"Old and New Growth Theories: An Assessment"
Pisa, 5-7 October 2001

Growth without normal capacity utilisation*

*Antonella Palumbo and Attilio Trezzini***

* The paper is in a provisional form, and may not be quoted. Comments are welcome. Our work has benefited from many discussions with P.Garegnani and F.Vianello, who gave precious suggestions and whom we wish to thank, while not implicating them in our mistakes.

** Dipartimento di Economia, Università di Roma Tre. E-mail: <palumb.a@uniroma3.it> and <trezzini@uniroma3.it>.

Although by far the greatest part of the literature on economic growth is made of theories and models that consider growth as driven by supply factors - the accumulation of capital, the growth of the labour force, the growth in time of the productivity of resources due to technical progress - in the present paper we will be exclusively concerned with the alternative approach according to which the driving force of economic growth is aggregate demand. This because, in our opinion, the supply-side approach to economic growth has serious shortcomings that prevent one to consider it as a good representation of actual tendencies of real economies. The approach, although made of so many different theories and models, has as a distinctive feature to assume that some mechanism will guarantee the tendency of all output that can be produced by fully using available resources to be absorbed, without aggregate demand representing in the long period a constraint on output and capacity expansion.

For all its popularity in economic literature (as shown by the fact that practically all the recent literature on endogenous growth is elaborated in terms of supply-side models), this approach fails in explaining why aggregate demand should passively adapt to supply in the long period. The equality between investment and full employment saving is either explained by means of mechanisms on which the subsequent literature has cast serious doubts, or it is simply assumed without explanation. But to assume that the economic system tends to the full employment of resources, and to build the entire theory of growth on such an assumption, which allows to completely neglect the demand side and to focus exclusively on the growth in resources and in productivity, is by no means an irrelevant assumption that can be made without proving.

We will thus leave aside this approach, and focus exclusively on what may be termed the approach of “demand-led growth”, a composite body of theories and models in which aggregate demand is given pride of place in driving the process of growth. This approach, with its emphasis on the way in which demand may call into existence new resources thus endogenously expanding the growth potential of the economy, is in our opinion likely to better get at the essence of the growth process.

Within this theoretical framework, we will especially focus on a methodological question, i.e., whether the long-period tendencies of the produced quantities can be effectively studied by means of positions characterised by complete adjustment between output and productive capacity.

The great majority of growth theories and models which economic literature has produced from the 1950s on is dominated by the analytical construct of the steady state – a growth path along which all quantities grow simultaneously at a constant rate with capacity utilisation continuously being kept at its normal level. Since the steady state hypothesis also plays a dominant role within the demand-led approach to growth, we will begin, in paragraph 1, by showing what serious limits it has as an analytical tool to represent the long-run tendencies of the economic system, and how its implicit assumption of constantly normal utilisation of capacity proves as incompatible with a correct representation of the autonomous role played by aggregate demand in the process of accumulation.

In the same paragraph 1 we will also evaluate the apparently less strict hypothesis according to which, whatever the actual evolution of quantities, the long-period tendencies have to be studied by means of average positions characterised by complete adjustment between capacity and output – that is, average normal utilisation instead of continuous normal utilisation - and we will show that this hypothesis has the

same shortcomings of the steady-state hypothesis, in that it does not allow for a determination of growth dependent on demand factors.

We will then proceed to wonder what may be the analytical role of the normal utilisation hypothesis in the analysis of quantities. This we will begin by studying, in paragraph 2, the conditions for which the tendency of capacity to adjust to demand may fully realise, which analysis has to be conducted by studying the long-period determinants of investment. We will conclude that the conditions for the full adjustment to effectively realise are so stringent as to make it highly unlikely in reality; and that the tendency of capacity to adjust to demand has to be considered as a force continuously at work and continuously influencing the process of accumulation, but not necessarily fully realising because it acts together with other, potentially contrasting, forces that influence investment - especially the force of competition among firms through innovation. This leads us to state that the normal utilisation hypothesis, so central in the analysis of prices because it is implicit in the dominant techniques dealt with in price equations and in the very definition of the normal rate of profit, has instead to be considered, in the analysis of quantities, nothing more than a tendency that acts together with other tendencies - with no process of gravitation of actual towards normal quantities taking place as instead may be said of prices.

The paper will conclude by showing, in paragraph 3, some possible misunderstandings of actual relations between variables in case normal utilisation be considered as the prevailing situation in the long period. We will particularly deal with the relationship among autonomous demand, the investment share, and the rate of growth of output. We will show that any rigid definition of the dependency of investment on demand expansion (i.e., any rigid assumption that normal capacity utilisation has to prevail) would amount to assuming that the above variables are connected in definite predictable ways; while, on reviewing some on the empirical literature on the subject, we will note that often this is not the case.

This analysis leads to recognise the role played, in shaping the above relations, of different possible features of particular processes of growth such as the sensitivity of investment to particular components of demand, the higher or lower reliance on external markets or on the growth of the domestic capacity to consume, the import content of production, the weight of manufacturing in national product. These and other factors have to be studied in a flexible analytical structure where the relation between autonomous demand and output (traditionally represented by the 'multiplier') and that between demand expansion and creation of capacity (traditionally represented by the 'accelerator') are both conceived as liable to be shaped by the peculiar characteristics of each phase of growth.

1. *The normal utilisation hypothesis in demand-led theories of growth.*

One element can be said to characterise all theories and models of growth elaborated by authors in the Keynesian and in the Kaleckian tradition, in which aggregate demand is seen as the driving force behind the growth process, and this is the idea that in the long period the saving-investment equality is brought about not by some automatic mechanism that adjusts investment to full-employment saving decisions, but

rather by some mechanism through which it is saving that adjusts to an independently determined amount of investment. This principle, following Kaldor (1955-6), we will name the "Keynesian Hypothesis".

As already said, much of the literature that can broadly be said to refer to the Keynesian Hypothesis has been developed in terms of steady-state growth models. In what follows we will try, in the first place, to assess whether a steady-state path is suitable to properly represent the autonomous role played by aggregate demand in the growth process. The difficulty of stating the autonomy of demand in such a theoretical framework, characterised by continuous normal utilisation of capacity, will lead us to consider the more general hypothesis that normal utilisation be regarded as the *average* long-period condition of the system, only to find it equally incompatible with the autonomous role of demand.

1.1. *Steady growth and the Keynesian Hypothesis*

By "steady-state growth path", usually shortened in "steady state" or "steady-state path", we mean a sequence of theoretical positions describing a path characterised by all variables - total output, the capital stock, the components of aggregate demand - growing at the same constant rate. What we would now like to ascertain is whether assuming that an economy is actually on such a path is only a simplifying abstraction and if as such it allows to grasp the basic features of the growth processes - or, rather, whether it represents a misleading assumption which obfuscates rather than illuminates the way in which the process of growth actually unfolds. It is hardly necessary to notice that, for the sake of the argument, we will make for the moment a series of simplifying assumptions - such as the assumption of given technical conditions - that in our opinion amount to neglecting some of the crucial features of the real growth processes. We will make such hypotheses in order to show how, even in these highly unrealistic conditions, the steady state proves a very inadequate tool for the analysis of long-run tendencies. Some of these restrictive assumptions will however be relaxed later.

Let us consider a very simple model that will be progressively modified. Let us assume a closed economy without government intervention; with given technical conditions and with aggregate consumption being a linear function of aggregate income without any autonomous component.

Let us define as "capacity output" or "capacity" the level of output that could be obtained by fully using the existing equipment with the available techniques of production. We will assume, as in most of the Keynesian and Kaleckian tradition, that the stock of labour never acts as a constraint on the expansion of output[1]. Also following the rest of the literature on demand-led growth, we will assume that normal utilisation of capacity (where utilisation is defined as the ratio between actual output and capacity output) is by no means equal to full capacity: as was originally stated in Steindl (1952), firms usually prefer to install an amount of capacity which is in excess both of actual production and also of the expected one, and this choice depends, on the one side,

[1] In a number of growth models elaborated by Kaldor (1955-6, 1957), though proposed as an extension of Keynes's ideas to the long period, full employment of labour is assumed to act as a constraint on growth. In later models (see for example Kaldor, 1970 and 1981) this point of view is abandoned and neither capital nor labour are seen to limit growth, which entirely depends on demand conditions (especially foreign demand).

on technical indivisibilities of fixed equipment and, on the other side, on the strategic decision of each firm to be able to satisfy unexpected increases in the demand for the products of its sector without losing market shares to its rivals. The existence of such a desired excess of capacity means that actual output, from a technical point of view, can not only fall short of but also exceed normal capacity output[2]. We will also assume that no sectoral bottlenecks constrain the expansion of actual output with respect to normal capacity[3].

A basic principle that can be envisaged - although in various and significantly different forms - in the literature on growth sharing the Keynesian Hypothesis is that the evolution over time of productive capacity is driven and determined by the expansion of aggregate demand. This principle has generally be formalised by means of the so-called *accelerator* as a quantitative relation between actual increases in output and actual levels of investment. This formalisation has been shown inconsistent with the extension of the Keynesian hypothesis to the long run and thus with the basic principle that it should represent (see Trezzini, 1995).

In order to develop our argument, thus, it is much better not to formalise any investment function. As a first step, we will make no hypothesis whatsoever about investment, not even adhering to the basic principle - just stated - of the dependency of investment on demand expansion.

Along the steady-state paths, capital and output by definition grow at the same rate; thus, both the degree of capacity utilisation and the *actual* capital/output ratio must necessarily be constant. Let us define as α, on the other hand, the *desired* capital/output ratio, the one corresponding to the desired degree of capacity utilisation u^*, implicit in the dominant techniques[4]. If the steady state has to be taken as a representation of the actual long-run tendencies of the system, the only degree of capacity utilisation that can plausibly be assumed as constantly prevailing seems to be the normal or desired one. Any different constant degree would in fact induce firms to change their investment decisions in order to obtain the desired degree - thus disrupting the very conditions of steady growth. (Although some authors develop steady-state models on the assumption of a divergence between actual and normal utilisation, steady growth, if properly understood, seems to be possible only in conditions of normal utilisation of capacity[5]).

Although we made no assumption on investment determination, we can infer both the level and the evolution in time of net investment simply from the conditions that define the steady state hypothesis. From the condition of equality between (net) saving and (net) investment, the rate of growth of capital g_k can be written as

---

[2] Ciccone (1986) analyses the role of the cyclical fluctuations in demand and output in determining the firms' decisions to install capacity in excess of average expected demand.

[3] We defined here the *normal* (desired) degree of capacity utilisation as a strategic magnitude determined by the competitive behaviour of firms in relation with expected fluctuations in demand. For a definition based on the assumption that normal utilisation has to be determined as the cost-minimising technique, see Kurz (1986, 1990).

