**Preliminary & incomplete draft**

# A New Theory of Wage-led Growth: Schumpeterian Investment, Corporations, and the Role of Induced Technical Progress


## Abstract

Post-Keynesian growth theory is dominated by the neo-Kaleckian growth model. Its key contribution is the notion of wage-led growth, which has proved politically attractive in an era of wage stagnation. However, the theory depends on equilibrium capacity utilization varying in response to aggregate demand, and there are strong theoretical and empirical grounds for questioning that assumption. This paper presents a new supply-side theory of wage-led growth. The theory emphasizes endogenous technical progress and a Schumpeterian channel whereby technical innovation spurs investment. It also diminishes the significance of household saving as corporations largely self-finance investment. Wage-led growth can exist if an increased wage share stimulates innovation, thereby inducing corporations to increase investment.



*Keywords:* Wage-led growth, induced technical progress, Schumpeterian investment, corporations.
*JEL ref.:* E12, E22, E24, E25.



Thomas Palley
mail@thomaspalley.com


October 2018

## 1. Introduction: wage-led growth revisited

Post-Keynesian growth theory is dominated by the neo-Kaleckian growth model pioneered by Rowthorn (1981) and Dutt (1984). The key contribution of the model is its notion of wage-led growth, which has proved politically attractive to activists and politicians in the current era of wage stagnation and increased income inequality. That is because wage-led growth provides a justification for raising the wage share in national income. In a wage-led world a higher wage share raises growth, contrary to predictions of most other growth theories. The reasoning is a higher wage share increases aggregate demand (AD), raising capacity utilization which in turn increases the rate of capital accumulation and growth.

A key feature of the neo-Kaleckian wage-led growth model is its dependence on variable capacity utilization. Absent that feature, the wage-led model collapses as there is no channel for the wage share to positively affect the rate of capital accumulation. Indeed, the opposite becomes true, and a higher wage share lowers accumulation and growth by negatively impacting the profit share and profit rate.

Unfortunately, there is a solid theoretical and empirical case for believing capacity utilization is not variable in the way assumed by the neo-Kaleckian model. At the theoretical level, if there are limits to firms' scale and the production function is quasi-concave, marginal costs will begin to rise at some stage. That means firms will have a profit maximizing rate of capacity utilization. Demand shocks may push them temporarily away from that optimum, but firms will seek to restore it, with the adjustment period being of business cycle frequency.

At the empirical level, there are grounds for believing capacity utilization is stationary (Schoder, 2014). Moreover, though measured capacity utilization may change owing to technological change or changes in the composition of industry, that still does not save the neo-Kaleckian model. That is because the model requires equilibrium capacity utilization change in response to AD, as the growth effect of the wage share works via its initial impact on AD. Changes in equilibrium capacity utilization due to changed supply-side factors simply impose a new normal rate of capacity utilization that is independent of AD.

The above considerations provide strong grounds for skepticism about the neo-Kaleckian model and its justification for wage-led growth. That said, wage-led growth can still be possible, only not in the way described by the neo-Kaleckian model.

This paper presents an alternative theory of wage-led growth that works through the supply-side. The new theory emphasizes the role of endogenous technical progress and the connection between technical change and investment. The paper extends the Kaldor – Hicks endogenous technical progress function (Palley, 2012, 2013, 2014, 2018a, 2018b) to include Schumpeterian growth considerations. In a Schumpeterian world technical innovation spurs investment. That channel allows the wage share to positively impact investment via its impact on innovation.

**2. The basic model**

The starting point of the analysis is an augmented Post Keynesian growth framework, the equations for which are given by:

(1) $Y = AMin[K/v, \mathit{L}/b]$

(2) $g_Y = g_K + g_A$

(3) $g_K = g_{\mathit{L}}$

(4) $g_K = I/K$

(5) $g_{\mathit{L}} = g_L + g_a$

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

(7) $s_\Pi + s_W = 1$

(8) $\pi = s_\Pi u$

(9) $u = Y/K$

(10) $u = u^*$

Y = output, A = level of disembodied technical progress, K = capital, v = capital - output ratio, *L* = effective labor input, b = effective labor - output ratio, I = investment, S = saving, L = employment, N = population, $g_Y$ = output growth, $g_K$ = growth of the capital stock, $g_A$ = rate of disembodied technical progress, $g_L$ = employment growth, $g_{LS}$ = effective labor supply growth, $g_a$ = rate of labor augmenting technical progress, $s_\Pi$ = profit share, $s_W$ = wage share, $\pi$ = profit rate, u = capacity utilization, $u^*$ = normal capacity utilization.

