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Effective demand and growth:

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Nelson H. Barbosa-Filho*

Abstract:

This paper presents a one-sector model where investment and autonomous expenditures determine the growth rate of income. The analysis starts with the dynamics of demand-led growth and the interaction between investment and autonomous expenditures. Since by definition investment determines the growth rate of capital, the paper uses the relation between demand-led growth, multifactor productivity growth, and labor-force growth to analyze the alternative closures of the supply side. After discussing how partially endogenous labor force and multifactor productivity may relax supply constraints, the paper shows how changes in the average propensity to save may accommodate investment and autonomous expenditures when the economy reaches its maximum growth rate. Since nothing prevents the functional distribution of income from changing before that happens, the paper concludes with a two-species model (for the labor share of income and the income-capital ratio) to illustrate how demand-led growth can generate business fluctuations while remaining below supply constraints.

Key words: Growth, Effective Demand, Keynesian, and Demand-led

JEL classification: E120, O410, B220, and B500

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Introduction

According to mainstream economic theory growth is fundamentally a supply phenomenon. Little or no attention is paid to demand on the assumption that effective income always converge to its potential level, which in its turn is defined by the long-run trend of effective income with the aid of some ad hoc specification of the “natural” rate of employment, the “normal” rate of capacity utilization, and the “long-run” rate of multi factor productivity growth.[1] Given the growth rate of the labor force and the optimal propensity to save, variations in growth rates are explained by technological change and, since the seminal work of Romer (1986), the “new growth theory'” has developed into a series of models that make productivity growth endogenous. Fair but not enough.

The history of capitalist economies indicates that demand has an important role in explaining growth. For instance, how can one explain the Great Depression and World War II boom in the US just from the supply side? How can one explain the postwar growth of East Asian economies without mentioning export promotion? How can one explain the postwar growth of Latin America without mentioning import substitution? The list goes on and although in each case one can always map income to input and productivity indexes ex-post, this does not explain what caused growth in the first place. In capitalist economies one does not necessarily produce what one can, but actually what one expects to sell at a profit. Mainstream growth theory offers us a good analysis of how inputs can be combined to attend demand but to understand the latter we have to look elsewhere.

Economists working on Keynes's ideas usually put demand on the center of their growth theories. The labels and models vary across authors but the unifying principle is that aggregate demand determines aggregate income in capitalist economies, both in nominal and real terms. The crucial question are thus: what drives aggregate demand and how does it interact with supply constraints and income distribution? The answers vary across authors and the objective of this chapter is to analyze these different answers in a common framework. In the jargon of structuralist macroeconomics, the aim is to analyze

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[1] For the assumptions implicit in estimates of potential income, see Clark (1979) and Congressional Budget Office (1995).

the alternative “closures” of Keynesian models through a one-sector model of capitalist economies.[2]

The text is organized in four sections. Section one presents the dynamics of demand-led growth and analyzes under what conditions investment and autonomous expenditures may drive income without resulting in an explosive income-capital ratio. Section two analyzes the supply constraints on demand-led growth and how income distribution may accommodate investment and autonomous expenditures when the economy reaches its maximum growth rate. Section three analyzes the joint dynamics of income distribution and economic activity, showing under which conditions a capitalist economy may display well-defined business fluctuations around a demand-determined growth path. Section four concludes the analysis with a summary of the main points of the paper.

1 - Demand-led Growth

The first step of our analysis is to define the dynamics of demand-led growth. To keep the analysis as simple as possible, consider a one-sector economy with homogeneous capital and labor. From the demand side, real income can be expressed as

(1) $$Q = C + I + A,$$

where Q is income, C the part of consumption induced by income, I investment, and A the other autonomous expenditures, that is, net exports plus autonomous consumption. Government expenditures are implicit in the three demand categories and imports of goods different than the domestic one do not enter in the identity because they are not produced locally. Expressing C as a linear function of Q, (1) becomes

(2) $$Q = \frac{I + A}{s},$$

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[2] According to Taylor “(...) prescribing closures boils down to stating which variables are endogenous or exogenous in an equation system largely based upon macroeconomic accounting identities, and figuring out how they influence one another. When one is setting up a practical model for any economy, the closure question becomes less abstract and of much greater economic interest, transforming itself to one of empirically plausible signs of ``effects" and -- more important -- a perception of what are the driving macroeconomic forces in the system. A sense of institutions and history necessarily enters into any serious discussion of macro causality.” (Taylor, 1991, p. 41).

where $s=1-(C/Q)$ is the marginal propensity to save. In growth terms

(3) $$q = \theta i + (1-\theta)a - \frac{1}{s}\frac{\mathrm{d}s}{\mathrm{d}t},$$

where $\theta = [I/(I+A)]$ is the share of investment in autonomous expenditures and q, i, and a are the exponential growth rates of Q, I, and A, respectively.

By definition θ is itself a function of i and a since

(4) $$\frac{\mathrm{d}\theta}{\mathrm{d}t} = \theta(1-\theta)(i-a)$$

and, therefore

(5) $$\theta = \frac{1}{1+\chi e^{-(i-a)t}},$$

where t represents time and χ is a constant given by the initial value of θ.[3] It is straightforward that there are three possible cases in (5), namely: $i=a$ and θ is stable, $i>a$ and θ converges to one, and $i<a$ and θ converges to zero.