[4] By assuming the existence of fixed capital, we are assuming that the *normal* or *desired* capital/output ratio is greater than 1.

[5] Reference is to some growth models in the "neo-Kaleckian" fashion, such as Rowthorn (1981) and Amadeo (1986a, 1986b), of which later in this paragraph.

$$g_k = \frac{I}{K} = \frac{S}{K} \qquad [1]$$

which, assuming a linear[6] saving function $S = sY$, becomes

$$\frac{I}{K} = s\frac{Y}{K} \qquad [2]$$

From the steady-state assumption it follows, as seen above, that productive capacity is *constantly* utilised at the *desired* or *normal* degree. This implies that the ratio between output and capital is constantly such as to be expressed by $1/\alpha$, the reciprocal of the desired capital/output ratio. Thus, along a steady-state path the following condition is constantly verified:

$$g_y = g_k = \frac{s}{\alpha} \qquad [3]$$

The rate of growth of capital - and that of all the relevant aggregates - compatible with the steady-state assumption must necessarily be equal to the ratio between the net marginal (in our assumptions equal to average) propensity to save and the desired capital/output ratio. This rate of growth, from Harrod's (1939) analysis on, is known as the *warranted* rate of growth.

This simple consideration suggests a difficulty arising when the steady state assumption is used in an analysis of growth based on the Keynesian Hypothesis. This hypothesis states that a level of autonomously determined investment determines a corresponding level of aggregate saving. On the contrary, equation [3] seems to suggest that g_k must necessarily be equal to a particular value given by the propensity to save of the economy and the capital/output ratio. These two magnitudes seem to be independent of investment - or of aggregate demand - and seem, on the contrary, to constrain the autonomy of the latter.

Most of the different attempts to develop a theory of growth along Keynesian lines that can be found in the literature can be read as different ways of stating the autonomy of g_k in relation [3], i.e., while maintaining the steady-state hypothesis.

In one of the first attempts in this direction, the so-called neo-Keynesian theory of distribution (Kaldor, 1955-6; Robinson, 1956, 1962; Kahn, 1959), the propensity to save of the economy is seen as determined by the incentive to invest. Thus in equation [3] a relation of causality is assumed from g_k to s, the latter being the weighted average of the (higher) propensity to save out of profits and the (lower) propensity to save out of wages, and thus growing with the rate of profit. It is thus changes in distribution, according to the neo-Keynesian approach, that take care of the adjustment of saving to investment. A higher rate of accumulation - which in turn depends on entrepreneurs' expectations and animal spirits, or on technical progress, of on any other force, but can

[6] This specification of the saving function derives from the above assumption that consumption has no autonomous components. Although there is no obstacle to assuming a different propensity to save out of the different incomes, as in the neo-Keynesian approach of which later, this kind of assumption is by no means necessary, and not making it keeps the relations to the simplest possible degree of formalisation.

be considered as entirely independent of saving - would induce higher prices and growing profit margins and, with given money wages, a higher rate of profit and a lower real wage.

As shown by Ciccone (1984, 1986); Vianello (1985, 1996), Garegnani (1992); Garegnani and Palumbo (1998), in this theoretical attempt a fundamental role is played by the assumption of an absolute inelasticity of long-run output to changes in aggregate demand. Distribution enters the picture only because an increase in investment - thus in demand - cannot be accommodated by any increase in total production but has to be compensated by a corresponding reduction in consumption.

However, the assumption of such an extreme inelasticity of long-run output to changes in demand has proved to be unwarranted (see especially Garegnani, 1992). In the long-run, when the capacity creating effect of investment flows is properly considered, output must on the contrary be regarded as highly elastic to any change - be it temporary or persistent - of aggregate demand[7]. These changes can induce both changes in the degree of capacity utilisation and changes in the capacity level, and by these two routes output may accommodate any change in aggregate demand without the need of varying normal distribution[8].

It is perhaps worth noting that what may have induced neo-Keynesian authors to think that there are no margins for output to respond to changes in demand is not the normal utilisation hypothesis as such, i.e. the idea that in the long period capacity and demand will tend to be adjusted to each other; but the hypothesis that the system *continually* finds itself in such a situation of complete adjustment. It is the hypothesis of *continuous* normal capacity utilisation - in other words, the steady-state assumption - that generates the idea of a dependency of distribution on accumulation[9]. However rapid the adjustment towards normal utilisation, even a temporally limited variability of the degree of utilisation of capacity (which is made possible in both directions by the very definition of normal utilisation given above) would be sufficient to deny that prices have *necessarily* to rise with respect to money wages if investment increases (or to decrease in the opposite case, which is perhaps even more difficult to justify). Steady state, in this case, represents not only the analytical framework in which the theory is cast but the very basis on which it is built - as implied by the fact that the theory would not hold outside this very stringent hypothesis[10].

As soon as the existence of output elasticity is recognised, the possibility appears of considering a different mechanism of adjustment of saving to investment, based - in the long as well as in the Keynesian short run - on changes in the level of output[11]. The

---

[7] Garegnani (1992) shows the great cumulative effect of a very small initial underutilisation of productive capacity in terms of the loss of potential capacity and output it gives rise to in a number of periods.

[8] For a more detailed critique of the neo-Keynesian theory of distribution see especially Ciccone, 1986, Vianello, 1985, Garegnani, 1992. On the confusion between the *normal* and the *realised* rate of profit, this latter being the only one that is liable to be influenced by changes in the pace of accumulation, see also Vianello (1989).

[9] In Kaldor (1955-6) the inelasticity of output depends on the full employment assumption, while Robinson (1962) assumes that the system may grow along a steady state path with labour unemployment.

[10] The fundamental role that the steady-state assumption plays in the neo-Keynesian theory of distribution has been especially pointed at by Vianello (1985, 1996).

[11] Kaldor (1955-6) states that the Keynesian multiplier, which in the short period expresses the changes in the level of output that bring about the equality between investment and saving, in the long period expresses the changes in distribution through which saving adjusts to investment. He explicitly admits that

possibility of reciprocal influences between accumulation and distribution is not denied - but no *necessary* relation can be established between g_k and the propensity to save as the neo-Keynesian approach maintains.

We are now back to our problem: leaving aside the link between accumulation and distribution stated by the neo-Keynesian approach - with the complete inelasticity of output to demand, and the lack of distinction between realised and normal rate of profit that it entails - from our equation [3] the difficulty of reconciling the steady-state assumption with the idea that demand plays an autonomous role in determining growth re-emerges[12].

At each position along a steady-growth path with normal utilisation investment equals capacity saving[13]. The only level of investment logically consistent with the assumption of a steady-state corresponding to normal utilisation is the level of capacity saving of the same period. By assuming steady growth, we therefore implicitly assume that investment can never deviate from the level determined by capacity saving. Thus, we would simultaneously reject both the view that investment is independent of capacity saving and the attribution of any autonomous role to investment in the growth process.

Two different position can be found in the literature that seem to overcome this logical difficulty.

In the neo-Kaleckian growth models the degree of capacity utilisation is seen as endogenously determined[14]. This means that in our equation [3]

$$g_y = g_k = \frac{s}{\alpha} \qquad [3]$$

given the propensity to save *s*, the rate of accumulation g_k determines the actual capital/output ratio α^a - possibly differing from its normal level α.

In this case, however, the assumption of steady-state implies that, once an actual capital/output ratio α^a different from normal prevails, it remains forever different from the desired. The constant divergence between actual and desired degree of capacity utilisation is apparently inconsistent with the assumption of capacity adjusting to demand expansion. The persistence of a divergence between actual and desired capacity utilisation would eventually force firms to change their investment behaviour changing thus the rate of growth of the economy[15].

As shown in Trezzini (2001), the finding of this inconsistency has forced neo-Kaleckians to change their models in many different directions - especially by assuming a tendency of the normal degree of capacity utilisation to adjust to the actual one - none of which seems really apt to solve the contradiction, the latter being determined by the

---

such a conception amounts to assuming a complete rigidity of output to demand, a rigidity that makes him say: "we are back to Say's law".

[12] We are maintaining the hypotheses we made before, and in particular we are still assuming that there are no autonomous components of demand, whose presence - as will be shown shortly - would modify equation [3].

[13] With this expression we indicate the amount of saving that corresponds to the output produced in conditions of normal utilisation of capacity.

[14] The origin of this neo-Kaleckian approach can be found in Steindl (1952); but the models we are referring to are essentially Rowthorn (1981), Amadeo (1986a); Lavoie (1995, 1996) and Amadeo (1987).

[15] The inconsistency between the steady-state assumption and the divergence between actual and desired utilisation was first pointed at by Committeri (1986). See also Auerbach and Skott (1988).

steady-state assumption itself[16].

A different, apparently more promising, theoretical position aims at overcoming the difficulty of reconciling the steady growth hypothesis with the autonomous role of demand by explicitly introducing some autonomous component of aggregate demand - thus modifying the terms of the argument and also modifying the general expression for the investment-saving equality.

The autonomous components of aggregate demand are those whose level can be assumed to be independent of the current level or expansion of production. They thus consist of public expenditure, exports, autonomous investment[17] and the so-called autonomous consumption. Allowing for the existence of these autonomous components makes the equality between saving and investment slightly more complex. The sum of saving, imports and tax revenues has now to equal the sum of investment, exports, autonomous consumption and government expenditure.

This change affects the determination of the rate of growth - the warranted one - that is implied by the steady-state hypothesis. Assuming for the moment that autonomous expenditure consists of just one type of expenditure which has no capacity creating effect - for example, a *purely technological* autonomous investment[18] - indicating by Z its level, we will have:

$$S = I + Z$$

the rate of growth of capital g_k thus becomes:

$$g_k = \frac{I}{K} = \frac{S - Z}{K} \qquad [1']$$

which, with the same linear saving function as before, $S = sY$, can be written as:

$$g_k = \frac{sY - Z}{K} = \left(s - \frac{Z}{Y} \right) \frac{Y}{K} \qquad [2']$$

Since along a steady-state path productive capacity is constantly utilised at the *desired* degree, the ratio between output and capital will constantly be $1/\alpha$. Along a steady-state path, thus the following condition is constantly verified:

---

[16] For a critique of the neo-Kaleckian growth models, which especially points at the misleading role played by the steady state hypothesis, see also Ciampalini and Vianello (2000).

[17] Like in the Keynesian literature on the subject (see for example Hicks, 1950), we will usually define as "induced" all investment which is determined and justified by demand expansion, and as "autonomous" all other kinds of investment. The distinction is purely conceptual, since as will be shown later there is no way in actual investment outlays of distinguishing between the two components. However, in the kind of steady-state models we are analysing, another, more restrictive, definition of autonomous investment is necessary (see next note).

