Zero growth and structural change in a post-Keynesian growth model

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Abstract

Continuous albeit oscillating economic growth has become a hallmark of modern economies. Arguing on the basis of theoretical models, some authors maintain that growth is even a systemic requirement of capitalist economies. Thus the latter remain only stable as long as they grow. From an empirical point of view, phases of negative growth (recessions) go often hand in hand with economically and socially detrimental side effects, which policy makers seek to avoid at virtually all costs. This is why a stagnant or even degrowing economy is also an anathema for policy makers and arguably the public at large. Concomitantly, economic research has focused mainly on the drivers of growth rather than the conditions under which stagnant economies can exist. The present paper seeks to contribute to the analysis of stagnant economies by investigating the interrelationship of zero growth and technological progress in the context of a Kaleckian growth model. The analysis starts by showing that a Kaleckian model allows zero growth if depreciation is taken into account and if animal spirits are somewhat (but not too) pessimistic. Combining these conditions with technological progress and wage bargaining, the further analysis then indicates that in a profit driven economy, the overall stability of the system is no longer guaranteed if zero growth is actively imposed, leading to a downward spiral, while in a wage-driven economy, stability can be induced under conditions of zero growth and technological progress while it may not be guaranteed for positive growth.

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I. Introduction

Continuous albeit oscillating economic growth has become a hallmark of modern economies. Arguing on the basis of theoretical models, some authors maintain that growth is even a systemic requirement of capitalist economies (Binswanger 2009, Gordon and Rosenthal 2003). Thus capitalist economies remain only stable, or so these authors argue, as long as such economies grow. From an empirical point of view, phases of negative growth (recessions) go often hand in hand with economically and socially detrimental side effects, e.g. higher unemployment (Goodman and Mance 2011, Knotek 2007) or even suicides (Barr, et al. 2012, Stuckler, et al. 2011), which policy makers seek to avoid at virtually all costs. This is why a stagnant or even shrinking economy, although discussed and often supported by an increasing number of ecologists and ecological economists (Ayres, et al. 2007, Kerschner 2010, van den Bergh 2011), remains an anathema for policy makers and arguably the public at large. It is not surprising therefore that for instance the European Commission has pledged in its Europe 2020 agenda to make Europe environmentally sustainable while maintaining the aim to achieve even higher growth once the recession is over (European Commission 2012).

Concomitantly, economic research has focused mainly on the drivers of growth rather than the conditions under which stagnant economies can continue to function well. In fact, there is meanwhile a host of publications endorsing green growth as the way out of the apparent conflict between economic growth and environmental sustainability while the theoretical analysis of low or zero growth is still in its infancy. This being said, there are nevertheless reasons to suggest that historic growth rates may neither be feasible nor even desirable in the longer run given the increases in resource efficiency which such growth rates would require (Jackson 2009). Thus the issue remains on the agenda.

The present paper seeks to contribute to the analysis of stagnant economies by investigating the interrelationship of zero growth and technological progress in the context of a Kaleckian growth model. The overall aim of the exercise is to explore whether and, if so, under which conditions a stagnant economy can exist and remains stable. It should be emphasised though that, by doing so, the paper does not endorse a stagnant economy as an economic policy objective. Rather, it seeks to identify some of the implications of decreasing growth rates. In fact, since low growth might come at a price, it is ultimately a value judgement which policy makers have to make whether that price is justified or not and whether the possible trade-offs between different policy objectives should be entertained.

II. Models and methods

1. Logical and temporal structure of the model

a) Logical structure

The logical structure of the model is depicted in Figure 1. The upper part of the figure constitutes the core of the Kaleckian model in which accumulation (growth) and capacity utilisation are determined simultaneously. The lower part of Figure 1 then depicts two additions which serve to analyse the