Assuming for the moment that s is constant, when $i>a$ income growth eventually converges to investment growth and the economy reaches a steady state with a stable income-capital ratio. In contrast, when $i<a$ income growth eventually converges to autonomous expenditures' growth and stays permanently above investment growth. The result is an explosive income-capital ratio, that is, a mathematical possibility with no economic sense since capitalist economies usually display stable income-capital ratios.

The sensible economic closure is thus for i and a to fluctuate but not to drift apart permanently. What leads and what lags varies across models and there are basically three closures to demand-led growth. First, in line with Keynes's *General Theory*, most Keynesian authors emphasize investment as the driving force of aggregate demand. The original hypothesis is that liquidity (the interest rate) and long-run expectations (the

[3] Let $\theta(0)$ be the value of θ when $t=0$, from (5) $\chi=[1-\theta(0)]/\theta(0)$.

marginal efficiency of capital) determine investment and income follows residually from the multiplier. The causal chain is usually intensified by adding an accelerator mechanism of income on investment and the extensions include expressing investment as a function of the rate of profit and some key financial ratios of firms (like debt-profit or debt-equity ratios).[4]

Second, Keynesian authors working with open models tend to emphasize net exports as the driving force of aggregate demand in small economies. The common hypothesis is that no economy can have an explosive trade with the rest of the world for an indefinite period of time, meaning that its export-income and import-income ratios should be stationary variables. The adjustment mechanism involves changes in real exchange rates and, from the assumption that the economy in consideration is relatively small, the growth rate of its exports determines the growth rate of its income (and imports) in the long run.[5]

Third, some Keynesian authors argue that autonomous consumption can also be the driving force of aggregate demand. The inspiration is Keynes's (1936, p. 220) anecdotal suggestion that digging holes in the ground may increase aggregate demand, which in practice is usually the role of military expenditures. Private consumption is also a possibility, especially when speculative bubbles result in temporary and substantial increases in the financial wealth of households.[6]

The above closures are not mutually exclusive and, in fact, one of the objectives of authors working on the integration of Keynes's and Marx's ideas is to analyze how

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[4] The classic references on the multiplier-accelerator mechanism are Samuelson (1939) and Hicks (1950), whereas the fundamental role of expectations and liquidity is usually emphasized by post Keynesian authors like Davidson (1972) and Minsky (1975). Building upon Kalecki's (1937) principle of increasing risk and Minsky's (1982) concept of financial fragility, some Keynesian authors like Fazzari, Hubbard, and Peterson (1988) also include liquidity constraints in the determination of investment.

[5] The original work on this topic is Harrod's (1933) trade multiplier, which was later developed by Thirlwall (1979) into an export-led growth model. Thirlwall's model originated an extensive literature on the balance-of-payments constraint on growth, of which the main theoretical and empirical aspects can be found in McCombie and Thirlwall (1994).

[6] Historically, the emphasis on autonomous consumption is usually associated with "secular stagnationists" like Hansen (1938 and 1941), who argued that an active fiscal policy is necessary to avoid a collapse of aggregate demand in face of sluggish investment. Given the current budget surpluses of the US government, the focus has recently shifted to private consumption, with special emphasis on the connection

investment, consumption, and net exports feedback on each other and generate "waves" of demand expansion and capital accumulation.[7] The result is a combination of history and economics into the analysis of growth and transformation of capitalist economies along the lines of Schumpeter's "creative destruction."

Now, since our analysis is restricted to a one-sector model, there is limited room for creative destruction because only technology may change, the good is always the same. This does not preclude some interesting dynamics between investment and autonomous expenditures and, in fact, the crucial question in our model is how i and a interact to produce growth and a stable income-capital ratio. To build a dynamical model to answer this, let u be the income-capital ratio and k the exponential growth rate of capital. Assuming for simplicity that there is no capital depreciation, we have

$$k = su - h, \tag{6}$$

where h is the ratio of autonomous expenditures to the capital stock, that is, the share of the capital stock that is "wasted" (not accumulated) to attend net exports and autonomous consumption.

In the literature on economic growth (6) is nothing more that an extension of Harrod's (1939) growth identity to include autonomous expenditures. Moreover, given the previous assumption that s is constant, (6) implies that u is stable as long as h and k are stable. We can thus obtain the evolution of u from the dynamics of h and k. By definition

$$\frac{\mathrm{d}h}{\mathrm{d}t} = h(a - k) \text{ and} \tag{7}$$

$$\frac{\mathrm{d}k}{\mathrm{d}t} = k(i - k), \tag{8}$$

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between speculative bubbles, debt-income ratios, and consumption. For an analysis of the latter see Godley (1999 and 2000).

[7] The classic references on the US experience are Baran and Sweezy (1966) and Bowles, Gordon, and Weisskopf (1984 and 1992).

where not surprisingly a non-trivial stationary solution occurs only when investment, capital, and autonomous expenditures grow at the same rate ($i=k=a$).

To move from accounting identities to theoretical relations we have to add some economic assumptions to the previous nonlinear system of differential equations. In Keynesian models it is common to assume that investment is a positive function of the level of economic activity because of the positive relation between capacity utilization and the rate of profit.[8] In terms of the model of this section this means that i is a positive function of u, which from (6) implies that i is a positive function of both h and k.