The first important innovation in the model is that there is both Harrod-neutral disembodied technical progress ($g_A$) and Hicks-neutral labor augmenting technical progress ($g_a$). Equations (1) – (5) constitute the supply side. Equation (1) is the aggregate production function which is Leontieff. Labor input equals effective labor, reflecting the impact of Hicks-neutral labor augmenting technical progress.[1] Equation (2) has output growth equal to the rate of capital accumulation plus the rate of Harrod-neutral disembodied technical progress ($g_A$). Equation (3) has the rate of capital accumulation equal the rate of growth of effective labor input growth, which is a requirement that follows from the Leontieff technology. Equation (4) defines the growth of the capital stock as equal to the rate of capital accumulation. Equation (5) defines the rate of effective labor input growth, which is equal to employment growth plus the rate of labor augmenting technical progress ($g_a$).

Equation (6) is the goods market clearing condition which requires that investment per unit of capital (i.e. the rate of capital accumulation) equal saving per unit of capital. Equation (7) is the income share adding up constraint. Equation (8) is the definition of the profit rate. Equation (9) is the definition of capacity utilization. Equation (10) has capacity utilization equal to normal capacity utilization. That assumption means

[1] The capital-effective labor ratio is obtained from equation (1) and is given by $k = K/L = v/b$. Unlike neoclassical growth theory, the capital-effective labor ratio is of no significance. In neoclassical growth theory it is essential as it determines labor productivity and the real wage.

the model is not afflicted by the capacity utilization critique that afflicts the neo-Kaleckian model.[2]

### 3. Schumpeterian investment

The second important innovation in the model concerns investment, and it is here that the Schumpeterian dimension enters. The innovation involves distinguishing between investment that is made to expand the capital stock, versus investment that is made to incorporate innovations and gain a competitive advantage over business rivals. The latter constitutes Schumpeterian investment.

That distinction is captured in the following linear investment function

(11) $g_K = I/K = \alpha_1 + \alpha_2\pi + \alpha_3 g_a$ $\qquad \alpha_1 > 0, \quad \alpha_2 > 0, \quad \alpha_3 > 0$

$\pi$ = profit rate. The rate of capital accumulation is driven by an autonomous component reflecting animal spirits ($\alpha_1$), the profit rate ($\alpha_2\pi$), and the rate of Hicks-neutral labor saving technical progress ($\alpha_3 g_a$). The Schumpeterian component of investment corresponds to that part of investment due to labor-saving technical progress ($\alpha_3 g_a$).

Historically, economists have focused on the role of capital accumulation driving technical progress. The economic logic of such thinking is as follows:

> "Technical progress is therefore both "revealed" and "realized" through investment, so that investment serves simultaneously as the means of (1) expanding the capital stock, (2) feeding technical innovations into the production process, and (3) uncovering future possibilities for innovation (Palley, 1996, p.124)."

A Schumpeterian perspective reverses that logic and has technical progress spurring investment. Investment can be viewed as a way of harvesting technical progress so that

[2] It also means that the model abstracts from the short-run disequilibrium adjustment dynamics associated with movements to normal capacity utilization.

faster technical progress induces increased investment. That pattern is consistent with the great growth waves associated with waves of innovation, and the mechanism has also been adapted to explain cyclical waves of investment (Shleifer, 1986).

**4. Corporations and saving**

The third important innovation in the model concerns saving and how investment – saving balance is achieved. The innovations concern the introduction of corporate saving and corporate retained profits.

Existing Post Keynesian growth models view saving through the lens of households. Those models distinguish between capitalist and worker households, with capitalists assumed to have a higher propensity to save, and aggregate saving consisting of saving by capitalist and worker households. That Post Keynesian formulation ignores the significant role of corporations.

As documented by Richard and Nancy Ruggles (Ruggles and Ruggles, 1992; Ruggles, 1993), the vast bulk of capital formation is self-financed by business. Corporate saving is therefore an essential and dominant part of aggregate saving, yet it is absent in Post Keynesian models. Not only does that treatment misrepresent saving, it also obscures the role of corporations in the growth process. The corporation is the dominant and most important private sector economic institution, and it was central to the analysis of second generation Post Keynesians (Galbraith, 1967; Penrose, 1959; Marris, 1964; Wood, 1975; Eichner, 1976). However, it has now significantly disappeared from Post Keynesian economics.

