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Abstract

This paper expands the neo-Kaleckian growth model to include nonlinearities, political economy factors, and interest rate and stock market effects. The expansions enrich the model and enhance its capacity to analyze and explain developments within contemporary capitalist economies. Nonlinearities can potentially make economies both wage- and profit-led, and failure to control for nonlinearities may result in misleading conclusions about the structure of the economy. Political economy analysis suggests capital's desire for profit maximization results in a lower growth rate. Lastly, the paper shows why *q* theory of investment is inconsistent with the neo-Kaleckian approach to capital accumulation and a higher *q* can be associated with a fall in the rate of investment.

Keywords: wage-led, profit-led, nonlinearities, q theory, stock market, political economy
JEL classification: E12, O41, O33.

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1. Introduction

The neo-Kaleckian growth model, pioneered by Rowthorn (1982), Taylor (1983, 1991), Dutt (1984), Bhaduri and Marglin (1990), and Lavoie (1995), has become a workhorse of Post Keynesian growth theory. A key feature of the model, principally attributable to Taylor (1983, 1991) and Bhaduri and Marglin (1990), is the distinction between wage-led and profit-led growth. This distinction gives the model both real world richness and policy relevance.

In wage-led economies, increases in the wage share of income (i.e. decreases in the profit share) raise capacity utilization and growth. In profit-led economies, the reverse holds. Additionally, there is a third category of conflictive economies, in which increases in the wage share raise capacity utilization but lower growth.

The wage- vs. profit-led growth distinction has clear and significant policy implications, and it has sparked a growing empirical literature aimed at identifying the

character of economies (Hein and Tassarow, 2009; Stockhammer, 2011; Onaran and Galanis, 2012). Moreover, from a policy perspective, this empirical literature has become even more important given current conditions of slowed growth, high unemployment, and significant change in the distribution of income in favor of profits.

The current paper expands the neo-Kaleckian model to incorporate nonlinearities, political economy effects, and financial factors. These expansions have important implications for the growing empirical literature that tends to frame the issue dichotomously (i.e. are economies wage- or profit-led?). In fact, economies can be both wage- and profit-led depending on cyclical circumstance.

2. The wage- vs. profit-led model revisited

By way of preliminaries, this section provides a brief restatement of the neo-Kaleckian model which is described by the following five equations

(1) $I/K = I(u, \sigma)$ $\quad I_u > 0, I_\sigma > 0$

(2) $S/K = S(u, \sigma, \beta)$ $\quad S_u > 0, S_\sigma > 0, S_\beta > 0$

(3) $\sigma = \sigma(\psi)$ $\quad \sigma_\psi > 0$

(4) $I/K = S/K$

(5) $g = I/K$

I = investment, K = capital stock, S = saving, u = capacity utilization rate, σ = profit share, β = propensity to save, ψ = bargaining power or other variable positively impacting the profit share, and g = growth rate.

Substituting equations (1) and (2) into (4) yields a dynamic investment – saving (IS) balance equilibrium condition. The slope of the IS condition in [u, σ] space is

$d\sigma/du|_{IS} = [S_u - I_u]/[I_\sigma - S_\sigma]$

The sign of the slope is theoretically ambiguous. The numerator is positive if the Keynesian expenditure multiplier condition holds, which is the maintained assumption. In that case, the sign depends on the sign of the denominator representing the relative sensitivity of the investment and saving rates to changes in the profit share.

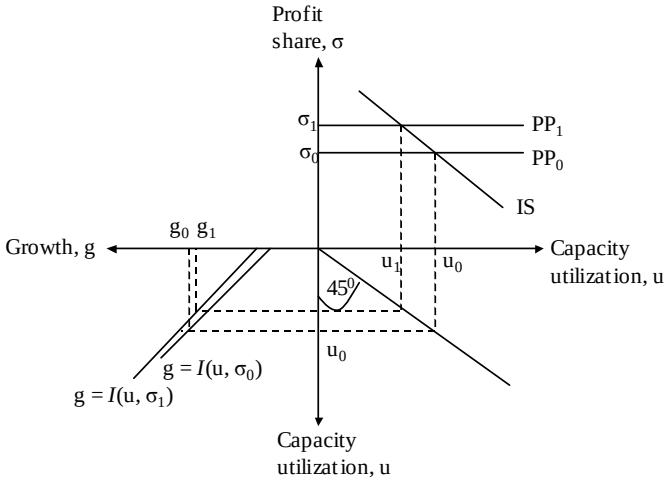
An economy is profit-led if an exogenous increase in the profit share raises capacity utilization which means it raises investment by more than saving ($I_\sigma - S_\sigma > 0$), rendering the IS positively slope. An economy is wage-led if an exogenous increase in the profit share lowers capacity utilization which means and it raises investment by less than saving ($I_\sigma - S_\sigma < 0$), rendering the IS negatively sloped. Conflictive economies are a sub-set of wage-led economies. A higher profit share lowers capacity utilization so that the IS schedule is also negatively sloped ($I_\sigma - S_\sigma < 0$). However, investment is highly sensitive to the profit share so that the rate of accumulation and growth increases despite lower capacity utilization.