[18] In such a (steady-state) theoretical framework the only possible type of *autonomous* investment is an investment that does not generate capacity - conceptually, an investment which is made only for the sake of substituting new methods of production for the old ones but *without affecting* the level of output that can be produced by normally using the equipment so installed. For such a concept, which however we will return to in para.2.2, see for example Serrano (1995, p.71 and 77).

$$g_y = g_k = \frac{s-(Z/Y)}{\alpha} \qquad [3']$$

The rate of growth necessarily implied by the assumption of steady state is now determined by the average propensity to save, the desired capital/output ratio and the ratio of autonomous demand to capacity income. This is a generalisation of equation [3] above, and implies that the steady-state rate of growth may assume, according to the value of the fraction Z_t/Y, infinite values between $g_y=0$ for $Z_t/Y=s$ and $g_y=s/\alpha$ for $Z_t/Y=0$.

Serrano (1995) and Bortis (1997) have independently developed two similar steady-state models in which, assuming a rigid accelerator mechanism and given distribution, a constant relation between autonomous demand and output (a *supermultiplier*) is stated[19]. From this they let it follow that the rate of growth of autonomous demand g_a determines the rate of growth of the economy allowing for normal utilisation of productive capacity and steady growth. For each different rate of growth of autonomous demand there is a specific fraction Z_t/Y that makes the warranted rate - the rate of growth implicit in the steady-state assumption -exactly equal to the rate g_a.

In these models the steady-state and the constant normal utilisation assumptions seem to be consistent with the representation of the growth process as a demand-led phenomenon.

However, as shown in Trezzini (1995), this consistency is only apparent. In each specific situation the existing capacity and the level of autonomous demand determine a specific value of the ratio Z_t/Y and thus a specific value of the warranted rate of growth. There is no reason, in principle, for the *autonomous* rate of growth of autonomous demand to be exactly equal to that value of the warranted rate. There is no reason, thus, for capacity utilisation to be normal and growth to be steady. If g_a happens to be greater than g_w, utilisation will be higher than desired, while a g_a lower than g_w would entail capacity utilisation lower than desired.

1.2. *The variability of long-run capacity utilisation as an expression of the autonomy of aggregate demand*.

The same problem can be seen from a different perspective, by analysing the effects of a change in the rate of growth of autonomous demand.

Let us assume that the economy is initially on a steady-state path, i.e. it is growing at a growth rate g_a equal to the rate of growth of autonomous demand with

[19] The concept of supermultiplier was first introduced by Hicks (1950), who however used it in a different context, to study cyclical fluctuations of output around a long-period normal-utilisation trend. It must be noted that Serrano (2001) builds a very similar model where a more articulated adjustment process based on a flexible instead of rigid accelerator is considered (see also Cesaratto, Stirati, Serrano, 2002). The supermultiplier is also used to represent the relation between autonomous demand and output in a number of models in the Kaldorian tradition (see Thirlwall, 1979; McCombie, 1985; McCombie and Thirlwall, 1997), where exports are considered as the only source of autonomous demand and where some strict assumptions are made concerning the long-run trend of investment and government expenditure in order to obtain the steady-state result (for a critical discussion of these models see Palumbo, 2001).

productive capacity normally utilised. Let us thus consider an increase in the autonomous demand growth rate, now equal to $g_a' > g_a$.

In order for the new rate g_a' to be the new warranted one it is necessary that the fraction Z/Y^* becomes lower. The level of Z however has certainly increased from the last period of the first phase to the first period of the second phase according to the rate of growth g_a. The reduction in the fraction may thus only take place if capacity grows more rapidly than autonomous demand. The higher rate of growth requires, on the new growth path, a percentage growth of capacity higher than that required in the old situation. Assuming normal utilisation this necessarily implies a higher share of induced investment (which is what creates additional capacity) over income. Thus, the share of autonomous demand Z over income must fall - assuming a value such that the warranted rate coincides with the new level of g_a' - while the share of net investment must rise[20].

This can only occur if the capital stock and productive capacity grow more rapidly than autonomous demand; i.e. their actual growth rates g_k and g_y^* must be higher than g_a'.

The latter, on its own, is already higher than the initial warranted rate g_w. Thus, full adjustment requires that capital stock and productive capacity grow at a rate certainly higher than that which normal utilisation would allow. Indeed, normal utilisation of capacity initially implies a level of induced investment that only allows capacity to grow at the *old* (lower) warranted rate.

As soon as the changes needed for full adjustment begin to be realised, capacity is over utilised. If the increase in the rate of growth of autonomous demand is correctly anticipated, overutilisation may take place before it occurs, but it is nevertheless a necessary phenomenon. Moreover, the extent of this adjustment seems to be so great as to be likely spread out over many periods, which therefore constitute an entire phase of overutilisation - not due, as should be clear, to wrong expectations.

From this it follows that stating the tendency of productive capacity to adjust to demand implies the variability of capacity utilisation. This variability is actually the way in which this tendency can manifest itself. An increase in any of the autonomous components of aggregate demand that occurs in an initial situation of normal utilisation implies a necessary overutilisation. If capacity grew at the same new rate of aggregate demand (g_a') this would imply initial overutilisation lasting forever[21]. Capacity must grow at a rate higher than that of demand in order to fill the gap between existing capacity and that required to grow in normal conditions. Thus, stating the tendency of capacity to adjust to demand implies the logical necessity to consider the variability of the degree of capacity utilisation.

We may further note that this variability is by no means a short period phenomenon. As long as we define the long-run degree of capacity utilisation as any average degree computed over a sufficiently long stretch of time, it is impossible to have it coinciding with the normal degree. The only possible case in which this occurs is when autonomous demand grows at a constant rate for such long time (and in absence of any other disturbances) that a complete adjustment can be attained and no change in the

[20] With given propensity to save, the fall in Z/Y and the rise in I/Y have obviously to compensate exactly.

[21] A condition of perpetual (and constant) over- or underutilisation not only is by itself incompatible with the steady growth hypothesis (as seen above, when discussing of neo-Kaleckian models), but also it amounts to denying the very existence of the tendency of capacity to adjust to demand, which is the pillar on which a demand-led growth theory must be built.

rate of growth is even expected for the future - in other words, when the rate of growth of autonomous demand is forever constant. Apart from this very peculiar case, the long-run average degree of capacity utilisation will eventually result to be different from normal and this is but the consequence of capacity adjusting to aggregate demand.

The assumption of continuous normal utilisation of productive capacity which is implicit to steady state models appears thus as incompatible with the representation of the role that demand expansion plays in the process of growth. (Nor, as seen above, can a steady-state model with constant but different-from-normal utilisation be taken as a correct representation of that role, since in this case the very mechanism would be lacking through which capacity adjusts to demand. This implies an inadequacy of the steady state assumption - as such - as an analytical tool in demand-led theories of growth.)

It is frequently assumed that, although the steady-state path is not adequate to represent the positions in which the economy actually finds itself, it represents nonetheless an useful abstraction to study the long-run tendencies of an economy, because capacity and long-period output have on average to be adequate to each other - otherwise, the system would be in a condition of perpetual disequilibrium[22]. However, what we have just said on the variability of capacity utilisation as a necessary condition for demand to play an autonomous role in driving growth, implies that the apparently less strict hypothesis according to which normal utilisation, though not being continuously realised, tends to be realised *on average*, also proves as inadequate as the steady state assumption to the study of the long-run tendency of capacity to adjust to demand.

What the above argument shows, indeed, is that the tendency of capacity to adjust to demand cannot manifest itself but through a variability of the degree of capacity utilisation, which implies that on average utilisation must necessarily be different from normal. If capacity must be adjusted to demand both in an initial situation characterised by a rate of growth g_a and, at the end of an hypothetical adjustment process, in another situation characterised by growth at a rate g_a' greater than g_a, capacity has to grow on average more than aggregate demand. Normal utilisation cannot prevail, even on average.

A model of growth which assumes average normal utilisation risks being as misleading as a model of growth that assumes continuous normal utilisation.

It must be noted here that the quantitative dimensions of the changes in the level of capacity, which would be needed to restore conditions of growth with normal utilisation, seem to be very relevant. Assuming, for example, a change in the rate of growth g_a from 0.05 to 0.06, and assuming α=2 and s=0.2, if normal utilisation were to be re-established immediately an increase in capacity and capital stock of 32.5% would be necessary; whereas corresponding to a subsequent decrease in the rate from 0.06 to 0.04, those aggregates would have to decrease by 30.7%. (This would obviously imply relevant changes in the sectoral composition of capacity.)[23] Such changes would only seem possible, even assuming perfect foresight on the part of the firms, after a long interval of time has elapsed.

---

[22] This is maintained in such different theoretical contexts and by such different authors as, for example,

[23] We are maintaining the very restrictive assumptions we made at the beginning, so that the calculations we propose here have no claim to realism. We only intend to show the possible order of magnitude of the changes required.

Even if we assume that a new steady-state path will eventually be attained (as we shall see later, this requires so restrictive hypotheses as to be highly unlikely) what here matters is that this adjustment can only take place through a succession of periods in which the existing productive capacity is necessarily over (under) utilised. Any *average degree of utilisation* calculated as an average of the actual degrees over an interval of time which includes even just a part of this phase of adjustment, will necessarily be different from the desired degree.

The analysis of *changes* in the rate of growth of demand will therefore lead us to consider the long-run *variability* of the degree of capacity utilisation as a necessary outcome of the tendency of the productive capacity to adjust to the trend of demand. This variability is not to be attributed to particular assumptions concerning the level of capacity inherited from the past or to the assumption of systematically incorrect expectations. Having assumed perfectly adjusted initial conditions and perfect foresight has not removed the need to consider the variability in average utilisation, once considering the effects of a *change* in the average growth rate of autonomous demand.

We may thus conclude that if we aim at studying growth starting from the Keynesian Hypothesis - i.e. assuming that it is saving that adjusts to an autonomously determined level of investment - and without calling into question distribution as a possible equilibrating mechanism between investment and saving, the full concidence between demand (output) and capacity cannot be assumed neither as a continuous nor as an average condition.