The current model reintroduces the corporation. Aggregate saving is made up of corporate and household saving, and the saving nexus is described by the following equations:

(12) $S/K = S = S_C + S_H$

(13) $S_C = r\pi$ $\quad 0 < r < 1$

(14) $r = r(q, s_\Pi)$ $\quad r_q < 0, r_{s\Pi} < 0$

(15) $S_H = s_0 + s_1[1 - r]\pi + s_2 q$ $\quad s_0 > 0, s_1 > 0, s_2 > 0$

$S_C$ = corporate saving, $S_H$ = household sector saving, r = corporate profit retention ratio, q = stock market price of firms' capital.[3] Equation (12) defines aggregate saving as equal to corporate and household saving. Equation (13) determines corporate saving which equals retained profits. Corporate saving is a positive function of both the retention ratio and the profit rate. Equation (14) determines the corporate retention ratio, which is a negative function of the stock market price of capital and a negative function of the profit share. The logic is that as the stock market bids up the value of existing capital, firms become more willing to finance themselves by selling new equity claims. Consequently, firms need to retain less profits to finance investment and can lower the retention ratio. A higher profit share means corporations have increased available internal finance, which induces them to reduce the share of profits they retain. Equation (15) determines household sector saving. Household saving is a negative function of the retention ratio as a higher ratio lowers distributed profits. It is a positive function of the profit rate as a higher profit share shifts income to capitalist households which have a higher propensity to save. Lastly, household saving is a negative function of asset prices owing to the consumption wealth effect of higher asset prices.

Combining equations (12) – (15) yields an aggregate saving function given by

[3] The goods market price of capital is unity so that q is the ratio of the stock market price to the goods market price.

(16) $S = r(q, s_\Pi)\pi + s_0 + s_1[1 - r(q, s_\Pi)]\pi + s_2 q = S(q, s_\Pi)$ $\qquad S_q < 0, S_{s\Pi} \gtrless 0$

An increase in the stock market value of capital reduces aggregate saving by lowering the corporate retention ratio and increasing the household consumption wealth effect.[4] An increase in the stock market value of capital causes firms to reduce saving by one dollar. Household income is increased by one dollar, but they only save part of it. Furthermore, household saving is directly reduced by the stock market wealth effect. Ergo, aggregate saving falls.

The impact of an increase in the profit share on aggregate saving is technically ambiguous because the corporate retention rate goes down.[5] Household saving increases unambiguously, but corporate saving could decline if the decline in the retention ratio is large enough. Henceforth, it is assumed that aggregate saving increases in response to a higher profit share so that $S_{s\Pi} > 0$.

**5. The Kaldor – Harrod - Hicks technical progress functions**

The fourth important innovation concerns technical progress and the introduction of a Kaldor – Harrod - Hicks technical progress nexus. The attribution to Kaldor (1957) reflects the fact that technological progress is endogenous. The attribution to Harrod (1939) reflects the fact that technical progress can be disembodied and positively impact the productivity of both capital and labor. The attribution to Hicks (1932) reflects the fact that technical progress can be labor augmenting.

Given that there are two types of technical progress, there are two separate technical progress functions. These technological progress functions are a critical element of the model as they are part of the mechanism that channels the beneficial growth effects

---

[4] The effect of the stock market on aggregate saving is given by $S_q = r_q\pi - s_r r_q\pi + s_q < 0$.
[5] The effect is given by $S_{s\Pi} = ru^* + r_{s\Pi}\pi + s_1[1 - r]u^* - s_1 r_{s\Pi}\pi$.

of the wage share. Later, it is shown that the technical progress function also serves as the mechanism that equilibrates and stabilizes the labor market.

The technical progress functions are given by:

(16) $g_A = A(t_A, g_K)$ $\qquad A_{tA} > 0, A_{gK} > 0$

(17) $g_a = a(t_a, s_W, U)$ $\qquad a_{ta} > 0\ a_{sW} > 0, a_U < 0$

$t_A$ = exogenous trend rate of Harrod-neutral technical progress, $t_a$ = exogenous trend rate of Hicks-neutral technical progress, U = unemployment rate. Equation (16) determines the rate of Harrod-neutral technical progress which is subject to a positive autonomous trend, and is also a positive function of the rate of capital accumulation. The logic of making it a positive function of the rate of accumulation is provided in Palley (1996), the argument being that technical progress is both revealed and realized through the process of investment. Investment causes productive organizational disruptions as firms work to smoothly incorporate capacity expansion.