Thus, assuming that a is constant and that there exists at least one non-trivial equilibrium point (h_e, k_e), let $h_d = h - h_e$ and $k_d = k - k_e$ measure the deviation from such point.[9] In matrix notation the linearized version of (7) and (8) is thus

$$\text{(9)} \qquad \begin{bmatrix} \mathrm{dh}_d / \mathrm{d}t \\ \mathrm{d}k_d / \mathrm{d}t \end{bmatrix} = \begin{bmatrix} 0 & -h \\ k(\mathrm{d}i/\mathrm{d}h) & -k + k(\mathrm{d}i/\mathrm{d}k) \end{bmatrix} \begin{bmatrix} h_d \\ k_d \end{bmatrix}$$

and the stability conditions are

$$\text{(10)} \qquad k\left(\frac{\mathrm{d}i}{\mathrm{d}k} - 1\right) < 0 \text{ and}$$

$$\text{(11)} \qquad kh\frac{\mathrm{d}i}{\mathrm{d}t} > 0$$

Since i is a positive function of u, (11) is always satisfied and the system is locally stable as long as (10) is also satisfied. The intuition is that, given autonomous consumption and net exports, the impact of economic activity on investment should be smaller than its impact on savings, which in its turn is usually the stability condition imposed on

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[8] Note that in the one-sector case under analysis the rate of profit equals the profit share of income times the income-capital ratio.

[9] a is assumed to be constant to reduce the number of possible cases but it can also be a function of u without loss of generality.

Keynesian models to avoid "knife-edge" dynamics ala Harrod (1939).[10] Figures 1 and 2 show the two possible phase diagrams of *h* and *k*.

[FIGURES 1 AND 2 ABOUT HERE]

In figure 1 the stability conditions hold and the equilibrium is a stable node or focus. In figure 2 the opposite happens and the equilibrium is an unstable node or focus. In both figures the fluctuation around the equilibrium point is counter clockwise, that is, *k* is the "predator" and *h* the "prey'" in the dynamics of demand-led growth.

Focusing on the locally stable case, the waves of demand expansion and capital accumulation can be represented by changes in the position of the *h* and *k* "equilibrium" lines. For instance, an increase in the exogenous component of the growth rate of investment moves the *k* equilibrium line up, as shown in figure 3.[11] The long-run result is a reduction in *h* with no change in the growth rate of income. By analogy, an increase in the growth rate of autonomous expenditures moves the *h* equilibrium line up, as shown in figure 4. The long-run result is an increase in *h* and *k*, meaning that autonomous expenditures drive income growth in the case under analysis.[12]

[FIGURES 3 AND 4 ABOUT HERE]

From figures 3 and 4 we can thus conclude that demand-led growth is consistent with a stable income-capital ratio, provided that investment does not show unstable dynamics ala Harrod (1939). The waves of demand expansion and capital accumulation can be represented by joint changes in the position of the equilibrium lines for *k* and *h*, with *u* following residually from (6). Depending on the growth rate of non-investment autonomous expenditures, the economy can be either at a "slow-growth" or "fast-growth" equilibrium, that is, effective demand can determine income growth.

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[10] To see how savings enters in the picture, note that from the chain rule: $\mathrm{d}i/\mathrm{d}k=(\mathrm{d}i/\mathrm{d}u)(\mathrm{d}u/\mathrm{d}k)$. Since from (6) $\mathrm{d}u/\mathrm{d}k=1/s$, (10) holds if $\mathrm{d}i/\mathrm{d}u<s$ and vice versa.

[11] More formally, let $i=\gamma+\zeta u$. Figure 3 illustrates the impact of an increase in γ.

[12] Note that this obviously comes from the assumption that *a* is constant. When *a* is a function of *u* we have a "mixed" system, that is, a system where investment and autonomous expenditures drive income growth. The choice of *a* to be the driving force aims to emphasize the often ignored case where growth can be stable and completely driven by exogenous demand.

2 - Supply Constraints and Income Distribution

So far we analyzed demand dynamics without mentioning supply but one of the fundamental axioms of economics is that resources are scarce. We have therefore to complement our investigation with an analysis of the supply constraints on demand-led growth.

Given its wide use in growth accounting, assume that supply can be described by a Cobb-Douglas function of degree one. The exponential and potential growth rate of income q^* can thus be expressed as

$$(12) \qquad q^* = m + \alpha k + (1-\alpha)n,$$

where m is the exponential growth rate of multifactor productivity, n the exponential growth rate of the labor force, and α a positive parameter between zero and one.

Focusing on the steady-state of the model of the previous section, we know that k equals q at the equilibrium point. So, assuming that the economy is at its maximum growth rate ($q=q^*$), the long-run constraint on demand-led growth can expressed as a function of m and n, that is

$$(13) \qquad q^* = n + m/(1-\alpha)$$

In words, technology (m) and demography (n) determine the potential growth rate of the one-sector economy under analysis. Not surprisingly, there are two ways to push this supply constraint up and we find variants of both in Keynesian models.

First, m itself can be a function of growth, so that a demand-led expansion ends up increasing the potential growth rate and financing itself in real terms. The inspiration is the "Kaldor-Verdoorn" laws, according to which the faster the growth rate of manufacturing output, the faster the growth rate of labor productivity in manufacturing and outside manufacturing.[13] The basic idea is that scale and learning economies increase labor productivity in manufacturing and the gains eventually spill over to other

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[13] For an analysis of these laws, see Rowthorn (1975), Thirlwall (1983), Chatterji and Wickens (1983), and McCombie (1983).

sectors. In terms of our simplified representation, this means that m is a positive function of q in (13).