Table 1 describes the analytical characteristics of profit-led, wage-led, and conflictive economies. Figure 1 provides a graphical analogue of the model given by equations (1) – (5) for the case of a wage-led economy. The PP line corresponds to equation (3). The IS schedule corresponds to equation (4). An increase in the profit share shifts the PP schedule up and reduces capacity utilization. That in turn reduces the growth rate despite the higher profit share.

Table 1. Conditions describing profit-led, wage-led and conflictive regimes.

	Capacity utilization	**Investment -Saving response**	**Growth rate**
Profit-led	$u_\sigma > 0$	$I_\sigma - S_\sigma > 0$	$I_u u_\sigma + I_\sigma > 0$
Wage-led	$u_\sigma < 0$	$I_\sigma - S_\sigma < 0$	$I_u u_\sigma + I_\sigma < 0$
Conflictive	$u_\sigma < 0$	$I_\sigma - S_\sigma < 0$	$I_u u_\sigma + I_\sigma > 0$

Figure 1. The wage-led neo-Kaleckian growth ($\sigma_1 > \sigma_0$).



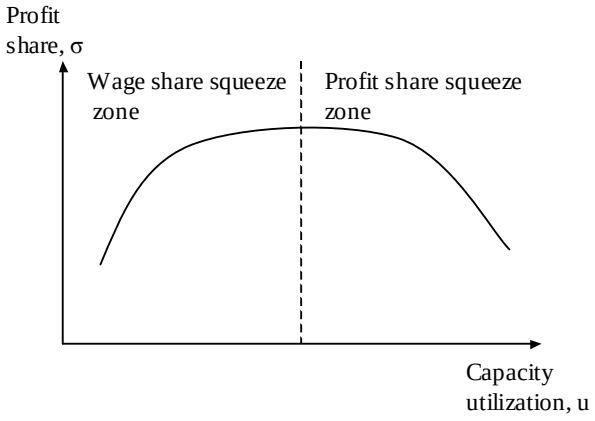
Conflictive economies can be interpreted as occupying a middle ground between wage-led and profit-led economies. Like the wage-led case, in a conflictive regime the IS curve is negatively sloped but its slope is larger in absolute value. This reflects the fact that investment is more sensitive to the profit share: I_σ is larger but $I_\sigma - S_\sigma <$is still negative. I_σ increases as investment becomes more sensitive to the profit share causing the IS to steepen. The slope of the IS turns positive when $I_\sigma - S_\sigma > 0$, at which stage the

economy becomes profit-led. A vertical IS therefore corresponds to the border case between the conflictive and profit-led regimes.

3. Nonlinearities

Figure 1 is drawn under the assumption that both the IS schedule and PP function are linear. In reality, it is likely that both the IS schedule and profit share function are nonlinear. Figure 2 shows the profit share as a concave function of capacity utilization. The area to the left of the peak can be labeled the wage share squeeze zone, while the area to the right can be labeled the profit share squeeze zone. The economic logic is that at low capacity utilization increased demand gives firms a little extra market power to raise profit margins. However, as capacity utilization increases, labor markets tighten and workers are able to claim a larger share of output.

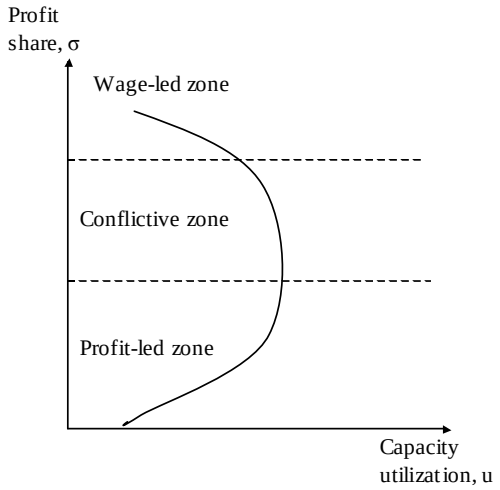
Figure 2. A nonlinear profit share function.