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employment effects of growth and possible feedback mechanisms on wage formation. This element is new insofar as in the standard Kaleckian model along the lines initiated by Bhaduri and Marglin (1990), changes of nominal wages do not impact the functional distribution and hence growth because such changes are immediately compensated for by changes in prices. As a consequence, real wages remain constant. If there is an impact at all, then this is so because nominal wages and prices do not change with the same speed as it were (Cassetti 2003). In what follows, I shall therefore propose a modification of the Kaleckian model in which nominal wages are shown to influence the wage share even if adaptation occurs instantaneously. Incidentally, this modification also overcomes a shortcoming of the Kaleckian model, which is rather worrying. Accordingly, wage bargaining (say, between unions and employer organisations) would not serve any purpose in that real wages would always remain constant save for some short periods of time during which adjustment has not yet occurred. Obviously, such a conclusion is at odds with widespread practices in many countries where bargaining aims precisely at increasing or at least maintaining the level of real wages.

Figure 1: The logical structure of the model

Another important feature of the propose model is that technological progress will be considered. This will be done by assuming that even in a stagnant economy, a certain proportion of the capital stock will be written off in each period and replaced by new investment. This investment will be labour saving in the sense that it will require less labour of the same type and quality to staff the new machines than what was required for the old machines. Thus there is a general shift from lower skill to higher skill types of labour even if overall employment does not change a lot. Arguably, this is in line with the available empirical evidence suggesting that up-skilling the labour force helps to reduce unemployment (Scarpetta, et al. 2012).
The temporal structure of the model is depicted in Figure 2. While there is no obvious starting point for the ongoing economic processes, the key point here is that causal links impose a temporal order such that processes which influence each other cannot do so simultaneously. Thus, while the goods market determines the level of economic activity and hence employment, the latter is then taken to be given for the (so-called) labour market. So unlike in neoclassical economics, no simultaneous solution is being assumed.

b) Temporal structure

Figure 2: The temporal structure of the model

2. Key assumptions and model elements

a) Pricing and distribution

Unless further assumptions are being made, real wages in a Kaleckian growth model are determined by the mark-up and hence by competition on the goods markets. This is obvious from the equation for the real wage under mark-up pricing:

$$\frac{w}{p} = \frac{w}{wl(1 + m)} = \frac{1}{l(1 + m)}$$

(1)

Here the mark-up $m$ and the labour input coefficient $l$ are the only parameters determining the real wage $\frac{w}{p}$. Thus the nominal wage and hence wage bargaining has no impact on real wages although there is clearly a distributional conflict between real wages and profit share at any given level of labour productivity (Bhaduri and Marglin 1990).

Against this background, Cassetti (2003) has proposed a bargaining approach in which he effectively turns the argument around and suggests that the mark-up is endogenous to the model while the wage is being set such that a specific wage share will be achieved. However, his formulation hinges on the assumption that prices and wages adjust with different speeds, i.e. that the stickiness of prices and wages differs. The reason is that real wage increases are only logically possible if higher wag-

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es are not simultaneously counterbalanced by higher prices. If they were, then the only effect would be higher inflation.

Interesting as it may seem (and there is probably some evidence to support different degrees of stickiness), one may nevertheless question whether this approach does not run counter to the original insight of the Kaleckian model in the sense that competition on the goods market (as embodied in the mark-up) is supposed to quantify the ability of firms to set and adjust their prices vis-à-vis each other whereas the bargaining part determines to what extent firms have to give in to the pressures of unions or employees for higher wages. Both issues may be related, but are not necessarily equivalent. In addition, one might also question why, according to Cassetti (2003) workers (or firms) should aim at a specific wage or profit share when they negotiate wages? After all, this share depends not only on the wage rate but also on the number of workers. Note, finally, that in this paper (unlike in Palley (2013)), no distinction between managerial and non-managerial pay will be made as the former is seen as a part of profits.

In what follows, the production function of our economy is assumed to be of the Leontief type. That is, both production factors will be employed in a fixed ratio $\Lambda$ with $\Lambda = \frac{L}{K}$ so that given the amount of one factor, the necessary amount of the other factor is also known. For the sake of simplicity, the units in which the output and the inputs are being measured have been chosen such that no scaling factor is needed:

$$Y = \min\left( L, \frac{L}{\Lambda} \right)$$  \hspace{1cm} (2)

where $\frac{L}{\Lambda}$ is the amount of capital that is needed given the labour input $L$ assuming that firms will never choose any combination of inputs that deviates from $\Lambda$ since this would be inefficient implying as it does either excess labour or capital input. By assuming that there is only one sector in the economy, the possible consequences of sectoral shifts, e.g. from more environmentally detrimental to less environmentally detrimental sectors, will be ignored. For an exploration of this effect see Lange (2013).