Second, n can also be a positive function of growth because a low rate of unemployment usually increases the participation ratio. The inspiration is Lewis's (1954) assumption that labor might not be a constraint on supply when there exists a non-capitalist sector from which capitalist firms can draw workers at a constant real wage. The dichotomy is usually between a capitalist industrial sector and a non-capitalist agricultural sector, but the modern variants of Lewis's work also point to disguised unemployment in informal and part-time jobs as the adjustment variable to changes in labor demand.[14] In terms of (13), this means that n is also a positive function of q.

Now, the above closures lift but do not eliminate the supply constraints on demand-led growth. On the side of technology, innovations depend not only on demand stimulus but also on the supply of new ideas. Since this usually has a dynamics of its own, m has inevitably an exogenous component. On the side of labor, the working-age population times the maximum amount of work hours per day also imposes an inevitable constraint.

What happens when demand-led growth hits the supply constraint? One possible answer was given by Kaldor (1956) and it is already implicit in (3), namely: the marginal propensity to save may change to accommodate demand. The basic idea stems from the classical assumption that the marginal propensity to save out of labor income is smaller than the marginal propensity to save out of capital income, so that s depends on the functional distribution of income. Formally, according to Kalecki's (1954) saving function

(14) $$s = s_l l + s_k(1-l) \, ,$$

where s_l and s_k are the marginal propensities to save out of labor and capital income, respectively, and l is the labor share of income. $s_k > s_l$ by assumption, with both parameters between zero and one.

[14] For a recent analysis of disguised unemployment, see Eatwell (1995 and 1997).

Focusing on the equilibrium demand-led growth rate (*k*=*i*=*a*), consider once again the case where growth is at its maximum value ($q=q^*$). From (3), (13), and (14) it is straightforward that

(15) $$\left(\frac{s_k - s_l}{s}\right)\frac{\mathrm{d}l}{\mathrm{d}t} = q^* - i\,,$$

so that the change in income distribution depends on the balance between the growth rate of potential income and the common growth rate of investment and autonomous expenditures.

According to Kaldor (1956), the labor share of income falls to accommodate aggregate demand when $i>q^*$, that is, there exists a forced-saving mechanism to accommodate demand when the economy hits its supply constraint. However, for the functional distribution of income to become the adjusting variable, the real wage must necessarily grow slower than labor productivity whenever $i>q^*$. As we shall see in the next section, this is not the only case admitted by Keynesian models.

Another way of looking at Kaldor's (1956) mechanism is to use (6) to represent the supply constraint. If we assume for the moment that there exists a constant and maximum income-capital ratio $u_{\max}$, (6) gives us a trade-off between *h* and *k*, as shown in figure 5.

[FIGURE 5 ABOUT HERE]

According to Kaldor's forced-saving mechanism, if the economy operates below the "*hk*" frontier given by $u_{\max}$, the labor share and the average propensity to save are stable. If the economy reaches the "*hk*" frontier, the labor share falls and the marginal propensity to save goes up, so that the frontier itself moves up. Such forced-saving mechanism is not infinite though, that is, s necessarily has an upper bound at s_k because the labor share of income cannot fall below zero. Thus, even if we admit Kaldor's (1956) hypothesis, we still have to analyze what happens when s can no longer accommodate demand.

From the Cobb-Douglass production the change in $u_{\max}$ is given by

(16) $$\frac{\mathrm{d}u_{\max}}{\mathrm{d}t} = u_{\max}[m-(1-\alpha)(n-k)]$$

In words, the change in the maximum income-capital ratio depends on technology (*m*), demography (*n*), and demand (*k* since *k*=*i*=*a* at the steady-state).

Assuming that *m* and *n* are completely exogenous to facilitate the analysis, note that an increase in demand-led growth has a negative impact on $u_{\max}$ according to (16). The reason is that the average productivity of capital is a negative function of the capital-labor ratio in a Cobb-Douglas function (because of the implicit decreasing marginal returns) and, when demand grows faster than potential income, capital grows faster than the potential labor force.

In addition to the above, (16) also shows that the maximum income-capital ratio would vary in the opposite direction of the labor share when the economy reaches its potential growth level. More formally, $u_{\max}$ falls when $i=k>q^*$ and increases when the opposite happens. The result is that the forced-saving mechanism outlined above maybe compensated, partially or fully, by a fall in the average productivity of capital when autonomous demand growth exceeds potential income growth.

3 - Business Fluctuations and Income Distribution

According to the previous section forced saving enters in the picture only when the economy reaches its potential growth rate. However, the labor share of income may vary before that happens and not necessarily in a counter cyclical way. In fact, the labor share of income may be a pro-cyclical variable because the growth rate of the real wage is likely to be influenced by workers' bargaining power, which is usually a negative function of the rate of unemployment.

Economists working on the integration of classical and Keynesian ideas usually combine effective demand with social conflict in a model of income distribution and business fluctuations.[15] Like the issues analyzed in the previous sections, such kind of a model admits more than one closure and, therefore, the relation between the income distribution and business fluctuations is the last point we have to analyze in this chapter.

To simplify the exposition, let us consider now a one-sector economy with no autonomous expenditures other than investment. The reason is that we are adding the labor share and, therefore, we have to drop one variable to keep the model in just two dimensions. The obvious candidates are autonomous consumption and net exports because investment and capital accumulation are crucial to understand economic growth.

