmitted capital back to the three sectors in line with relative profitability. Investment demand from each sector is assumed to be some proportion of the financial capital allocated by the centre. This proportion is itself variable and is determined endogenously by the extent to which actual capacity utilization diverges from an exogenously determined normal rate. Hence, the allocation of finance from the centre (and hence saving) does not totally constrain investment, since a smaller or larger (via a credit system) amount will actually be invested according to the recent behaviour of capacity utilization. And it is here, specifically the possibility that finance may not be fully utilized, that D-L find the essence of the Keynesian insight.\(^{18}\)

D-L models therefore represent more complex versions of composite dynamics\(^{19}\) where capital mobility is cast explicitly in terms of differing rates of capital accumulation; coupled with the influence of quantity signals not only on short-run outputs but on investment demands as well. As a representation of the general approach to investment adopted by D-L, consider the following case, used in D-L [1985] and [1989]. Accumulation by sector \(i\) at the end of \(t\) designed to augment capacity available for use in \(t+1\) can be represented as

\[
u^{\text{r}}_{t+1} = \frac{\left(1 + \pi^r_i \right) F^r_i \left( u^r_i - u^{\text{r}}_i \right) - \delta_i}{\sum_{i=1}^{n} \left(1 + \pi^r_i \right) g^r_i}
\]

where \(r\) is the rate of accumulation, \(F^r_i\) is the total undistributed profit flow to the centre, \(p^r_i K^r_t\) the value of the capital stock, \(u^r_i\) and \(u^{\text{r}}_i\) the actual and normal utilization rates respectively and \(\delta\) the constant depreciation rate.\(^{20}\)

However this treatment of investment, and in particular the role of normal utilization, \(u^{\text{r}}_i\), in the investment process, seems problematic, at least from the perspective of recent work on extending the Keynesian approach to the long-run. D-L take this as a target rate of utilization assumed to be less than one hundred per cent due to the presence of uncertainty regarding future demand levels; the only reference to its determination being that it "is derived from previous experience" ([1985] p.136). The important point is that it appears to be taken as an indicator of a desired relation between output and productive capacity. As has been suggested elsewhere (Ciccone [1986] and [1987], White [1989] and [1995]), in a system subject to persistent cyclical disturbance and uncertainty in

\(^{18}\) While appearing to adhere to the short-run interpretation of Keynesianism discussed in section III above, D-L recognise a link between the question above relating to investment, the issue of Say's Law and the nature of the Keynesian insight into capitalism (e.g. D-L [1985] pp. 145-146 and [1990] p. 233). Specifically they find the significance of the Keynesian view to lie in the existence of money and credit - specifically, credit displaces, though it does not "supersede" what they call the capital constraint - viz., the constraint which makes it necessary to look at the relative profitability of production in different sectors of the economy.

\(^{19}\) This complexity is the source of some criticism of D-L's approach (cf. Flaschel and Semmler [1985] pp. 8-10).

\(^{20}\) The function \(g^r_i\) is assumed nonlinear and yields \(g(0) = 1\). This representation of investment is, in essence reproduced for the two sector case presented in D-L [1990], though in the latter the willingness of the banking system to grant credit for investment is also considered.
demand levels the normal degree of capacity utilization is determined by the average utilization anticipated for the capital stock which is seen as appropriate to the expected long-run pattern of demand. It was also suggested above (pp.27-30) that precisely because \( u_a \) is an average, a divergence between actual and normal utilization need not indicate a capacity of inappropriate size in relation to expected demand: such divergences may need to persist for some time in order to influence fixed capital investment. The implication is that, at least for the purpose of modelling investment, it may be inappropriate to use the discrepancy between actual and normal utilization as the relevant indicator of a maladjustment of capacity in relation to long-run demand conditions.\(^{21}\)

These latter comments should not be taken to suggest that normal utilization is irrelevant to the behaviour of quantities. The point is rather that the explicit role of \( u_a \) in an investment function \( a \) la D-L's model is questionable, in so far as it is taken to represent the influence of a desired relation between output and the scale of productive capacity. However, this does not rule out the influence of \( u_a \) on investment via the pattern of sectoral profit rates. So long as it is reasonable to assume that the relevant profit rates are calculated on the basis of \( u_a \), then the pattern of normal utilization rates - and therefore the nature of long-run demand experience which determines \( u_a \) - must play some role in the determination of investment.

**VII Conclusion**

The preceding discussion has attempted to shed light on the problems with recent approaches to composite classical-Keynesian dynamics; and, by implication, to point to ways in which CDD and a long-run Keynesian adjustment of quantities could be more plausibly integrated. At the heart of the problem with recent literature on composite dynamics is, for the most part, an inadequate representation of Keynes's insights into capitalism and implicit acceptance that these insights are confined to the short-run. Rejecting this interpretation and accepting the possibility of a Keynesian dynamic at work in the long-run leads to four important implications.

First, since models of CDD effectively consider only the composition of investment, leaving open the determination of aggregate investment, this seems an appropriate place in which to forge a link between the dynamics embodied in a long-run version of the principle of effective demand and the dynamics of competition and hence prices. The main difficulty in this regard is how a target relation between demand (output) and productive capacity may be integrated into the sectoral investment function of CDD.

models. If investment in each sector is geared to such a target relation, what becomes of the role of profit differentials? How is investment in each sector simultaneously directed in line with a target relation between demand and capacity and differentials in sectoral profit rates?

Second, in the view of the present writer, D-L's models provide the most useful approaches in relation to the last question; in the form of the proposition that the extent to which sectoral capacities respond to profit differentials is conditioned by the degree of excess capacity in each sector; so that both demand conditions and profit differentials affect investment. However, their treatment of the demand constraint in terms of the discrepancy between actual and normal utilization rates is problematic, once the long-run nature of normal utilization is taken into account.

Third, a long-run view of investment, both in relation to profit differentials and long-run demand conditions carries with it implications about the appropriate approach to price determination in a model of CDD. The link running from changes in relative prices to profit rates to capital mobility has to be reconsidered, since this part of CDD rests on the effect of short-run price changes on those rates of profit which are used as a guide for investment decisions. If these profit rates are based on long-run views about quantities, it is difficult to justify (except on grounds of analytical convenience) the assumption that these same rates of profit are based on short-run views about prices.

Fourth, the need for an alternative treatment of price determination - for the purpose of examining the impact of intersectoral capital mobility on profit rates - is also implied once a clearer distinction is made on the quantity side between short-run movements in outputs independently of changes in the scale of productive capacity and longer-run capital accumulation. Such a distinction will sever the straightforward connection between intersectoral capital mobility and the sectoral pattern of excess demands.

\(^{21}\) This assumes of course that investment is designed to eliminate such maladjustment.
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