Before proceeding, it is perhaps worth precising that the same argument that we developed by comparing two different steady-state paths characterised by different growth rates could be recast in terms of the comparison between two different "fully adjusted" positions - with which expression we indicate, as in Vianello (1985), positions characterised by full adjustment between output and capacity - representing, respectively, the situation before and after a change in autonomous demand. Without asking, for the moment, whether such situations may actually be attained by the system, let us assume for the sake of the argument that this is the case. Starting then from an initial fully adjusted position, an increase in demand would generate a situation of overutilisation of capacity. Capacity would thus have to grow faster than demand for a certain period of time, during which the initial overutilisation would continue (the investment flows aiming at installing the greater required capacity would also have the effect, in each subsequent period, of expanding demand and output, with the consequence of making it necessary a still greater expansion of capacity if normal utilisation is to be restored). If we admit that in the end the system will again find itself in a fully adjusted position, we will however have observed a (presumibly long) phase of adjustment characterised by a systematic divergence between capacity and output - that is, not accidental divergencies in both directions, but divergencies, however transitory, always in the same direction (in the case just considered, we would observe a systematic overutilisation of capacity until full adjustment is restored). This means that any average value would reflect this divergence[24].

Fully adjusted positions represent but steady-state paths of instantaneous

[24] The divergence between the actual *average* rate of accumulation and the one described by the ratio between net investment and the stock of capital in the fully adjusted position was already noted by Vianello (1985).

duration, since in each fully adjusted position the propensity to save, the level of autonomous demand and the level of capacity output univocally determine the rate of growth that would be sustainable for the system in order to maintain normal utilisation. We can therefore define a fully adjusted situation by the warranted rate of growth it implies, even if it be realised just for a period. This means that to study the conditions in which the system can complete the adjustment from one fully adjusted position to another amounts to the same thing as defining the conditions in which the system may switch from one steady state to another.

To this question, i.e. whether the tendency of capacity to adjust to demand may be considered as a tendency that actually realises completely - a question which involves the analysis of the long-period determinants of investment - we will now turn.

2. *The conditions for the full adjustment of capacity to demand and the determinants of investment.*

Up to this point we have denied that the complete adjustment between demand and capacity may correctly be considered as characterising the long-run trend of the economic system either continuously or even on average. Yet, this does not amount to denying the analytical usefulness of the concept of full adjustment between capacity and demand - while it certainly amounts to denying any relation that finds its justification exclusively in the steady state assumption and that loses its validity outside the artificial hypotheses that define it.

But in order to correctly evaluate what may be the analytical role of the normal utilisation hypothesis, the first step is to try to establish what are the conditions in which the full adjustment of capacity to demand may effectively be attained at some point in time. If we could realistically assume that this tendency, despite not being the average situation in which the economy finds itself, operates so powerfully in the system that situations of full adjustment tend systematically to realise, then the theoretical positions characterised by normal utilisation would retain all their validity as “centres of attraction”, so to speak, of actual quantities; and the relations between variables that one can establish by making use of the normal utilisation hypothesis would somehow reflect the relations between actual variables. If, on the contrary, we should conclude that the tendency of capacity to adjust to demand cannot in general be considered so powerful as to actually realise full adjustment, we will have to consider a more general method to study the actual evolution of quantities in time.

The question of the effective attainability of full adjustment is strictly related to the question of the determinants of investment. Indeed, to state the tendency of capacity to adjust to demand is but a way of stating that investment decisions are taken for the sake of installing enough capacity to produce, in conditions of normal utilisation, the flow of output that demand justifies. “Demand” cannot but be *expected* demand, since the capacity creating effects of investment decisions will be felt in the future.

Let us now assume, for a moment, that to bring capacity into equality with expected demand is the only reason firms have to install (or destroy) productive capacity, i.e. let us assume that all investment (defining as “investment” all types of outlays that have a capacity generating effect) are induced by the trend of expected

demand. We will show that even in this restrictive hypothesis (since to assume that the only reason to invest is to adapt productive capacity to demand seems a way to neglect some other fundamental forces that act on investment, as we shall see later) it is very unlikely that the tendency to adjust capacity to demand will effectively realise in full.

2.1. *Investment as an induced phenomenon*.

To begin with, it seems worth trying to define with some more detail in what consists the process through which entrepreneurs are likely to react to changes in demand in order to adjust their capacity. The theoretical analysis of this question has been dominated by the notion of accelerator, and the discussion on accelerator, in its turn, has been dominated by Harrod's (1939) principle of instability. This instability, however, depends on the idea that entrepreneurs react to any change in the effective rate of growth - and thus to any over- or underutilisation of capacity - immediately taking investment or disinvestment decisions that take care of compensating this disequilibrium, but obtaining, by these very decisions, the opposite result of exasperating the initial over- or underutilisation. However, firms cannot be taken to react so mechanically to whatever disequilibrium they observe in their installed capacity. In the first place, it is likely that they will react only after they have had time to ascertain whether the observed change in demand be a transitory or a permanent one, since in the very definition of normal capacity utilisation being different for the technically maximum there is room for fluctuations in demand (see Ciccone, 1987; Bonifati, 1998). This means that other-than-normal utilisation has to be observed for a rather long period before it becomes a sufficient cause to take investment decisions; i.e. before it induces in entrepreneurs the expectation of future demand continuing to have a trend in the same direction.

Bonifati (1998, p.4) also notes that a very small change in actual and expected demand, however regarded as permanent, might not be sufficient to justify capacity adjustment. Firms may consider it more convenient to accommodate the change - say, a small permanent increase in demand - by using the already installed capacity, thanks to the wide margins of elasticity that they have programmed once taking the previous investment decisions.

What is perhaps more relevant is the fact that investment decisions are taken individually by firms, but what matters is their aggregate result. Different firms, for example, may correctly anticipate an increase in demand for the products of their sector, and even be quite accurate on its dimensions, but each of them may suppose to be able to satisfy the increase in demand increasing its own market share, which could induce in the aggregate to make much more investment than necessary[25]. Other situations may be imagined, and the fact the adjustment of capacity to demand also happens with new firms entering the sector (or old firms leaving it) makes the picture still more complicated.

We can then conclude that, in the first place, the very process of adjusting capacity to demand requires the degree of utilisation diverging on average from the normal one for a rather long interval of time before the need is felt by firms to adapt

[25] This means, obviously, that strategic decisions related to competition among firms inevitably enter investment decisions. The argument will be dealt with in paragraph 2.2.

their capacity - which confirms what we said in the previous paragraph about the impossibility of considering normal utilisation as the average condition of the system. In the second place, the process of adjustment cannot be considered as a mechanical one, because too many factors contribute to the final aggregate result; which means that any mechanical formulation of the tendency of capacity to adjust to demand - like the rigid accelerator - risks being grossly misleading a representation of the tendency itself. And, in the third place, the full realisation of the tendency of capacity to adjust to demand would require some sort of mechanism that guarantees that the investment decisions, although taken individually by firms, have in the aggregate the correct result.

Let us now turn to the conditions required for the full adjustment to actually take place, while keeping the hypothesis that investment is exclusively an induced phenomenon. We will look at the problem by stating the conditions for which the system can be deemed as capable of collocating itself on a new steady-state path after the initial steady-state situation has been disrupted by the change in a parameter, say the rate of growth of autonomous demand.

The following conditions seem to have necessarily to hold if that result is to be obtained[26]: in the first place, the new rate of growth of autonomous demand g_a' - as well as the old rate g_a - must be smaller than the ratio s/α between the propensity to save and the desired capital/output ratio. This, as we saw before, is a necessary pre-condition of existence of a steady-state path with normal utilisation. In the second place, firms must be capable of perfectly foreseeing the future levels and average rate of growth of autonomous demand, as well as the levels of all the variables that would correspond to such a growth rate along the steady-state path. Since each investment decision has capacity creating effects, and since the capacity so installed will last some time in the future, the effect of mistakes on the part of the firms would not be corrected easily. It is thus necessary that firms correctly anticipate both the pace at which autonomous demand will grow, and the effect of their own investment decisions and the investment decisions of other firms on aggregate demand (moreover, each firm has to correctly anticipate which share of the increased demand will direct towards its own products). The need of such perfect knowledge on the part of the firms finds its rationale in the fact that the complete adjustment may only take place (as we saw in paragraph 1.2) through a number of periods in which capacity grows faster than autonomous demand, which means flows of net induced investment higher that those compatible with normal utilisation of the already installed capacity - in other words, overutilisation for a number of periods. But firms must not be confused by this overutilisation, and have to know that, if aggregate demand is currently growing faster than it will, this is due to the phase of adjustment. That is, they have to distinguish between that part of the changes in the actual variables due to the adjustment process, and that which is due to persistent changes in the rate of growth of demand.

Now, it is only too apparent that such an assumption of perfect foresight is highly unrealistic, and that, as regards the first condition listed above, there seems to be no reason in principle why autonomous demand could not grow at an average rate higher than s/α. Yet, even if those restrictive conditions be warranted, they would not be sufficient. In addition to those, a third condition should be satisfied, that is to say, a particular - and quite unusual - mode of operation on the part of the firms should be

[26] The following analysis is largely based on Trezzini (1995 and 1998).

assumed. Once the necessary time has elapsed and the capacity necessary for the realisation of growth at the new rate g_a' with normal utilisation has been created (or destroyed), firms should reduce (or increase) singularly, and then in the aggregate, the levels of investment. This is a necessary condition to finally enter the new steady-state path, in which investment has to grow at exactly the same rate of growth of autonomous demand - and not at a higher (lower) one, as in the adjustment process. But the voluntary reduction (increase) in investment should occur despite the prolongation of the over (under-) utilisation and despite the fact that for each single firm it would be more profitable not to reduce (increase) investments at all. This supposed mode of operation does not seem compatible with either competition among the firms or with the decentralisation of investment decisions.

All these conditions imply that another fundamental condition has to hold in order for the adjustment to a new steady-state to be completed. The new rate of growth of autonomous demand, g_a', has to remain *constant* for the whole period required for the adjustment to take place. This is a necessary condition because only if the rate of growth of autonomous demand were constant could it guide the entrepreneurs' decisions and their behaviour during the long phase of adjustment. Should it change before the adjustment is completed, the above conditions could not be fulfilled because firms would have nothing certain on which to base their expectations and their investment decisions.

But, as already noted, the process of adjustment immediately appears as extremely long[27]. Thus, it is necessary to assume a extremely high degree of persistence of all the determinants of the trend of autonomous demand in order for the rate of growth g_a' to remain constant for such a long period.

The implausibility and arbitrariness of such a hypothesis will better be understood if one compares the conditions to establish such a constancy with those required for the definition of 'normal prices' around which effective (market) prices gravitate. It could in fact be maintained that there is some sort of symmetry between the concept of a constant trend of quantity variables and the concept of normal prices. But this analogy is far from accurate.