The IS schedule can also be nonlinear as shown in Figure 3 in which it is backward bending. There are two reasons for the backward bend. The first is conventional neoclassical capital stock adjustment costs. As the profit share and profit

rate increase, the investment rate increases. However, rising marginal costs of capital stock adjustment limit the rate at which new capital can be added and absorbed into organizations. The second reason is a rising profit share increases the income of very top tier income households at the expense of workers and middle class households, and this gives rise to a rising saving rate. Together, the two arguments explain why the IS schedule may bend backward as the profit share increases. As shown in Figure 3, there will then be three regions. The bottom portion of the IS is the profit-led zone. The middle portion, beginning when the IS becomes vertical from below, is the conflictive zone. The top portion is the wage-led zone.[2]

Figure 3. A nonlinear IS schedule.

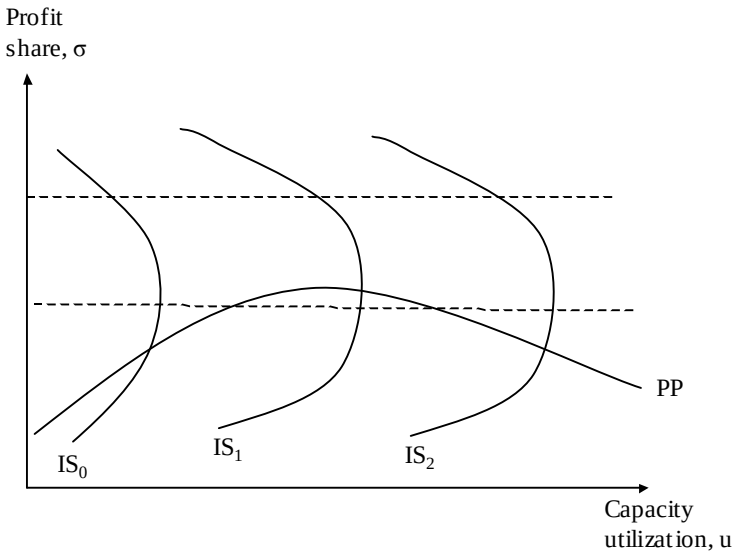


Combining Figures 2 and 3 then means there are potentially six distinct economic zones: profit-led/wage squeeze; profit-led/profit squeeze; conflictive/wage squeeze; conflictive/profit squeeze; wage-led/wage squeeze; wage-led/profit squeeze.

[2] The idea of a non-linear IS has some parallels with Kaldor's (1940) non-linear model of the business cycle.

As shown in Figure 4, the coexistence of a nonlinear IS and profit function means an economy may move through different zones over the course of a business cycle. For instance, Figure 4 shows a series of rightward shifting IS schedules. These shifts can be interpreted as the result of a mix of short- and medium-run shifts. Short run shifts are associated with changes within a business cycle. Medium run shifts are associated with changes across business cycles. As depicted in Figure 4, the economy starts in the profit-led/wage squeeze zone, moves into the conflictive zone, and then moves to the profit-led/profit squeeze zone.

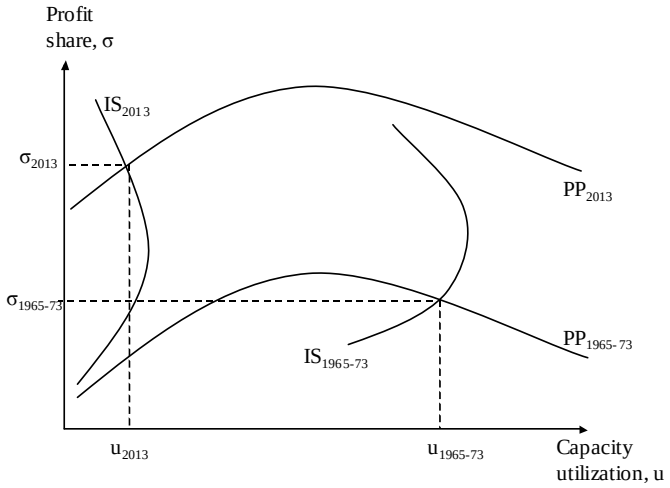
Figure 4. Cyclical regime profile in the neo-Kalekian model with a nonlinear IS schedule and profit share function.