Let the labor share of income and the income-capital ratio be our indexes of income distribution and economic activity.[16] By definition

(17) $$\frac{\mathrm{d}l}{\mathrm{d}t} = l(w - b) \text{ and}$$

(18) $$\frac{\mathrm{d}u}{\mathrm{d}t} = u(q - k),$$

where w and b are the exponential growth rates of the real wage and labor productivity, respectively. From the Cobb-Douglas production function we have

(19) $$b = \frac{m}{1-\alpha} + \frac{\alpha}{1-\alpha}(k - q)$$

whereas from (6) and (14) Harrod's growth identity is now

(20) $$k = [s_l l + s_k(1 - l)]u$$

So, recalling that q is itself a function of the change in s, after some algebraic operations the reduced form of (17) and (18) is

[15] See, for instance, Marglin (1984), Dutt (1990), Taylor (1991), and Foley and Michl (1999).

[16] Assuming that there are just two classes (workers and capitalists), the choice of distributive variable does not matter. In contrast, the choice of u carries implicit the assumption that capital and not labor is the scarce input in capitalist economies.

(21) $$\frac{\mathrm{d}l}{\mathrm{d}t} = xl[w - \tilde{m} + \phi(i - su)] \text{ and}$$

(22) $$\frac{\mathrm{d}l}{\mathrm{d}t} = xu[i - su + \xi(l / s)(w - \tilde{m})]$$

where to simplify the notation $\tilde{m} = m/(1-\alpha)$ is a linear function of *m*, $\phi = \alpha/(1-\alpha)$ and $\xi = s_k - s_l$ are positive constants, and $x = s/(s - \xi\phi l)$ is a rational function of *l*.

Assuming that the labor share of income is close to the labor-elasticity of supply ($l = 1 - \alpha$), *x* is positive and we can concentrate our investigation on the expressions within brackets.[17] In economic terms, (21) and (22) form a nonlinear dynamical system that describes the dynamics of income distribution (*l*) and economic activity (*u*) in terms of investment (*i*), savings (*s*), relative prices (*w*), and productivity ($\tilde{m}$).

To analyze the possible closures of (21) and (22), note that in (14) we already assumed that *s* is a function of *l*. Without loss of generality, let us also assume that *w* is a function of *u* (the "wage curve") and that *i* is a function of *l* and *u* (the investment function).

On the distributive side the intuition is that real-wage growth is a function of the level of economic activity and we can find two alternative closures in Keynesian models. First, as we saw earlier, *w* is a negative function of *u* according to Kaldor's (1956) demand theory of income distribution. Second, *w* is a positive function of *u* according to the Marxian reserve-army assumption.

On the demand side the intuition is that investment growth is a function of the rate of profit and, therefore, of the labor share of income and the income-capital ratio. Hence, despite the capital critique, most Keynesian models do define investment as a positive function of the rate of profit because of liquidity constraints. In terms of the model of this section this means that *i* is a positive function of *u* and a negative function of *l*.

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[17] Formally, $x>0$ if $s>\xi\phi l$. From the definition of ξ and ϕ the latter inequality means that $s_k > (s_k - s_l)[l/(1-\alpha)]$, which is necessarily true when $l=1-\alpha$ because we already assumed that $s_k > s_l$.

Similar to what we did in section one, assume that there exists at least one non-trivial equilibrium point (l_e, u_e) and let (l_d, u_d) measure the deviation from such point.[18] In matrix notation the linearized version of (21) and (22) is

$$\text{(23)} \qquad \begin{bmatrix} \mathrm{d}l_d / \mathrm{d}t \\ \mathrm{d}u_d / \mathrm{d}t \end{bmatrix} = x \begin{bmatrix} l\beta_{11} & l\beta_{12} \\ u\beta_{21} & u\beta_{22} \end{bmatrix} \begin{bmatrix} l_d \\ u_d \end{bmatrix},$$

where to facilitate the exposition

$$\text{(24)} \qquad \beta_{11} = \phi\left(\frac{\mathrm{d}i}{\mathrm{d}l} + \xi u\right)$$

$$\text{(25)} \qquad \beta_{12} = \frac{\mathrm{d}w}{\mathrm{d}u} + \phi\left(\frac{\mathrm{d}i}{\mathrm{d}u} - s\right)$$

$$\text{(26)} \qquad \beta_{21} = \xi \frac{s_k}{s^2}(w - \tilde{m}) + \frac{\mathrm{d}i}{\mathrm{d}l} + \xi u$$

$$\text{(27)} \qquad \beta_{22} = \xi \frac{l}{s}\frac{\mathrm{d}w}{\mathrm{d}u} + \frac{\mathrm{d}i}{\mathrm{d}u} - s$$

So, even in a one-sector context and after many simplifying assumptions we still have our hands full! We cannot determine the sign of any of the above expressions a priori and, therefore, there are many possible closures to our one-sector model.[19] For instance, the sign of β_{11} depends on the balance between the negative response of investment to the labor share (di/dl) and the difference between the marginal propensity to save out of labor and capital income (ξ). If the latter is small β_{11} is likely to be negative but we cannot determine this a priori. By analogy the same holds for the other β entries and, to organize the analysis, we can use the signs of these entries to classify the possible closures of our one-sector model.

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[18] Non-trivial means that l and u are positive at the equilibrium point.

[19] To be exact, there are 24 qualitatively distinct closures of a 2x2 system of linear differential equations like the one in (25).