Obviously, mark-up pricing is assumed but costs now consist of wage and capital costs. The latter can be conceived as being the rental costs of capital goods with $r$ being the rent per unit of capital. Under these conditions the price $p$ of the good that is produced in the model economy is

$$p = (wl + rk)(1 + m)$$  \hspace{1cm} (3)

or

$$p = \left( w \frac{L}{Y} + r \frac{K}{Y} \right) (1 + m)$$  \hspace{1cm} (4)

From the above assumption of a Leontief production function and $\Lambda = \frac{L}{K}$ it the follows that

$$pY = \left( wL + r \frac{L}{\Lambda} \right) (1 + m) = wL \left( 1 + \frac{r}{w\Lambda} \right) (1 + m)$$  \hspace{1cm} (5)

and
\[ 1 - \pi = \frac{wL}{pY} = \frac{1}{(1 + m)(1 + \frac{r}{w\Lambda})} \]  (6)

From differentiating (6) we see that

\[ \frac{\partial (1 - \pi)}{\partial w} > 0 \]  (7)

and consequently

\[ \frac{\partial \pi}{\partial w} < 0 \]  (8)

At the same time, it remains true that

\[ \frac{\partial (1 - \pi)}{\partial m} < 0 \]  (9)

and

\[ \frac{\partial \pi}{\partial m} > 0 \]  (10)

Hence the share of wage income in national income \(1 - \pi\) increases as nominal wages go up. Thus the suggested reformulation of mark-up pricing preserves the key point of the Kaleckian insight into the importance of structural factors for distribution captured by the mark-up \(m\) while giving a role to bargaining about nominal wage which is absent in the standard formulation.

Since given \(r\) and \(w\), production costs are minimized for \(\Lambda = \frac{r}{w}\), the latter is also the implicit rate of substitution between different technologies. This implies that if firms can choose the technology given relative prices, they can do so with a view to compensate for increasing nominal wages. For any given technology however labour market conditions and hence bargaining power does affect distribution.

Obviously, as \(\Lambda\) approaches \(\infty\) (i.e. production becomes more labour intensive), the share of wages converges to the case of zero capital costs. If this is the case, then there is no impact of bargaining any more and (6) converges towards the traditional formulation for the wage share under mark-up pricing.

b) Growth and capacity utilisation

In the following I shall outline the Kaleckian growth model in a formulation that takes into account depreciation. In this context, it will also be shown that zero growth can only be maintained if depreciation is added to the model.

As in the standard formulation, the gross-rate of profit is

\[ r = \frac{\Pi}{pK} = \frac{\Pi}{pY} \cdot \frac{Y^v}{K} = \pi \frac{1}{v} \]  (11)

With \(\Pi\) being gross profits and
\[ u = \frac{Y^v}{Y} = \text{rate of capacity utilisation} \]  
\[ v = \frac{K}{Y^v} = \text{capital potential output ratio} \]  

whereas \( pK \) is the nominal capital stock and \( pY \) is nominal production. Unlike in the neoclassical model, the post-Keynesian approach allows for the possibility of underutilised productive capacity. At the same time, capital and labour are used in fixed proportions. Finally, it will be assumed that there is depreciation and the rate of depreciation \( d = \frac{D}{pK} = d_t \lambda \) is assumed to be a function of technological progress (Rowthorn 1981). This can be rationalised by arguing that firms are more likely to scrap their equipment and invest in new machinery if more advanced technologies become available.