First of all, the existence of a 'normal value' of the rate g_a is not obvious in itself. A normal value of a variable can be conceived as a centre of gravitation of the respective actual values on grounds of specific theoretical reflection. In the theory of prices, the justification must be found of the property of normal prices to represent centres of gravitation for actual prices. Such justification lies, for example, in the force of competition that induces capitals to flow from one sector to another in pursuit of the maximum rate of return, and brings rates of profit to uniformity. Whereas, neither what we find in literature on the subject nor reflection induce to believe that the existence of a normal level of the rate g_a that is a centre of gravitation of the actual growth rates of the autonomous demand may be postulated. The complexity and variety of the forces driving the evolution of any autonomous component of aggregate demand suggest that the average value of the rate of growth g_a will emerge as an average, *ex-post*, magnitude from the actual oscillations of the variables. This seem to be quite a different

[27] It must be noted that, however arbitrary the unit of time considered, the process of adjustment may well be considered as "long", in the same sense that the period in which productive capacity is liable to change is long relative to the period of production with given equipment.

circumstance from that in which economic theory can precisely identify forces that drive the gravitation of actual magnitudes towards normal values independently determined.

In the second place, to assume gravitation of market prices around normal ones implies identifying some forces relatively more persistent than the other, accidental, ones that determine the incessant movement of the former. But this property of relative persistence has nothing to do with the assumption of constancy. This last assumption simply amounts to arbitrarily stating that the value of one variable does not change for a certain period of time. Relative persistence, on the contrary, implies not an arbitrary assumption but an analysis of the various forces influencing a variable in pursuit of the dominant ones. No analysis of this kind is to be found (nor, probably, *can* be found) about the forces that should in the long period prevail on the more erratic ones and force the rate of growth of autonomous demand to stay constant in time.

But the most important difference seems to be that, unlike the realisation of the full adjustment between demand and capacity, the process of gravitation of prices does not require in the least that the whole system be in conditions of equilibrium with the values of all variables adjusted to each other.

Let us suppose a change in one of the circumstances - say, the technical conditions of production - determining normal prices. In order for actual prices to gravitate towards the ‘new’ normal prices, no long process of investment seems to be necessary. As Garegnani (1979, p.137) argues, “when some of the producers have adopted the new method, the competition between them and those using the old method will generally be sufficient to make the new system of prices effective (that is to say, to ensure that actual prices will gravitate towards the new levels)”.

Gravitation does not require that the whole production actually takes place in the conditions according to which normal prices are defined. That is to say, it does not seem necessary, for an adjustment to normal prices to occur, that the entire productive capacity be adjusted to demand, that all firms adopt the dominant technique, or that in each firm in each sector wages are actually paid at the normal level. This implies that no assumption is necessary on the new conditions defining normal prices remaining constant for an indefinite period of time. But this also implies that normal positions retain their meaning as centres of gravitation of actual variables although the conditions defining them (such as the use of the dominant technique and the normal degree of utilisation) do not need to prevail in the whole economy.

The complete adjustment of capacity to demand, on the contrary, would require that, after a change in technical conditions of production or in the rate of growth of autonomous demand, no other change takes place until all producers have had time to entirely renew their capacity in order to use only the dominant techniques with the normal degree of utilisation in the whole economy. The patent lack of realism of such an assumption implies that it is unlikely to prove useful in the analysis of growth.

Finally, one should also consider that in order to define the conditions for a steady state we have to make a series of simplifying hypotheses, for example on the constancy of the propensity to save (in the simple case) or of the propensity to import and the tax rates (in the more complex cases), which are also unlikely to prove realistic, especially in specific phases of growth accompanied by structural transformations. Any change (even if of small entity) in one of these parameters would require the system to adapt to the changed conditions through a long adjustment process during which, again, all other circumstances have to remain constant for the full adjustment to actually take

place.

We can thus conclude that the conditions for which the tendency of capacity to adjust to demand may completely realise are so stringent that full adjustment has to be considered a very unlikely situation. This tendency should thus be correctly considered and studied as a fundamental force governing the process of capital accumulation, but not such as to completely realise, so that the correspondence between capacity and demand will always tend to be approximate.

2.2. *Investment as an autonomous phenomenon.*

All the previous argument was based on the assumption that investment is only induced by demand expansion. But, as soon as we begin to think of the forces likely to influence the decisions to invest in the long period, we see that to consider investment as exclusively determined by the tendency of capacity to adjust to demand, however loosely and non-mechanically this tendency is assumed to operate, inevitably implies neglecting some fundamental forces acting on accumulation and shaping its level as well as its forms. The most important of these forces seem to be technical change and competition among firms.

As said above, and as many economists including Keynes and Kalecki have stressed, the main characteristic of the analysis of investment is that investment decisions are taken by firms in an uncoordinated fashion. Firms make investment exactly to compete with other firms, to reap the higher profits that some sectors promise, to be first in adopting innovations that give them an advantage over the rivals, to increase their market shares at the expense of other producers. The sum of these individual decisions gives rise to an aggregate result, which is what matters in the analysis of growth, but entrepreneurs cannot be taken to invest for the sake of that aggregate result.

Competition may induce entrepreneurs to take investment decisions that are not induced and justified by the expected expansion in demand. Competition is, in the first place, the force through which prices tend to be brought to their normal level and the rate of profit tends to become uniform in all sectors of the economy, which happens through capitals moving from one sector to another in pursuit of the maximum return.

But competition is more than that: it is also the force that induces firms to change their methods of production and their products, or to enter new sectors - in other words, to innovate - in order to exploit new profit opportunities. And it is the force that obliges the non-innovative firms to react and to take investment decisions in their turn, if they are to survive[28]. Firms may make innovative investment even if the demand they face is stagnating - actually, they could even be said to have a greater stimulus to (at least some kinds of) innovative investment when demand for the products of the sector they are in grows slowly or declines, since in this case the ability to undertake innovative activity aimed at cost reduction may be the factor that determines who survives and who perishes.

However, it can be maintained more in general that innovative investment is not determined by demand expansion (neither aggregate demand nor sectoral demand). The

[28] For the innovative activity of firms, the obliged reference is Schumpeter (1934). For a penetrating analysis of the long-run determinants of investment, see Bonifati (1998).

new capacity installed by successful innovators will at least in part substitute for the capacity destroyed by the death of other firms, but the net effect is uncertain. True, if firms were to install capacity that in the long period proves in excess of that required and justified by the level of demand, the tendency of capacity to adjust to demand will set in motion in order to correct the discrepancy. But, as we saw before, this process of adjustment is by no means rapid, nor does it in the generality of cases completely realise.

The recognition that investment is not only aimed at adapting capacity to demand but also has different motivations reflects, in economic theory, in the concept of *autonomous* investment, and in the practice of building models - from Hicks (1950) on - where total investment is given by the sum of two components, an induced and an autonomous one[29].

This bipartition of the investment function is not without problems. It could be maintained that it is impossible to distinguish in practice the two components, and that the different motivations that induce firms to invest should more properly be seen as different motivations behind the same investment act rather than as causes of different investment decisions. To make an example, if an entrepreneur decides to buy some new equipment which incorporates a new technique, he will establish the size of his investment according to the demand he expects to face (which, in turn, depends not only on the expected evolution of sectoral demand and on his current market share, but also on the market share he presumes to be able to steal from his rivals). He cannot but aim at installing the "right" amount of capacity, i.e. the capacity that if normally used exactly equals expected demand. Under- or over-utilisation of the new capacity so installed cannot *voluntarily* be chosen, since any desired capacity excess would already be incorporated in the very concept of normal utilisation. Thus, we can conclude, the same act of investment is liable to be interpreted both as an innovative investment and as an investment induced by demand.

Despite the difficulty (or, perhaps, the impossibility) of distinguishing in actual investment flows the autonomous component from the induced component, the idea remains that to build productive capacity in order to meet expected demand does not represent - on examining the firms' behaviour - the only reason to take investment decisions.

Yet, if normal utilisation is assumed either as the persistent or the average situation of the system, or even if growth is analysed in terms of the movement from one fully adjusted path to the other, the additional conceptual difficulty arises that there seems to be no place in the analysis of growth for a kind of investment that is not demand-induced. If normal utilisation has to be restored after any change (and for this to happen, as we saw before, many restrictive conditions - among which perfect foresight - have to be satisfied), all investment decisions must be justified by the expansion of demand. In case some investment decisions are taken by firms for any other reason than that, induced investment has to take care of filling the gap between the "unjustified" new capacity so installed and the capacity made necessary by demand expansion - another way of saying that total investment must be considered as induced.

---

[29] For the following analysis on the concept of autonomous investment we owe much to the stimulus of Serrano (2001) and Cesaratto, Serrano, Stirati (2002), although the conclusions they reach are diametrically opposed to ours.

Or, one could adopt a much more restrictive definition of autonomous investment, according to which it has to be seen as "purely technological" investment[30]. With this we would understand any firms' outlays that aim at changing the current methods of production or at introducing new products but make so without affecting the level of productive capacity. Autonomous investment should not have capacity generating effects - it should be on the same level as autonomous consumption, or exports, or government expenditure: a source of aggregate demand with no capacity effects.

This hypothesis is obviously analogous to the previous one, and both amount to assuming that no influences other than the expansion of demand act on investment decisions in the long period.

However, once we realise, according to the previous analysis, that normal utilisation is neither the persistent nor the average situation in which the system finds, and even that in the generality of cases no mechanism guarantees the complete realisation of full adjustment, the necessity disappears of neglecting, in the analysis of investment, the other fundamental forces that affect it, apart from the expansion of aggregate demand.

Investments that are not justified by demand expansion - such as innovative investments - happen all the time, and have both capacity effects and demand effects. The stimulus that comes from competition and innovation interacts with the need or desire on the part of entrepreneurs to adjust capacity to demand, in determining the amount of investment firms undertake. After some time has elapsed, it will always be possible for the single firm to evaluate if the single investment decision was really justified. But, in the meantime, the sum of these individual investment decisions has had aggregate effects, and has also changed the very conditions on which the adequacy of the single investment decision has to be assessed.

We can recall that at the very beginning of our analysis, on analysing the steady growth assumption, we chose not to make hypotheses on the investment function in order not to find them in contrast with the steady state assumption itself. Now we can argue, more in general, that the normal utilisation hypothesis contrasts with the notion that investment is also an autonomous phenomenon.

However, to be obliged to adopt a restrictive definition of investment, or, rather, a partial definition of its causes, is not the only shortcoming of an analysis of growth in terms of the movement from one fully adjusted path to another - as we shall see shortly.

3. ***On the long-period relation between autonomous demand, investment and output.***

If a process of growth is to be analysed in terms of fully adjusted paths, there are some relations between variables that have to hold. We will here examine some of these relations, notably those between the rate of growth of output, the share of investment and autonomous demand. While such relations do not seem to conform in reality to the normal utilisation hypothesis, we will argue that they are better studied by making use of a more flexible theoretical structure, in which the tendency of capacity to adjust to

[30] The same concept already referred to in par. 1.1 and used, for example, in Serrano (1995).

demand is one factor that operates among many.