Finally, there is the need to consider structural change effects impacting the PP function. It is now widely recognized that there has been significant changes in the functional distribution of income over the past forty years (see Mishel et al. 2009), with the profit share benefitting at the expense of the wage share. That has shifted up the PP function.

Figure 5 can be thought of as depicting a stylized history of the U.S. economy. In the period 1965-73, the U.S. was characterized as a profit-led economy operating with high-capacity utilization in the profit squeeze zone. In 2013, it is a wage-led economy operating with low capacity utilization in the wage squeeze zone.

Figure 5. Structural change in a nonlinear neo-Kaleckian model (2013 vs. 1965-73).



The above non-linear model has several important analytical implications. First, if the U.S. economy (and perhaps other economies too) is now in a regime similar to that denoted by the intersection of IS_{2013} and PP_{2013} in Figure 5, economic expansion is going to produce a rising profit share that curtails expansion. However, lowering the profit share by shifting down the PP function could move the economy into a conflictive regime where there is a trade-off between growth and capacity utilization. This suggests a three-fold challenge: to shift the IS schedule right, flatten the PP schedule, and shift the PP schedule down.

Second, Figure 5 illustrates how the U.S. economy may have passed through several structural regimes. The late 1960s and early 1970s were characterized by a profit-led/profit squeeze regime. In the mid- and late 1970s the IS shifted significantly left,

resulting in a new IS/PP intersection characterized by profit-led/wage squeeze. Thereafter, the neoliberal regime increased the profit share and shifted up the PP function. It also may have shifted the IS slightly rightward via asset price inflation, consumer borrowing, and budget deficits. That process resulted in a transitional shift to the current regime of wage-led/wage squeeze. Such a stylized history has important econometric implications. Linear time series that do not take account of these nonlinearities will miss these features. Consequently, they may provide a misleading guide to the economy's structural character.

4. Political economy and the neo-Kaleckian model

The non-linear version of the neo-Kaleckian growth model described in the previous section also provides the basis for some interesting insights into the political economy of growth and macroeconomic policy. Business can be thought of as aiming to maximize profits. That implies choosing a capacity utilization rate that solves

(6) $\underset{u}{\text{Max}}\ \pi = \sigma(u)u$

This yields the following first order condition

$d\pi/du = \sigma_u u + \sigma = 0$

Rearranging implies the following condition:

$E_{\sigma,u} = \sigma_u u/\sigma = -1$

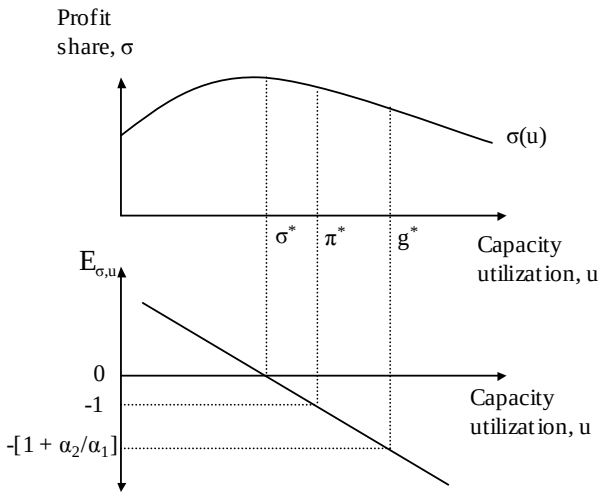
This condition says profit maximizing business will seek to lobby macroeconomic policymakers to aim for a utilization rate at which the elasticity of the profit share with respect to capacity utilization ($E_{\sigma,u}$) is unity. Note, this point is unambiguously to the right of the peak of the profit share function because business seeks to maximize profits and not the profit share.

Now, suppose the accumulation function is linearly approximated by

(7) $g = \alpha_0 + \alpha_1\sigma u + \alpha_2 u$ $\qquad\qquad$ $\alpha_0, \alpha_1, \alpha_2 > 0$

The growth maximizing rate of capacity utilization is then obtained by solving $dg/du = \alpha_1[\sigma_u u + \sigma] + \alpha_2 = 0$. This yields the condition $E_{\sigma,u} = -[1 + \alpha_2/\alpha_1]$. Growth maximization requires a utilization rate at which the elasticity of the profit share with respect to capacity utilization ($E_{\sigma,u}$) is greater than unity. As shown in Figure 6, this point is even further to the right of the peak of the profit share function than the point of profit maximization. The politically interesting implication is that the point of growth maximization is deeper in the region of profit share squeeze and will be resisted by business.

Figure 6. The relation between capacity utilization that maximizes the profit share, profit, and growth.