With these assumptions, the net-rate of profit becomes (Rowthorn 1981)

\[ r^n = \pi u \frac{1}{v} - d_t \lambda \]  

By definition, savings have to equal investment \( -I \),

\[ I = S \]  

and are expressed as shares of the nominal value of the capital stock:

\[ g = \frac{I}{pK} = \frac{S}{pK} = \sigma \]  

Moreover, only entrepreneurs are assumed to save out of the profits they receive whereas net-savings of workers are zero.\(^2\) Hence

\[ \sigma = s \cdot r^n = s \left( \pi u \frac{1}{v} - d_t \lambda \right) \]  

By introducing depreciation in such a way, savings become in part autonomous, i.e. independent of capacity utilisation. Thus while savings remain a function of capacity utilisation, the savings function has now an intercept \(-d_t \lambda\) with negative sign.

Investment in relation to the nominal capital stock is assumed to be determined by the rate of capacity utilisation \( u \), the rate of technological progress \( \lambda \), and the share of profits \( \pi \), that is

\[ g = \alpha + \beta u + \tau r^n + \varphi \lambda \]  
\[ = \alpha + \beta u + \tau \left( \pi u \frac{1}{v} - d_t \lambda \right) + \varphi \lambda \]  

with (initially) \( \alpha, \beta, \tau, \varphi \geq 0 \).

Using the condition for a goods market equilibrium, \( \sigma = g \), the equilibrium rate of capacity utilisation is then given by

\(^2\) This does not preclude that individual workers save; it only implies that workers as a class do not save.
under the condition that $(s - \tau)\left(\frac{\pi}{\nu}\right) - \beta > 0$.\(^3\) Obviously, equilibrium capacity utilisation decreases with increasing profit share $\pi$. That is, lower profits (and thus higher wages) always have a positive impact on capacity utilisation. Moreover, the resulting equilibrium is stable if

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0$$

Thus stability implies that

$$(s - \tau)\left(\frac{\pi}{\nu}\right) - \beta > 0$$

The equilibrium rate of accumulation $g^*$ (investment in relation to capital stock) can then be obtained by inserting $u^*$ in equation (16) and making use of the equilibrium condition $\sigma = g$. Hence

$$g^* = s\left(\frac{\pi}{\nu}\right) \alpha + (s - \tau) d_1 \lambda + \varphi \lambda \left(\frac{\pi}{\nu}\right) - \beta - sd_1 \lambda$$

The impact of the profit share $\pi$ on equilibrium growth as judged by the first derivative of (21) with respect to the profit share depends on the parameter configuration. It may either be positive (so that growth is profit driven) or negative (so that growth is wage driven).

c) **Imposing zero growth**

It is well-known that the standard neo-Kaleckian model which does not assume depreciation does not allow zero growth (Padalkina 2012). What about the modification introduced here?

Imposing the condition of zero growth implies setting equation (21) to zero, i.e.

$$s\left(\frac{\pi}{\nu}\right) \alpha + (s - \tau) d_1 \lambda + \varphi \lambda \left(\frac{\pi}{\nu}\right) - \beta - sd_1 \lambda = 0$$

After some transformations one obtains

$$d_1 = \frac{-\alpha - \varphi \lambda}{\lambda \beta \frac{\nu}{\pi}}$$

Accordingly, the depreciation rate (or more precisely the depreciation factor with respect to the rate of technological progress) depends positively on the profit share $\pi$ and negatively on the capital to potential output ratio $\nu$.

For this expression to result in an economically meaningful value (a positive depreciation factor), it is necessary that some of the parameters take on rather unusual values. Two cases can be distinguished:

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\(^3\) Otherwise, capacity utilisation would be negative.
Case 1:

- $\beta$ is negative while $\alpha$ and $\varphi \lambda$ take on positive values, i.e. investment responds negatively to capacity utilisation (disregarding the indirect effect via the rate of profit). This assumption is not very plausible to say the least and can therefore be discarded.

Case 2:

- While $\beta$ remains positive, $\alpha$ is negative and its absolute value is greater than $\varphi \lambda$. Thus animal spirits must be negative. This is more plausible as one would expect rather subdued animal spirits in a situation with low or even negative growth. Obviously, if the absolute value of $\alpha$ is too large, then capacity utilisation would fall to zero.