3.1. *The implausibility of full adjustment*.

Needless to say, the presumption that real processes of growth can be represented as if real economies actually followed a secular steady-state path along which all variables grow at a constant rate is rather unrealistic, and finds no possible confirmation in data, unless one smoothes away whatever observed variation by means of very long-period *ex-post* averages and assumes - without proving - that these secular average values are steady-state values[31]. Rather, a model with normal utilisation may prove useful in the analysis of real processes of growth if one could describe the changes in the relevant variables by means of the comparison between two different steady-state paths, one representing the initial situation and the other the situation in which the system ends after a transitory phase of adjustment.

When normal utilisation prevails, there are some relations we expect to find between autonomous demand, the rate of growth of output and the share of investment in output. Assuming the system starts from a fully adjusted path, and provided there are no changes in the desired capital/output ratio, in the propensity to save, and in other parameters such as the propensity to import, etc., any increase - say, a doubling - in the rate of growth of autonomous demand, results, in the new fully adjusted situation, in a doubling of the rate of growth of output, a doubling of the share of *net* investment in output, a decrease in the share of autonomous demand. During the adjustment process, when the greater capacity has to build, net investment has to represent an even higher share of output (the higher the shorter the duration of the adjustment process).

There is no way, of course, to find any clear confirmation or refutation of these relationships in actual data. No data are generally available on net investment (due to the conceptual difficulty of distinguishing in actual investment flows the part that reintegrates from the part that enlarges productive capacity), nor the constancy of the depreciation rate can safely be assumed (although virtually all empirical analyses make such an assumption)[32]. Moreover, the rate of growth of output, as well as that of its various components, varies continually, and any average value calculated over a number of years contains the inevitable arbitrary element of the choice of the interval. The concept of autonomous demand is a theoretical one, and no simple correspondence is to be established between it and any of the empirical aggregates defined and calculated in national accounts (for example, there is no simple way to give an empirical content to the concept of autonomous consumption). The other parameters we assumed as constant may well vary during specific growth episodes.

Yet, the changes in the net investment share, which the model with normal utilisation predicts are such big variations that, they have somehow to show in data. That is why, bearing all the above limitations in mind, we will nonetheless review some of the empirical regularities (or non-regularities) the applied literature of the last

[31] It might be surprising to note how often it is maintained that average ex-post values, if calculated on a span of sufficient length, are steady-state values. For just an instance, see Romer (1989, p. 60).

[32] While an empirical analysis of the variability of the depreciation rate would run into enormous conceptual difficulties, it seems impossible to neglect its existence, and to note that some specific phases of accumulation are particularly characterised by the brusque acceleration in the rhythm of substitution of new capacity for old.

decades has pointed at[33].

On the relationship between growth and the investment share there is a quite large body of literature, since it has been a crucial element of the debate between "old" and "new" theories of growth within the supply-driven approach (see, just for a few examples, Romer, 1989; Mankiw, Romer and Weil, 1992; Levine and Renelt, 1992). Unsurprisingly, the cross-country association between the two variables[34] is much less robust than it appears at first sight, since it seems to hold only for subgroups of high and middle-income countries (Romer, 1989, p. 60-2) and to depend heavily on the presence in the sample of the fast-growing East Asian countries, which in the period from the 1960s to the mid 1990s show the highest values of both variables (Carrol and Weil, 1994, p.149)[35]. Indeed, too many parameters influence the absolute level of the gross investment share, to think that the international differences should be wholly explained by the differences in growth rates. Much more meaningful, for the issue at hand, is to analyse changes in time within each country. Tests of causality based on time observations have shown that increases in the rate of growth tend to precede with some regularity increases in the share of gross investment (Carrol and Weil, 1994; Blomström, Lipsey and Zejan, 1996)[36].

This result - which, as may be incidentally noted, poses more than one problem to supply-driven theories of growth, according to which the inverse sequence should be expected[37] - may be taken to show the effect of a higher rate of growth of demand on the creation of new capacity, i.e., to show the operation of the tendency of capacity to adjust to demand[38], especially if taken together with De Long's and Summers's (1991) well-known result, according to which the component of investment which appears as more

---

[33] Some of the empirical findings we discuss result from cross-country regressions or similar techniques, in which economies very different for size, level of development, institutions and history, are treated as comparable numerical observations in a data set. It is barely necessary to remember that the findings associated with these techniques should always be considered with circumspection, however wide is the consensus in the literature on some of them.

[34] The correlation is between the *gross* investment share and the rate of growth. We have to notice that in these applied works the measures of growth are sometimes the rate of growth of output per capita or of output per worker, rather than that of total output. Thanks, however, to the close statistical association between the three measures of growth in the period covered by data, any of the three can be taken, for our purposes, as generically representing growth.

[35] The correlation studied by Carrol and Weil (1994) is that between the rate of growth and the share of gross *saving* rather than investment; but the two shares are highly correlated.

[36] In both works, causality tests of the Granger type are conducted by using five-year average values. The variable considered by Blomström, Lipsey and Zejan (1996) is the gross fixed investment share.

[37] The sequence from higher growth to higher investment and saving share is hard to reconcile with the strong theoretical presumption that it is an autonomous increase in the propensity to save and in the accumulation of capital that induces an increase in the rate of growth (either permanent, like in "new" growth theories, or transitory, as in a Solow-type model). This is why Carrol and Weil (1994, p.147) define their own result as "surprising". And also very surprising is for them to find that the saving share seems, if at all, to Granger-cause growth with a *negative* sign (the result is also confirmed in Podrecca and Carmeci, 2001). The issue is dealt with in Palumbo (1996).

[38] Although easily in accordance with the demand-led approach, this result is incompatible with a theory of the neo-Keynesian type, where the rigidity of output with respect to normal capacity implies the need for the investment share to rise (and for the consumption share to decrease) at the very beginning of a phase of faster growth, i.e. the need to devote a greater share of output to accumulation if accumulation is to rise at all. The idea that investment may rise without compressing consumption at the start of a growth process is only compatible with a degree of capacity utilisation that varies, at least transitorily (see Garegnani and Palumbo, 1998, par. 3).

strictly associated with growth is equipment investment - the empirical variable that might be considered as nearest to the notion of investment in capacity[39].

However, to maintain that the tendency of capacity to adjust to demand somehow shows in data is quite different from maintaining that the relations we observe correspond to the relations we should expect between the same variables if normal utilisation prevails.

Both the fact that there are exceptions to the general pattern according to which a change in growth rates tends to bring about a lagged change of the same sign in the investment share, and the fact that the observed variations in the investment share are often of relatively small entity, induce to think that what we are observing is a tendency that works together with other tendencies (which may at times overwhelm it) rather than a powerful mechanism which always brings full adjustment into realisation.

A couple of examples may help make our point. In each of the main advanced economies during the 1980s the average rate of growth of output was about one half that of the 1960s and the early 1970s (see table 1). The shares of equipment and of total investment showed between the two periods an absolute constancy or even a small increase in two of the six countries considered in the table (US and Japan); a very marginal reduction in other two (France and UK) and a relevant decrease only in two cases out of six (Italy and Germany). Even in these last two cases where the variations were bigger, it would be implausible to maintain that the *size* of the reduction conforms to theoretical expectation. Let us suppose that the average values of the initial period, 1960-75, could somehow be considered as describing a fully adjusted initial position; and let us assume a 0.04 depreciation rate and a normal capital/output ratio equal to 3 in Italy and to 3.5 in Germany. With these values remaining constant, and with the observed average rate of growth of output declining from 5% to 2% in Italy and from 4.5% to 2% in Germany, in the second period we should observe a gross investment share at 18% in Italy and 21% in Germany, if the values of the second period had to be interpreted as new adjusted values[40]. Both expected values are about 4 percentage points

---

[39] What De Long and Summers (1991) establish is a cross-country correlation between the rate of growth of output per worker and the share of equipment investment in GDP at constant prices. The authors conduct some causality tests and tend to dismiss the possibility that the direction of causality goes from growth to the equipment share on grounds that do not seem very firm. The main argument they use has to do with equipment prices. They observe that the fastest-growth economies show lower prices of equipment relative to the general price level. They interpret this fact as a sign that the increase in equipment investment may not have been induced by demand, otherwise we would observe an increase in its relative price. However, one can observe that prices of capital goods, and especially of certain types of equipment, have historically shown a strong downward trend: although this obviously shows, as De Long and Summers argue, a change in supply conditions depending on technical progress (one type of technical progress that apparently acts more on the conditions of production of capital goods than on those of consumption goods), it would be possible to admit that at least two different forces act on equipment investment - the increase in its absolute quantity and in its share in output, due to the tendency of capacity to adjust to demand, and the decrease in its price, due to technical progress. Besides, where growth was higher and the demand for new investment goods stronger, the faster substitution of new (cheaper) for old equipment might have led to a faster decline in the average prices on capital goods. The authors' thesis, moreover, seems to be confuted by their own finding that one component of equipment investment, i.e. electrical machinery, is more associated with growth but another, non electrical machinery, is the one whose price is lower in fast-growing economies.

[40] According to the formula $I/Y=K/Y(g+\delta)$, where I is gross investment, Y output, K the capital stock, g the growth rate and δ the depreciation rate (applied to the stock of capital).

lower than the observed ones.

The argument is of course stronger for the other four cases above, in which the observed reduction in the growth rate was accompanied either by a small reduction in the investment share or even by its constancy.

The cases of Japan and United States are particularly interesting when extending the observation to the 1990s: while in the 1960s, 1970s and 1980s the fact that the investment share was in Japan systematically much higher than in the US could be explained (and was explained)[41], by the fact that also the rate of growth of output was systematically higher, the still much higher - though declining - investment share of the 1990s is hardly attributable to the same cause, given the stronger growth that US has experienced in the 1990s if compared with Japan.

The possibility remains, of course, of reconciling theory and evidence by assuming either that some of the observed values are not steady-state values (but, rather, capture a phase of adjustment), or that some of the parameters we assumed as constant actually changed. In other words, since the values observed and described above are necessarily to be explained by some variations in the actual capital/output ratio, either one assumes that this is a transitory divergence between the actual and the normal one - which implies that observed output, even though being a ten-year average, is not normal capacity output - or one assumes that the *normal* capital/output ratio changed between the two periods. In the first case we must at least admit that some of the average values we observe do not represent normal values, with the additional difficulty that there is no way in principle to distinguish between normal and non-normal values when looking at the average observed ones. In the second case we should suppose that the normal value of the capital/output ratio (which we would arbitrarily infer *ex post* from the observed values of the rate of growth and the investment share) tends to change practically every time the rate of growth of output changes. In both cases one may wonder what is the relevance of steady states for empirical analysis (and we made no mention of the big variation needed in the share of net investment - and consequently in the observed share of gross investment - in order to pass from one steady state path to another. Needless to say, there is no trace in data of such big variations).