Starting with the dynamics of the labor share, the distributive regime is "Kaldorian" when β_{12}<0 because this means that an increase in the level of economic activity has a negative impact on the labor share, as proposed by Kaldor (1956). In contrast, the distributive regime is "Marxian" when β_{12}>0 because this means that the labor share rises with the level of economic activity, as implicit in the reserve-army hypothesis. The sign of β_{11} determines whether the labor share is stable (β_{11}<0) or unstable (β_{11}>0) in isolation, that is, whether or not the labor share converges to a stable value in the absence of variations in the level of economic activity.

By analogy, the demand regime is "profit-led" when β_{21}<0 because this means that the negative impact of the labor share on investment predominates over its positive impact on consumption. The result is that an increase in the labor share leads to a reduction in the level of economic activity and vice versa. The opposite happens when the demand regime is "wage-led" (β_{21}>0) and, similar to the analysis of the distributive side, the sign of β_{22} determines whether or not the level of economic activity is stable in isolation.[20]

To illustrate some of the alternative configurations, let us consider the cases where both *l* and *u* are stable in isolation. Since this still leave us with two distributive configurations and two demand configurations, there are four distinct closures to our one-sector model. Considering just locally stable equilibrium points, figures 6 through 9 show the phase diagram of the each possible cases.

To facilitate the interpretation, let the "distributive" and "demand" curves of our one-sector economy be the loci of points (*l,u*) for which *l* and *u* are stable, respectively. In figures 6 and 7 the equilibrium point is a stable node and the structural difference lies on the response of the economy to "distributive" and "demand'" shocks. For instance, in the Marxian wage-led case of figure 6 an upward shift of the distributive curve (a "pro-labor" distributive shock) or an rightward shift of the demand curve (a positive demand shock) leads to an increase in both *l* and *u*. In contrast, in the Kaldorian profit-led case of figure

[20] The terms wage-led and profit-led come from Taylor (1991) and correspond to what Marglin and Bhaduri (1990) call "stagnationist" and "exhilarationist," respectively. A similar analysis can be found in Rowthorn (1982) and Dutt (1986).

7 a pro-labor distributive shock increases the labor share and reduces capacity utilization, whereas a positive demand shock does exactly the opposite.

[FIGURES 6 AND 7 ABOUT HERE]

In figures 8 and 9 the equilibrium point is either a stable node of focus and not only are the responses to permanent distributive and demand shocks completely different, but also the adjustment of l and u to the equilibrium point. In the Marxian profit-led case of figure 8 a pro-labor distributive shock reduces capacity utilization, a positive demand shock increases the labor share, and out of the equilibrium the labor share is the “predator” and capacity utilization the “prey.” In the Kaldorian wage-led case of figure 9 we have exactly the opposite case.

[FIGURE 8 AND 9 ABOUT HERE]

Overall, we can conclude that even when we restrict our analysis to locally stable points and assume that l and u are stable in isolation, we still have very distinct representations of the dynamics of income distribution and economic activity. Rather than a flaw, this is actually an advantage of Keynesian models because it allows one to adapt his or her theoretical model to the institutional and technological characteristics of real-world economies.

4 – Conclusion

The supply emphasis of mainstream growth theory does not preclude an analysis of demand-led growth. In fact, mainstream growth theory tells us how income is generated to attend aggregate demand with little or no attention to the determinants of aggregate demand itself. The aim of Keynesian growth models is exactly to analyze the latter and, as we saw in section one, the three basic and non-mutually exclusive closures are investment-led growth, consumption-led growth, and export-led growth.

Under some plausible economic assumptions demand-led growth is perfectly consistent with a stable income-capital ratio and, therefore, the expansion of capitalist economies may be determined completely from the demand side. In such framework supply enters residually to attend aggregate demand and the very own supply constraints may be pushed up by aggregate demand when multi factor productivity and the labor participation ratio are pro cyclical variables.

The above obviously does not eliminate supply constraints and, if and when the economy reaches its maximum growth rate, the labor share of income may become the residual variable along the lines of Kaldor's (1956) demand theory of income distribution. The basic ideas is that the average propensity to save increases when the economy reaches its maximum growth rate, so that a reduction in induced consumption accommodates the increase in investment and other autonomous expenditures.

There is no reason to assume that the labor share changes only under extreme conditions though. In fact, Keynesian models often adopt some variant of Marx's reserve-army hypothesis, according to which workers' bargaining power, and therefore real wages, vary pro cyclically. One of the possible results is business fluctuation around a demand-led growth trend without the economy necessarily reaching its maximum growth rate. Such kind of business fluctuations are determined by the interaction of effective demand with social conflict, with the distributive and demand dynamics varying according to the structure of the economy in question.

Rather than imposing one structure a priori, Keynesian models admit various closures, leaving for the analyst the determination of the institutional and technological features of the case under investigation. On the distributive side the labor share of income may be stable or unstable in isolation, as well as procyclical (the Marxian closure) or countercyclical (the Kaldorian closure). On the demand side the income-capital ratio may also be stable or unstable in isolation, as well as a positive (the wage-led closure) or negative (the profit-led closure) function of the labor share of income.

In comparison to mainstream growth theory, Keynesian models offer thus a more broad and complex analysis of economic growth where demand injections interact with institutional and technological parameters to generate waves of income expansion and capital accumulation. Although the assumptions and narratives vary a lot across authors, the main ideas can be expressed in a common and flexible framework.

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Figure 1: phase diagram of h and k about a stable equilibrium point.