How does the zero growth depreciation rate respond to changes in technological progress? Differentiating equation (23) gives

$$\frac{\partial d_1}{\partial \lambda} = \frac{\alpha}{\beta \frac{v}{\pi} \lambda^2} < 0$$

in both case 1 and case 2 for $\alpha < 0$, i.e. for negative animal spirits. Thus, everything else being equal, the depreciation rate has to decrease with increasing technological progress in a situation where the zero growth condition is fulfilled.

**d) Labour market**

The term labour market is used here as a short-cut for describing the mechanisms that determine the demand for labour, but this is not to say that the labour market can be characterised by simple demand and supply functions in the real wage and that the equilibrium real wage is then determined by the intersection of supply and demand. In fact, there is arguably no labour market which has anything in common with other markets where such mechanisms may be at work (Rosenbaum 2000).

The idea that is to be further explored here is a rather basic one. As already mentioned before, it is assumed that independently of the growth rate, a certain proportion of the capital stock will be written off in each period. This proportion is in turn a function of technological progress. The approach is thus similar in spirit to assuming a vintage capital stock as suggested by Salter (1966), see also Bloch, et al. (2009).

Two effects have to be distinguished. (1) If firms invest, i.e. buy new equipment, then this new equipment has to be staffed. Hence investment per se creates demand for labour. (2) At the same time, depreciation reduces the demand for labour. That is, if machines are no longer used, then the staff that was necessary to operate these machines is no longer necessary and will be laid-off.

The net-employment effect of investment cum depreciation is therefore

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4 Depreciation is to be understood here in the sense that a piece of equipment is no longer used. Thus the meaning of the term differs from the meaning in the context of accounting where depreciation often refers to a gradual reduction of the book value of a piece of equipment over several years, even if the actual technical usefulness has not changed significantly until the equipment is actually retired.
Dividing by $K$, using $\Lambda = \frac{L}{K}$ (from the above production function) and with $\bar{\Lambda}$ being the labour-capital-ratio of new investment, equation (25) can be written as

$$\frac{\Delta L}{L} \cdot \Lambda = \frac{I \cdot \bar{\Lambda}}{K} - \frac{D \cdot \Lambda}{K}$$

Hence

$$n = \frac{1}{\Lambda} [g_G \bar{\Lambda} - d \Lambda] = g_G \frac{\bar{\Lambda}}{\Lambda} - d$$

That is, the growth rate of labour demand is positive if the adjusted gross rate of accumulation exceeds the depreciation rate (where $g_G$ is the gross-rate of accumulation).

Since the zero-growth condition necessitates that there is no net accumulation given that depreciation equals investment, i.e.

$$g_G = d$$

It follows that for zero growth

$$n = g_G \left( \frac{\bar{\Lambda}}{\Lambda} - 1 \right) = g_G \left( \frac{\bar{\Lambda} - \Lambda}{\Lambda} \right) \approx g_G (-\lambda)$$

Thus whenever the labour intensity of new investment exceeds that of the existing capital stock (i.e. there is negative technological progress), then even zero growth leads to higher employment. If, on the other hand, new investment is less labour intensive (as one might expect) then zero growth leads to lower employment. In fact, with the zero growth condition being fulfilled, higher investment leads to lower employment as this accelerates the replacement of the (labour intensive) old capital stock by new (less labour intensive) machinery. Concomitantly, since technological progress is assumed to be labour saving, $\frac{\bar{\Lambda} - \Lambda}{\Lambda}$ can in fact be regarded as (a proxy of) the negative rate of technological progress $\lambda$.

**Wage bargaining**

In what follows, it will be assumed that workers and employers negotiate nominal wages amongst each other. Although in reality, the outcome of such a bargaining process is likely to depend on many aspects including the institutional set-up, the degree of unionisation, the industrial structure etc. (Ellguth, et al. 2012), these will be left out of the picture as being exogenous to the present analysis. Instead, the only factor that will be taken into account is employment growth.