Some great variation in the normal capital/output ratio seems, however, to necessarily take place in developing countries going through a process of industrialisation, due to the increase in the average ratio between fixed capital and output that the growing weight of modern sectors at the expense of backward traditional ones is bound to bring about[42]. Thus, due to the growing necessity for reintegration per unit of output, the increase in the gross investment share associated with the increase in the growth rate in this case should be much bigger than that calculated with a constant capital/output ratio. While for the Asian NICs such a big rise in the investment share is actually observable in the post-war decades, the rise was instead extremely modest in other developing countries also experiencing fast growth, such as Turkey and Chile, where the share seems, according to Rodrik's (1995) analysis, to have even remained constant for much of the post-war period.

As for the trend of autonomous demand and its share in output, it is very

[41] This is implicit, for example, in Romer's (1989) calculations of the steady-state capital/output ratio in the two countries.

[42] Urbanisation is another phenomenon, usually taking place together with industrialisation, which is likely to raise the average fixed capital/output ratio of the economy.

difficult, as we remarked before, to give an empirical content to this notion. There is however much literature on exports and growth, some of which may be worth quoting since one can safely assume that exports are a component of autonomous demand[43]. The evidence from cross-country analyses is in this case even less informative, as one could easily expect. While there seems to be a positive correlation between the growth rate of exports and the growth rate of output (see Tyler, 1981; Romer, 1989, p. 66), only a very weak positive correlation may be established between the share of exports and the rate of growth of output (see Levine and Renelt, 1992; Harrison, 1996)[44]. This is not surprising, given that the data on different countries reflect very different experiences, and very different roles for exports in the accelerating-growth phases (not to speak of the role of other components of autonomous demand other than investment, of which no mention is made here). What matters here, however, assuming that exports somehow represent autonomous demand, is the lack in data of the supposed inverse relation between the share of exports and the share of investment when the rate of growth accelerates.

The same thing may be observed in specific historical cases, such that of some East Asian countries like Korea and Taiwan, where the acceleration in growth was accompanied by an increased rate of growth of exports, a dramatically rising share of investment, and also a dramatically *rising* share of exports (in Korea, it passed from 3% in the early 1960s to above 30% in the 1990s); while in other countries like Japan, even though the high growth of the 1960s, 1970s and 1980s is also associated with high rates of growth of exports and with the progressive expansion of the country's share in world trade (similarly to what happened for Korea)[45], the export share has been roughly constant for the whole post-war period, being always between 9 and 12%, and, we may note incidentally, around 10% both in the high-growth 1960s and in the stagnating 1990s[46]. Both the constancy of the export share in Japan and its enormous growth in Korea contradict, at least at first sight, what could be expected from a theoretical analysis based on the normal utilisation hypothesis, according to which, as we saw above, the autonomous demand share in output should decrease to accommodate the increase in the investment share that takes place because of the adjustment of capacity to demand.

Thus, the full adjustment hypothesis does not prove particularly useful to predict the empirical regularities. This should not surprise, assuming our previous theoretical analysis was correct. Of course, stating the irrelevance of steady states does not amount to denying the necessity of theoretical analysis to explain the phenomena of growth. We

---

[43] Much of the empirical literature on exports and growth deals with the supposedly positive effects of openness on growth. The exports share is often used as a proxy for openness, given the difficulty of constructing reliable indicators on trade restrictions. Perhaps it would be more accurate to say that the observation of the successful process of development of some Asian countries, all of them characterised by high and growing exports shares, has induced some authors to justify this historical experience, in accordance with the precepts of neoclassical theories, in terms of gains from trade induced by greater openness. See for example Balassa (1988) and Krueger (1995); and for a critical survey Palumbo (1999).

[44] In Michaely (1977) and in Kormendi and Meguire (1977) a positive association is found between the rate of growth and the *change* in the share of exports. Both studies cover the period from the 1950s to the early 1970s. Also this result, however, is far from robust.

[45] Of course, the two countries were competing at an altogether different technological level, much lower for Korea that at the time mainly exported the products of light industry.

[46] Data from OECD, *Main Economic Indicators*, december 2000.

need some sort of theoretical hypothesis that may help explain why the investment share in some cases rises dramatically and in other cases stays constant or changes by relatively small amounts, when the rate of growth accelerates; and also what factors influence its absolute level making it so different for different countries; and what are its relations with the share of exports and with the other variables.

The set of empirical regularities to be explained enlarges if one extends the period of observation, since, as noted by Maddison (1992), there seems to be some sort of "secular" pattern - for most though not all countries - according to which the gross investment share grows from the very low levels (around 5%) of pre-industrial times to values above 20-25% in advanced economies, to subsequently decrease slightly[47]. The exception to this general pattern is represented by the United States, where according to the data elaborated by Kuznets (1946) the investment share shows a remarkable long-term constancy.

Lastly, the theoretical structure we need must be such as to easily deal with the deep structural changes that seem to be at the heart of the observed experiences of growth - at least for what concerns the developing countries going through industrialisation.

3.2. *The necessary flexibility of the relation between autonomous demand and output*.

Any model of growth which embodies the assumption of normal capacity utilisation proves inadequate to the above-stated theoretical need. In such a model, the relation between autonomous demand and output cannot but be a rigid one, since the amount of investment which is induced by the growth in autonomous demand is exactly determined, as we saw in par.1, by the condition that normal utilisation be restored. At the same time, such a model cannot easily deal with changes in parameters. As we argued in par. 2, after a change has taken place in the economy, very "tranquil" conditions should prevail for a time sufficient to allow the system to attain a new steady state. Since this cannot be the case, and since other changes are bound to occur, the relations of the model are not useful to predict the actual relations between variables[48].

The problem lies in the idea that a simple quantitative relation may be established in the long period between autonomous demand and output, similar to the short-period Keynesian multiplier. Once analysing the long period, the capacity creating effect of investment has to be taken into account, so that this relation should synthesise both the effect of each component of autonomous demand on induced consumption, and the effect of variations in output on the investment decisions of firms aiming at creating or destroying capacity - plus the interactions between the two effects.

To represent this relation by means of a supermultiplier amounts to assuming that real economies are always in those very particular conditions in which the two effects of investment are exactly, so to speak, 'balanced' and thus neither excesses nor shortages of capacity occur.

---

[47] Maddison's (1992) study covers Australia, Canada, France, Germany, India, Japan, Korea, Netherlands, UK, USA and Taiwan.

[48] As we hope to have shown with the previous analysis, the problem does not lie in the fact that some accidental forces prevent the system from ever actually being in a fully adjusted position, but in the fact that the forces that contrast the tendency to full adjustment have the same nature - and thus, possibly the same strength - of the tendency itself.

On the contrary, our previous analysis suggests that the tendency of capacity to adjust to demand, though continually at work, has no time to realise completely before a new change takes place and changes the quantity and quality of capacity that should theoretically be built in order to conform to the new situation. Moreover, on considering some results of the empirical literature, we could detect in data nothing more than the continuous operation of the tendency, with no trace of the relations that full adjustment would imply.

If one avoids the rigidity of the supermultiplier - thus recognising that investment, though being the means through which the creation of capacity takes place, and so necessarily depending somehow on output - retains, in the long period, also its autonomous nature and its independence of saving and of the current level of income, the possibility of establishing any simple quantitative relation between autonomous demand and output disappears. No simple formalisation may be attained of a relation into which so many different factors enter.

In addition to that, any rigid relation such as the supermultiplier implies the idea that the various components of autonomous demand have all the same quantitative effect both on the multiplicative process and on investment decisions, while it is likely that changes of the same size but of different nature - say an autonomous increase in consumption and an increase in exports - have different effects. Data seem also to suggest that the *same* factor may have different effects in different conditions (i.e. in different countries or in different periods in the same country).

The long-period relation between autonomous demand and output cannot but be a very flexible relation, with both the effect of autonomous demand on induced consumption (the multiplier) and the effect of changes in output on the creation of capacity (what is traditionally called the 'accelerator') being subject to the influence of a number of factors which may differ according to the level of development and the characteristics of the specific growth process.

We have already noted, for example, that for economies going through industrialisation one parameter that is certainly liable to change is the average capital/output ratio of the economy, given the greater weight that fixed capital is bound to assume relative to the pre-industrial structure. This implies a greater effect of each unit variation in autonomous demand on the desired amount of investment aimed at installing capacity[49].

Another factor which is liable to widely vary across economies – and also to change within a single economy during the growth process – is the share of new demand both for consumption goods and for capital goods that directs towards foreign markets. Looking at data one may easily recognise actual economies that, either for lack of raw materials or for their low initial technological level or for the sheer lack of some productions, had to depend heavily on foreign technology and capital goods for the needs of industrialisation (East Asian countries such as Taiwan and Korea may be cases in point). This gives rise to a high import content of the productions of modern sectors, and to a greater import content of the whole production, the greater the share of the modern sector in total production becomes. A high (or growing) propensity to import

[49] For this kind of phenomenon, it is likely that economies with a greater share of manufacturing in total output – and with a greater share of heavy industry – tend to have a greater share of gross investment in output with respect to other economies with larger shares of agriculture or services.

gives rise to a comparatively small (or decreasing) multiplicative effect of autonomous demand on final output, and may go some way towards explaining the great rise in both the investment share and the exports share that we may observe in the above named Asian countries (and may explain its low level and its constancy in Japan, an economy capable of producing internally most of the required capital inputs).

Similarly, empirical and historical analysis leads to recognise patterns of development based to a different extent on the expansion of the domestic market, so that one might conclude that the overall effect of a change in autonomous demand on output will be greater the greater the marginal propensity to consume and the greater the ability to produce domestically the goods required by consumers. A greater propensity to consume, we may note, implies a comparatively smaller share of investment and other autonomous demand in output, which may help explain the observed patterns of these variables in US history. What matters here is that the change in a particular source of autonomous demand may have a different impact on these parameters and make them change during specific phases of growth (as, for example, it happens when the introduction of new goods alters the economy's propensity to consume).

These and other factors cannot be assumed away when studying the relation between autonomous demand and output. They are not different phenomena, liable to a separate analysis: they are some of the different forms that this relation takes in the real processes of growth.

Table 1
Rates of growth of total GDP, share of gross investment and of equipment investment in GDP in selected countries. 1960-1985.