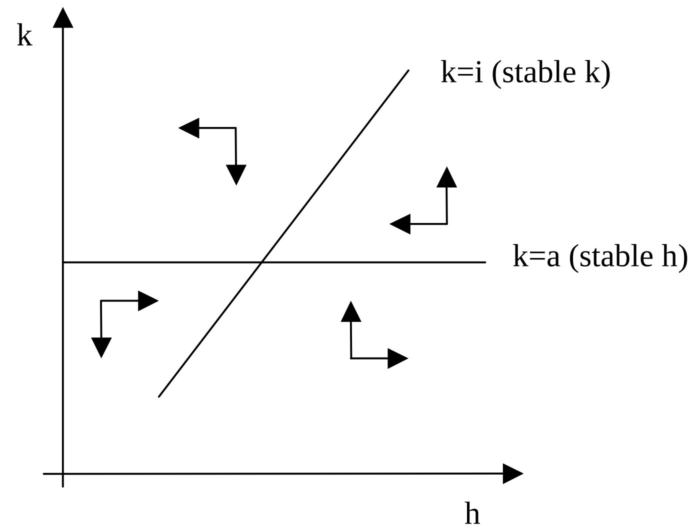

Figure 2: phase diagram of h and k about an unstable equilibrium point.

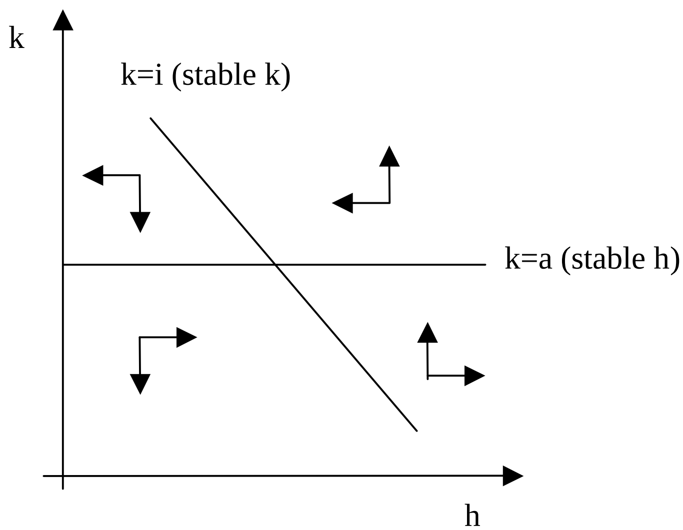

Figure 3: impact of an increase in the exogenous components of the growth rate of investment.

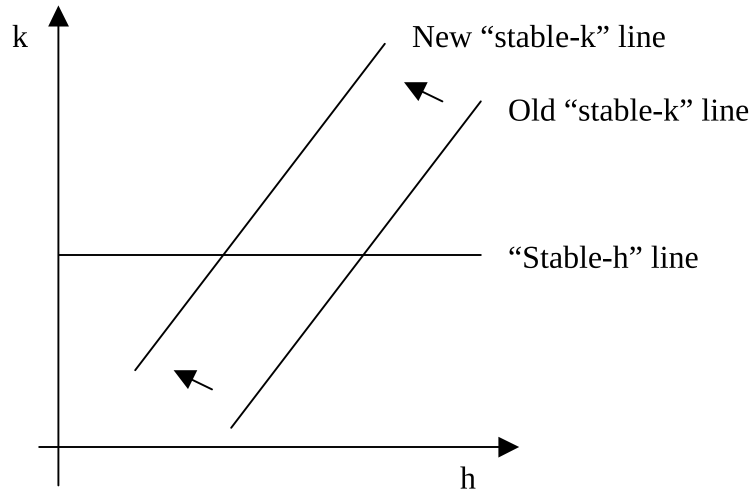

Figure 4: impact of an increase in the growth rate of autonomous expenditures

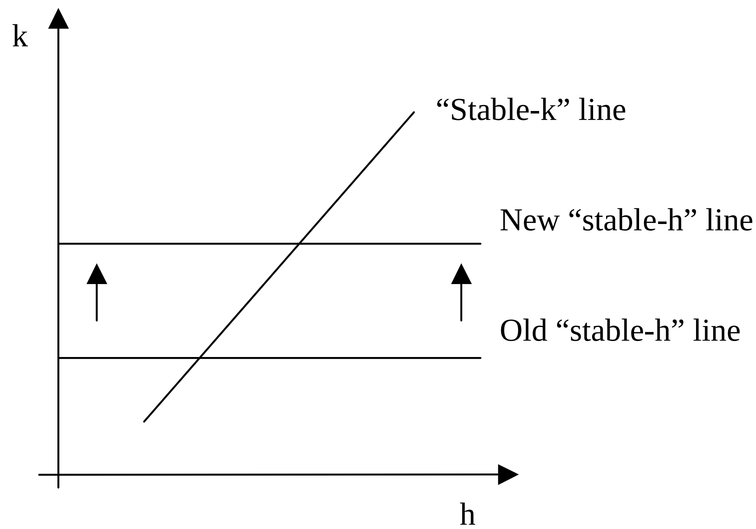

Figure 5: the “hk” frontier.