Formally

$$w = f(n)$$

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5 This assumption differs from that in related work where technological progress is assumed to be both labour and resource saving. See for instance Lange (2013).
The underlying argument here is that the bargaining strength of workers increases if employment growth is high or increasing relative to the growth of the workforce. By contrast, bargaining strength decreases if employment growth is low or decreasing relative to the growth of the labour force. Thus

\[ w = w_0 + \rho(n - \bar{n}) \]  

(31)

Or

\[ \Delta w = w - w_0 = \rho(n - \bar{n}) \]  

(32)

where \( \bar{n} \) is the normal growth rate of the labour force and \( \rho > 0 \) depicts the bargaining power of unions/employees. Thus wages increase if the growth rate of the labour force exceed the normal rate and decline if the opposite is the case.

3. **Model implications**

   **a) Profit driven growth**

In this section, the various elements developed above will be combined and examined with a view to characterise the resulting equilibrium outcomes. Figure 3 and Figure 4 depict two cases which are familiar from the post-Keynesian growth literature. Figure 3 concerns the case where growth is profit-driven. That is, higher profits lead to higher growth rates and, conversely, lower profits lead to lower growth rates. In order to facilitate the exposition, let us look first at the standard case of an equilibrium with positive growth. In this situation, capacity utilization is at \( u^* \) and the equilibrium growth rate is \( g^* \). Since, by assumption, employment is such that there is neither upward nor downward pressure on wages, one can say that the labour market is also in an equilibrium position.

What happens if there is an increase of the mark-up? Obviously, an increase of the mark-up implies an increase of the profit share \( \pi \) (equation (10)). In a profit driven economy, this will lead to an increase of the growth rate combined with a decrease of capacity utilisation. However, due to higher employment, the bargaining position of employees (or unions) improves and, as a consequence, there will be upward pressure on wages. This leads in turn to a lower profit share and hence lower growth. As a consequence, the economy returns to its initial state and can therefore be said to be stable.

What happens once zero growth is imposed? Essentially, the beginning of our story remains the same as can be seen from the lower set of schedules in Figure 3: an increase of the mark-up drives up the profit share and leads therefore to higher growth assuming that the employment schedule (dashed line) is such that for zero growth wages will not change.\(^6\) What happens next depends on the response to the unduly high growth rate. If nothing happens, then the same mechanisms which brought back the economy towards its initial state in a positive growth scenario will also make sure that the economy returns to the zero growth state. Hence a laissez-faire zero growth equilibrium (in that sense) is stable.

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\(^6\) This implies that the effective growth rate of the labour force must be negative, for instance as a result of working time reductions.
Things turn out to be a bit trickier once a positive growth rate is immediately countered by higher depreciation so that effectively growth remains zero all the time. The reason is that now higher investment coupled with higher (but equally dimensioned) depreciation (which implies a rightward shift of the employment schedule and a downward shift of the savings and investment schedules represented in each case by a dotted line) exerts a negative impact on employment. This will in turn lead to downward pressure on wages and an even higher profit share. Hence the situation appears inherently unstable and we face a kind of paradox: an attempt to actively restore zero growth introduces instability while tolerating a slightly positive growth rate for a short while makes sure that the economy returns to the initial (zero growth) state. These results are summarised in Table 1 together with another example where the initial shock consists of a change in labour force growth (not depicted in the figures).

Figure 3: Profit driven growth
### Assumptions
- **Shock: increase of mark-up and hence increase in \( \pi \)**
- **New investment less labour intensive**