	1960-75			1975-85		
	g	gross inv	equip	g	gross inv	equip.
France	4.7	27	8.1	2.3	25	7.6
Germany	4.5	30	9.1	2.0	25	7.5
Italy	4.9	27	7.2	1.9	22	5.9
Japan	8.9	35	11.3	3.8	37	11.9
UK	3.0	19	7.4	1.6	16	6.3
US	3.8	21	7.7	2.4	21	7.6

Source: OECD, various publications; De Long and Summers (1991, appendix IV).
GDP at constant prices, average annual rates of growth. Gross investment share and equipment share at constant prices.

Amadeo, E. J. (1986a), "The Role of Capacity Utilisation in Long-Run Analysis", *Political Economy* vol.2 n.2

Amadeo, E. J. (1986b), "Notes on Capital Utilization, Distribution and Accumulation", *Contributions to Political Economy*.

Amadeo, E. J. (1987), "Expectations in a Steady-State Model of Capacity Utilisation", *Political Economy* Vol. 3 No. 1

Auerbach, P. and Skott, P. (1988) "Concentration, competition and distribution", *International Review of Applied Economics*, vol.2, no.1

Balassa, B. (1988), "The Lessons of East Asian Development", *Economic Development and Cultural Change*, XXXVI, 3, (Supplement) pp. S273-s290.

Blomström, M., Lipsey, R.E., Zejan, M. (1996), "Is Fixed Investment The Key to Economic Growth", *Quarterly Journal of Economics*.

Bonifati, G. (1998), "The capacity to generate investment", paper presented at the Conference *Sraffa and Modern Economics*, Rome (Italy), October.

Bortis, H., (1997) *Institutions, Behaviour and Economic Theory – A Contribution to Classical-Keynesian Political Economy*, Cambridge: Cambridge University Press.

Carrol, C.D. and D.N.Weil (1994), "Saving and growth: a reinterpretation", *Carnegie-Rochester Conference Series on Public Policy*, 40, pp.133-192.

Cesaratto, S., Stirati, A., Serrano, F. (2002), "Technical change, effective demand and employment", *Review of Political Economy* (forthcoming).

Chenery, H., Robinson, S., Syrquin, M. (1986), *Industrialization and Growth. A Comparative Study*, New York: Oxford University Press for the World Bank.

Ciampalini, A., and Vianello, F. (2000), "Concorrenza, accumulazione del capitale e saggio del profitto. Critica del moderno sottoconsumismo", in M. Pivetti (ed.), *Piero Sraffa*, Roma: Carocci.

Ciccone, R. (1986), "Accumulation and Capacity Utilization: Some Critical Considerations on Joan Robinson's Theory of Distribution", *Political Economy, II*, 1, pp.17-36.

Ciccone, R. (1987), "Accumulation, Capacity Utilisation and Distribution: A reply", *Political Economy*, Vol. 3 No. 1

Committeri M. (1986) "Some Comments on Recent Contributions on Capital Accumulation, Income Distribution and Capacity Utilization" *Political Economy* vol.2 n.2

Committeri M. (1987) "Capacity Utilization, Distribution and Accumulation: a rejoinder to Amadeo" *Political Economy*, Vol. 3 No. 1.

De Long, J.B. and Summers, L.H. (1991), "Equipment Investment and Economic Growth", *Quarterly Journal of Economics*, 445-502.

Garegnani, P. (1978-9). Notes on consumption, investment and effective demand, *Cambridge Journal of Economics*, II, 4, pp. 335-354, and III, 1, pp. 63-81.

Garegnani, P. (1979), "Cambiamenti e paragoni", in *Valore e domanda effettiva*, Torino: Einaudi.

Garegnani, P. (1992), "Some Notes for an Analysis of Accumulation", in J.Halevi, D.Laibman, E.Nell (eds.), *Beyond the steady-state*, Basingstoke & London: Macmillan.

Garegnani, P., Palumbo A. (1998), "Accumulation of Capital" in *The Elgar Companion to Classical Economics* (edited by Kurz, H.D. and Salvadori, N.), Aldershot: Edward Elgar.

Harrison, A. (1996), "Openness and growth: A time-series, cross-country analysis for developing countries", *Journal of Development Economics*, XLVIII, pp. 419-447.

Harrod, R., (1939), "An essay on dynamic theory", *Economic Journal*, March.

Hicks, J. R. (1950), *A Contribution to the Theory of the Trade Cycle*, Oxford: Clarendon Press.

Kahn, R. (1959), "Exercises in the Analysis of Growth", *Oxford Economic Papers*, XI, 2, pp. 143-156.

Kaldor, N. (1955-6). Alternative Theories of Distribution, *Review of Economic Studies*, XXIII, pp. 83-100.

Kaldor, N. (1957), "A Model of Economic Growth", *Economic Journal*.

Kaldor, N. (1970) "The case for regional policies", in *Further essays on economic theory. Collected economic essays, vol. 5*, London: Duckworth, 1978.

Kaldor, N. (1981), "The role of effective demand in the short run and the long run", in *Further essays on economic theory and policy. Collected economic essays, vol. 9* (edited by F. Targetti and A. P. Thirlwall), London: Duckworth, 1989.

Kormendi, R. and Meguire, P. (1985), "Macroeconomic determinants of growth. Cross-country evidence", *Journal of Monetary Economics*, XVI, pp. 141-163.

Krueger, A. (1995), "The Role of Trade in Growth and Development: Theory and Lessons from Experience", in *Sustaining Export-Oriented Development. Ideas from East Asia* (edited by R.Garnaut, E.Grilli, J.Riedel), Cambridge: Cambridge University Press.

Kurz, H. (1986), 'Normal Positions' and Capacity Utilisation, *Political Economy, II*, 1.

Kurz, H. (1990) Accumulation, Distribution and the "Keynesian Hypothesis", in *Essays on Piero Sraffa* (eds. K. Bharadwaj, B. Schefold), London: Unwin Hyman.

Kuznets, S. (1946), *National Product Since 1869*, New York: Arno.

Lavoie M. (1995) "The Kaleckian model of growth and distribution and its neo-Ricardian and neo-Marxian critiques" *Cambridge Journal of Economics*, 19.

Lavoie M. (1996) "Traverse, Hysteresis and Normal Rates of Capacity Utilization in Kaleckian Models of Growth and Distribution" *Review of Radical Political Economics*, 28

Levine, R. and D.Renelt (1992). A Sensitivity Analysis of Cross-Country Growth Regressions, *American Economic Review*, LXXXII, 4, pp.942-963.

McCombie, J.S.L (1985), "Economic growth, the Harrod foreign trade multiplier and the Hicks' super-multiplier", *Applied Economics*, 1985, XVII, pp. 55-72.

McCombie, J.S.L, and Thirlwall, A.P. (1997), "The Dynamic Harrod Foreign Trade Multiplier and the Demand-orientated Approach to Economic Growth: an evaluation", *International Review of Applied Economics*, XI, 1, pp. 5-26.

Maddison, A. (1992). A Long-Run Perspective on Saving, *Scandinavian Journal of Economics*, XCIV, 2, pp.181-196.

Mankiw, G., Romer, D., Weil,

Man-Seop Park (1997) "Accumulation, Capacity Utilisation and Distribution" *Contributions to Political Economy* Vol. 16

Michaely, M. (1977), "Exports and growth. An empirical investigation", *Journal of Development Economics*, IV, pp. 49-53.

Palumbo, A. (1996), "Notes on investment, saving and growth", *Contributions to Political Economy*, XV, pp. 105-115.

Palumbo, A. (1999), "Some remarks on exports and economic growth", *Studi Economici*, 67.

Palumbo, A. (2001), "Are Exports a Source of Growth? Some Theoretical Issues Raised by Empirical Analysis", in *Sraffa and Modern Economics* (edited by R.Ciccone, C. Gehrke, G.Mongiovi), London: Routledge (forthcoming).

Robinson, J. (1962). *Essays in the Theory of Economic Growth*, New York, St Martin's Press.

Robinson, J., (1956) *The Accumulation of Capital*, London.

Rodrik, D. (1995), "Trade strategy, investment and exports: another look at East Asia", CEPR, Discussion Paper Series, no. 1305, november.

Romer, P. (1989), "Capital Accumulation in the Theory of Long-Run Growth", in *Modern Business Cycle Theory* (edited by R.Barro), Cambridge Mass.: MIT Press.

Rowthorn, B. (1981), "Demand, real wages and economic growth", *Thames Papers in Political Economy* Autumn, reprinted in *Studi Economici*, vol. 18, 1982, (3-54) and also in M.C. Sawyer (ed.) Post-Keynesian Economics Aldershot, Edward Elgar

Schumpeter, J.A. (1934), *The Theory of economic development*, repr. Oxford University Press, 1961.

Serrano, F. (1995), "Long period effective demand and the Sraffian supermultiplier", *Contributions to Political Economy*, XIV, pp. 67-90.

Serrano, F. (2001), "Accumulation and 'Unproductive consumption' in the Development Literature: A Classical Supermultiplier Analysis", UFRJ mimeo, published in portuguese in *Polarização mundial e crescimento* (eds. J. Fiori and C. Medeiros), Editora Vozes, Petropolis (Brazil).

Solow, R. (1956). A Contribution to the Theory of Economic Growth, *Quarterly Journal of Economics*, LXX, pp.65-94.

Steindl, J. (1952). *Maturity and Stagnation in American Capitalism*, Oxford, Basil Blackwell.

Thirlwall, A.P. (1979), "The balance of payments constraint as an explanation of international growth rate differences", *Banca Nazionale del Lavoro Quarterly Review*, 128, pp. 45-53.

Trezzini, A. (1995), "Capacity utilisation in the long run and the autonomous components of aggregate demand", *Contributions to political economy*, XIV, pp. 33-66.

Trezzini, A., (1998) "Capacity Utilisation in the Long Run: Some further Considerations" *Contributions to Political Economy* n.17, pp. 53-67

Trezzini, A., (2001) "Steady State and the Analysis of Long-Run Tendencies: the Case of Kaleckian Models" (Forthcoming)

Tyler, W.G. (1981), "Growth and export expansion in developing countries. Some empirical evidence", *Journal of Development Economics*, IX, pp. 121-130.

Vianello, F. (1985), "The Pace of Accumulation", *Political Economy*, I, 1, pp. 69-87.

Vianello, F. (1989) "Effective Demand and the Rate of Profits: Some Thoughts on Marx, Kalecki and Sraffa" in Sebastiani M. (ed.) *Kalecki's Relevance Today*, London.

Vianello, F. (1996), "Joan Robinson on normal prices (and the normal rate of profits)", in M.C. Marcuzzo, L.L Pasinetti, A. Roncaglia (eds.), *The Economics of Joan Robinson*, London: Routledge.