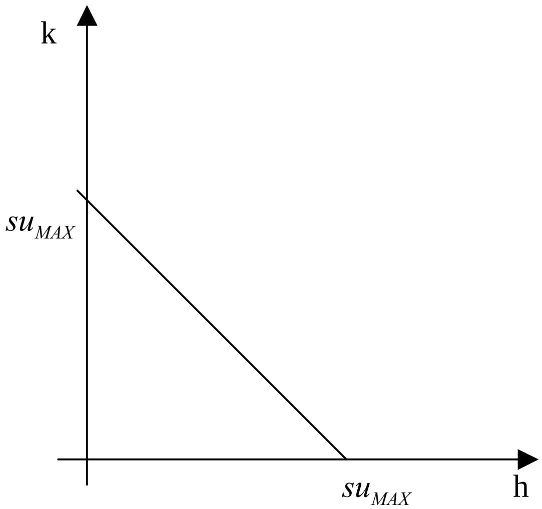

Figure 6: phase diagram of a Marxian wage-led economy

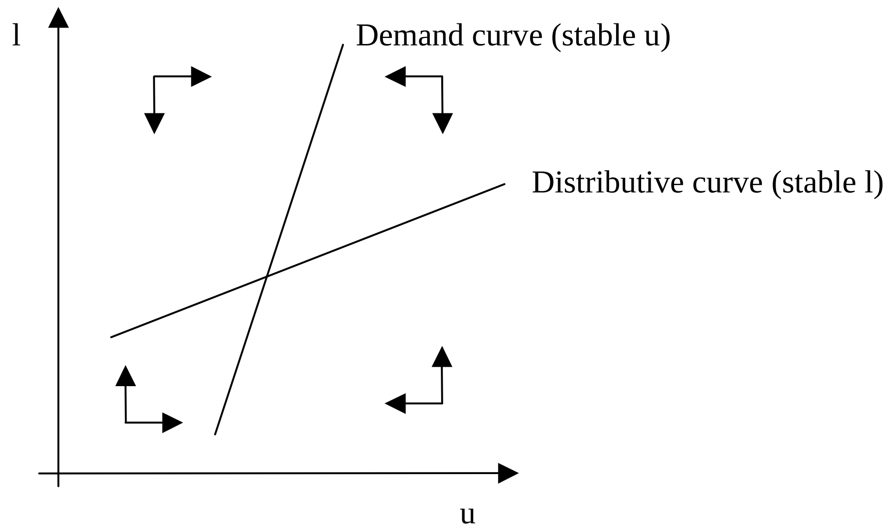

Figure 7: phase diagram of a Kaldorian profit-led economy.

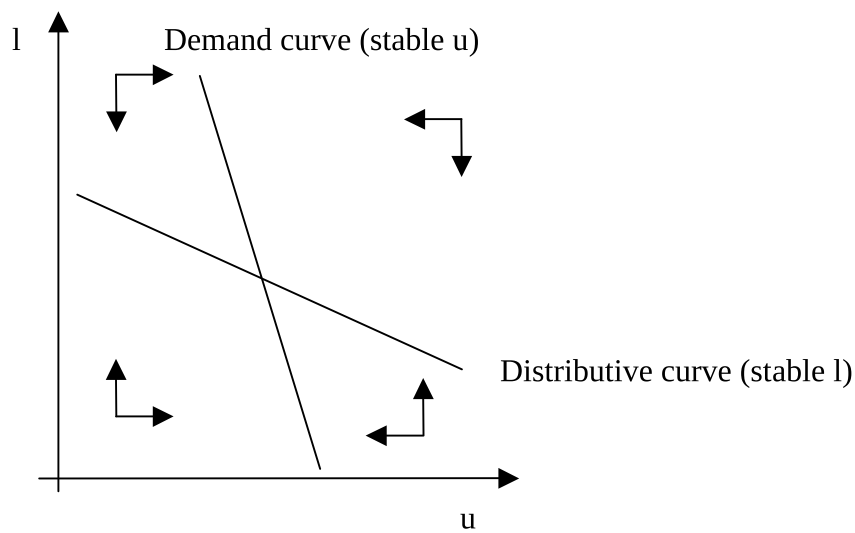

Figure 8: phase diagram of a Marxian profit-led economy.

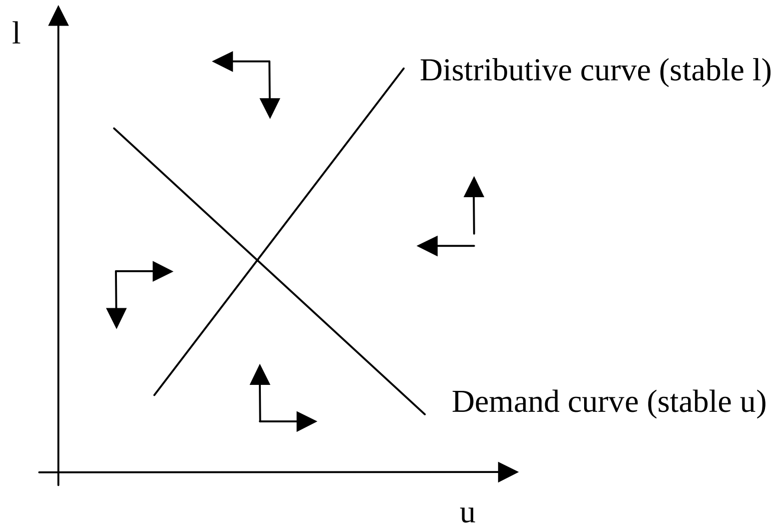

Figure 9: phase diagram of a Kaldorian wage-led economy.