### Case blue: profit driven growth

<table>
<thead>
<tr>
<th>Positive Growth</th>
<th>Zero Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross growth rate increases</td>
<td>Gross growth rate increases</td>
</tr>
<tr>
<td>Net labour growth increases</td>
<td>Depreciation increases</td>
</tr>
<tr>
<td>Upward pressure on wages</td>
<td>Net labour decreases as the turnover of the capital stock increases (shift of labour demand curve)</td>
</tr>
<tr>
<td>Decrease of profit share</td>
<td>Downward pressure on wages</td>
</tr>
<tr>
<td>Lower growth rate</td>
<td>Increase of profit share</td>
</tr>
<tr>
<td>( \rightarrow ) STABLE ECONOMY</td>
<td>Further increase of gross growth rate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positive Growth</th>
<th>Zero Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downward pressure on wages</td>
<td>Downward pressure on wages</td>
</tr>
<tr>
<td>Increase of profit share</td>
<td>Increase of profit share</td>
</tr>
<tr>
<td>Gross growth rate increases</td>
<td>Gross growth rate increases</td>
</tr>
<tr>
<td>Net labour growth increases</td>
<td>Depreciation increases</td>
</tr>
<tr>
<td>Upward pressure on wages</td>
<td>Net labour growth decreases</td>
</tr>
<tr>
<td>( \rightarrow ) STABLE ECONOMY</td>
<td>Downward pressures on wages</td>
</tr>
</tbody>
</table>

\( \rightarrow \) UNSTABLE ECONOMY

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Table 1: Cases to be distinguished for profit driven growth
Figure 4: Wage driven growth
### Assumptions
- **Shock:** increase of mark-up and hence increase in $\pi$
- **New investment less labour intensive**

<table>
<thead>
<tr>
<th>Case orange: wage driven growth</th>
<th>Positive Growth</th>
<th>Zero Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gross growth rate decreases</td>
<td>Gross growth rate decreases</td>
</tr>
<tr>
<td></td>
<td>Net labour decrease</td>
<td>Net labour increases as depreciation rate decreases (shift of labour demand curve)</td>
</tr>
<tr>
<td></td>
<td>Downward pressure on wages</td>
<td>Upward pressure on wages</td>
</tr>
<tr>
<td></td>
<td>Increase of profit share</td>
<td>Gross growth rate increases again</td>
</tr>
<tr>
<td></td>
<td>Growth rate decreases</td>
<td>$\rightarrow$ UNSTABLE ECONOMY</td>
</tr>
<tr>
<td>$\rightarrow$ UNSTABLE ECONOMY</td>
<td></td>
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</tbody>
</table>

- **Shock:** increase of labour force growth
- **New investment less labour intensive**

|                                 | Downward pressure on wages | Increase of profit share |
|                                 | Gross growth rate decreases | Net labour growth decreases |
|                                 | Downward pressure on wages | Downward pressure on wages |
| $\rightarrow$ UNSTABLE ECONOMY | | Increase of profit share |

Table 2: Cases to be distinguished for wage driven growth
b) Wage driven growth

Figure 4 concerns the case where growth is wage driven. That is, higher profits lead to lower growth rates and, conversely, lower profits lead to higher growth rates. Again, let us look first at the standard case of an equilibrium with positive growth. In this situation, capacity utilization is again at $u^*$ and the equilibrium growth rate is $g^*$. Since, by assumption, employment is such that there is neither upward nor downward pressure on wages, one can say that the labour market is also in an equilibrium position.

What happens here if there is an increase of the mark-up? Obviously, an increase of the mark-up implies an increase of the profit share $\pi$. But in a wage driven economy, this will lead to a decrease of the growth rate combined with a decrease of capacity utilisation. Due to lower employment, the bargaining position of employees (or unions) deteriorates and, as a consequence, downward pressure on wages occurs. This leads in turn to a higher profit share and hence even lower growth. As a consequence, the economy moves further away from its initial state and can therefore be said to be unstable.

What happens once zero growth is imposed? As before, the beginning of our story remains the same as can be seen from the lower schedule in Figure 4: an increase of the mark-up drives up the profit share and leads therefore to lower (here negative) growth assuming that the employment schedule (dashed line) is such that for zero growth wages will not change. What happens next depends on the response to the (now) unduly low growth rate. If nothing happens, then the same mechanisms which drive the economy away from its initial state in a positive growth scenario will also make sure that the economy is driven further away from the zero growth state.