5. Interest rates, the stock market, and the neo-Kaleckian model

The neo-Kaleckian model has been largely developed without reference to financial market factors. This section introduces interest rates and the stock market, and it shows

how the neo-Kaleckian model can help explain why q theory (Tobin and Brainard, 1977) constitutes an inadequate theory of investment.

The first step is the addition of equations explaining the value of the stock market which are given by

(8) $q = e\pi$

(9) $\pi = \sigma u$

(10) $e = 1/\delta$

(11) $\delta = \lambda + r$

q = value of the stock market relative to the capital stock, e = stock market profit valuation multiple, δ = investors' discount rate, λ = equity risk premium, and r = real interest rate on bonds. The modified accumulation function is given by

(12) $g = \alpha_0 + \alpha_1\sigma u/\delta + \alpha_2 u$ $\qquad \alpha_0, \alpha_1, \alpha_2 > 0$

The rate of investment now depends on the discounted profit share rather than the gross profit share. Substituting equation (11) into equation (10) yields

(13) $g = \alpha_0 + \alpha_1\sigma u/[\lambda + r] + \alpha_2 u$

Equation (13) provides a point of entry for interest rates and the rate of accumulation is now a negative function of the real interest rate.

Using equations (8), (9), and (10), equation (12) can also be restated in terms of q as follows

(14) $g = \alpha_0 + \alpha_1 q + \alpha_2 u$

According to equation (14), the rate of accumulation appears to be a positive function of q. However, this is misleading because q is an endogenous variable that depends on u and the sign of its partial derivative is ambiguous ($q_u \gtrless 0$). The reason for the ambiguity is

the sign depends on whether the economy is wage- or profit-led, and it also depends on where the economy is relative to the profit maximizing rate of capacity utilization. As shown below, this is why q performs poorly in econometric models.[3]

Table 2 provides comparative statics with regard to the rate of accumulation (g) and the stock market valuation (q). g and q move in the same direction with regard to the bond rate (r), the equity risk premium (λ). If the economy is profit-led or conflictive, they co-move in the same direction with regard to the bargaining power variable (ψ). However, they move in opposite directions if the economy is wage-led. The logic is increased firm bargaining power increases firms' profits, which raises q but it also has a sufficiently depressing effect on u that g falls. In a wage-led economy, changes in firm-worker bargaining power that change the profit share produce a negative relation between q and the rate of investment (g), contrary to the predictions of q theory.

Finally, changes in the propensity to save (β) cause g and q to co-move positively if capacity utilization is below the profit maximizing utilization rate (π^*), or if capacity utilization is above the growth maximizing utilization rate (g^*). However, g and q co-move negatively if capacity utilization lies between π^* and g^*. Below π^*, increases in u raise both the profit rate and the rate of accumulation. Above g^*, increases in u lower both the profit and the rate of accumulation. In between, increases in u lower the profit rate but increase the rate of accumulation.

In sum, the neo-Kaleckian model explains why the stock market and the rate of investment can move in opposite directions if the economy is configured in a particular

[3] Equation (14) model also shows that q should not be added as a separate variable in investment equations, but is instead embedded in the discounted profit share variable.

way. Such a patter is contrary to the predictions of q theory, and it helps explain why q performs so poorly in econometric analyses of investment.[4]

Table 2. Comparative statics for accumulation (g) and stock market valuation (q).

	dg	dq
dr	-	-
$d\gamma$	-	-
Wage-led: $d\psi$	-	+
Profit-led: $d\psi$	+	+
$u < \pi^*$: $d\beta$	-	-
$\pi^* < u < g^*$: $d\beta$	-	+
$u > g^*$: $d\beta$	+	+

6. Conclusion

This paper has expanded the neo-Kaleckian growth model to include nonlinearities, political economy factors, and interest rate and stock market effects. The expansions enrich the model and enhance its capacity to analyze and explain developments within contemporary capitalist economies. The inclusion of nonlinearities shows that economies can be both wage- and profit-led. That poses an econometric challenge, and econometric estimates that fail to account for nonlinearities may provide a misleading understanding of an economy's structural characteristics.

[4] This is a macroeconomic critique of q theory. It is separate and distinct from the microeconomic critique of q theory provided by Crotty (1990) and Palley (2001) who focus on the implications of distinguishing between managers and owners. Managers determine investment, whereas owners determine stock market valuations. Managers' profitability expectations therefore matter for investment while shareholder profitability expectations matter for the stock market, and the two can be very different.

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