As before, things turn out to be different once a negative growth rate is immediately countered by lower depreciation so that effectively growth remains zero all the time. The reason is that now lower investment coupled with lower (but equally dimensioned) depreciation (which implies a leftward shift of the employment schedule and an upward shift of the savings and investment schedules represented in each case by a dotted line) exerts a positive impact on employment. This will in turn lead to upward pressure on wages and a lower profit share. Hence an attempt to actively restore zero growth introduces stability while tolerating a slightly negative growth rate for a short does not allow the economy to return to the initial (zero growth) state. See Table 2 for a summary of the results.

These results are significant insofar as, first of all, a wage-led economy combined with wage-bargaining is instable unless there are some automatic stabilisers which prevent the growth rate from increasing beyond a certain point. One possibility here might be that the mark-up is not constant but responds to the growth rate. It could be argued after all that with buoyant growth, firms find it easier to increase the mark-up and hence the profit share. But if this is the case, then obviously this has a dampening effect on growth. Conversely, if growth is sluggish then firms compete more strenuously for market shares and will accept a somewhat lower mark-up in return for higher shares, which in turn spurs growth. If the zero growth condition is imposed actively, it is the depreciation rate which plays such a stabilising role as it responds contrariwise to both increasing and decreasing growth rates.

To conclude the discussion of the above model, some comments on the relationship between the paper by Binswanger (2009) and the present approach might be helpful. In Binswanger’s model, zero
growth is not stable because a minimum growth rate is necessary in order for firms in the consumption sector to realise profits or at least avoid losses (which is seen as a precondition for firms’ existence in the long-run). Although the above model does not contain a banking sector, including this feature in the way Binswanger has done might therefore undermine the conclusions drawn from our model. That is, even under the conditions highlighted above, zero growth may not be stable. Thus the minimum growth rate can only be zero if either

- the interest rate is zero (implying that banks do not make profits),
- the depreciation rate is zero, or
- the pay-out ratio of banks is one.

The last condition implies that banks do not retain any profits and it has the same effect as the first condition since zero profits imply that there is nothing to retain for banks.

According to Binswanger, however, these are sort of special cases which are therefore of limited relevance. But while this may indeed be true for the first two conditions, it is less plausible for the third one. The reason is that in Binswanger’s model, banks retain a share of their profits because they aim at maintaining a largely constant equity to loan ratio. In a non-growing economy, however, loans do not grow either as there is no need to pre-finance additional investment. Thus bank do not have to increase their equity to maintain a constant equity to loan ratio. But if this is so, then even then Binswanger model allows zero growth.

### III. Conclusions

This paper has sought to make a number of points. To begin with, it has been shown that the rather implausible connotation of mark-up pricing whereby wages have no impact on the functional distribution of income can easily be overcome – without changing the original insights of the model – by introducing capital costs in the context of a Leontief production function. Doing this while adding depreciation to the Kaleckian growth model in the context of labour saving technical progress and wage bargaining produces an interesting effect: in a profit driven economy, the extended model remains stable in that the employment effects of higher growth will counterbalance via higher wages the growth enhancing effect of increased profits through, for instance, a higher mark-up. By contrast, a wage driven economy is instable in that higher wages induce higher growth which translates in turn into higher employment and, finally, higher wages.

These two results remain unchanged if depreciation is set such that the effective growth rate approaches zero. However, if the depreciation rate is adjusted pro-actively with a view to prevent any increase in the growth rate, then the initially stable profit driven economy becomes unstable whereas the initially unstable wage driven economy can be stabilised.

The stability issue aside, the growth model developed in this paper also suggests that with labour saving technological progress labour demand actually declines in the absence of growth due to the gradual replacement of the existing capital stock by less labour intensive machinery. This implication suggests that the issue of redistributing labour (and hence income) is crucial if low or zero growth are to remain socially and economically sustainable.
Another corollary of the above findings is that – analogous to the case of economic expansion, which benefits wage earners and entrepreneurs differently (Bhaduri and Marglin 1990), economic contraction may hurt wage earners and entrepreneurs also in a different manner. In a profit driven economy, lower growth implies a lower profit share and therefore a higher wage share. By contrast, lower growth implies a lower wage share in a wage driven economy and in turn a higher profit share.
IV. References