Equation (17) determines the rate of Hicks-neutral (labor-saving) technical progress which is subject to a positive autonomous trend, and is a positive function of the wage share. It is also a negative function of the unemployment rate. The economic logic of making it a positive function of the wage share is provided in Palley (2012). The argument is that when the wage share is high firms have an incentive to innovate and introduce labor saving advances that save on the wage bill. The economic logic of making labor-saving technical progress a negative function of the unemployment rate is provided in Palley (2013, 2014). The argument is that when the unemployment rate is high firms have a reduced incentive to innovate and introduce labor saving advances because labor supply is abundant, which puts downward pressure on wages.

For simplicity of exposition, it is assumed the two technical progress functions are linear and given by

(16') $g_A = t_A + \gamma g_K$ $\gamma > 0$

(17') $g_a = t_a + \lambda_1 s_W - \lambda_2 U$ $\lambda_1 > 0, \lambda_2 > 0$

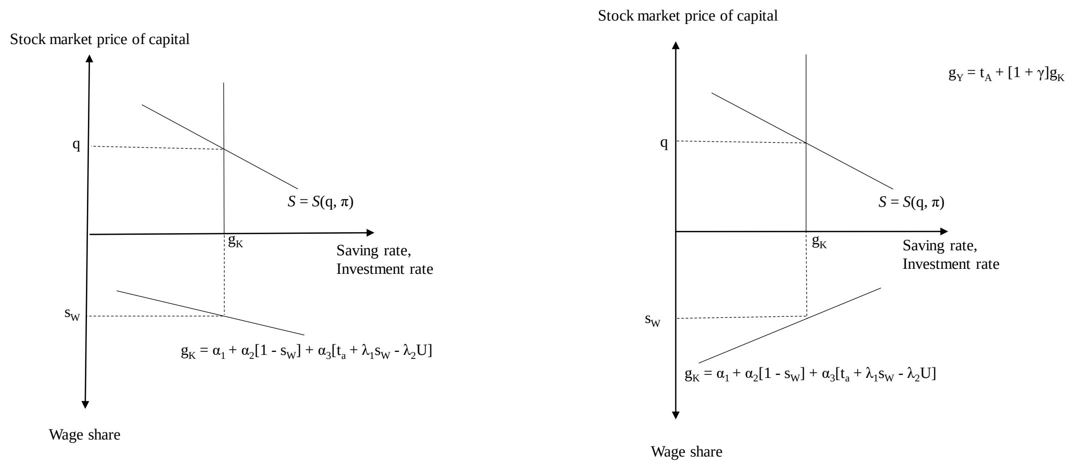
**6. Short-run equilibrium and comparative statics**

The model economy can be either wage-led or profit-led. The profit-led impulse comes directly from the positive effect of the profit rate on the rate of accumulation. The wage-led impulse comes indirectly via the Kaldor - Hicks technological progress function. A higher wage share increases the incentive to uncover labor-saving innovations, which in turn stimulates capital accumulation via the Schumpeterian channel. If the profit-led impulse dominates, the economy is profit-led. If the wage-led impulse dominates, it is wage-led.[6]

Figure 1 shows the determination of the rate of accumulation and the market price of capital. The left-hand panels show the case of wage-led growth, while the right-hand panels show the case of profit led growth.

[6] There is a third case when the two impulses exactly offset, so that distribution has no effect on growth.

Figure 1. Determination of the short run rate of accumulation and market price of capital.




The determination of the rate of accumulation is given by

(18) $g_K = \alpha_1 + \alpha_2[1 - s_W] + \alpha_3[t_a + \lambda_1 s_W - \lambda_2 U]$

The term $\alpha_2[1 - s_W]$ reflects the positive effect of the profit rate on accumulation. The term $\lambda_1 s_W$ reflects the impact of the wage share on innovation: the term $\lambda_2 U$ reflects the impact of the unemployment rate on innovation; and the term $\alpha_3$ reflects the Schumpeterian investment effect whereby innovation drives investment. If $\alpha_2 < \alpha_3\lambda$ the economy is profit-led. It is wage-led if the inequality is reversed, which is more likely if the Schumpeterian investment is strong.

The rate of growth of output is given by

(19) $g_Y = t_A + [1 + \gamma]g_K$

Output growth is a positive function of the rate of Harrod-neutral technical progress and the rate of capital accumulation.

The upper panel in Figure 1 describes the stock market and the determination of the equilibrium stock market price of capital. Investment is independent of the stock market and saving behavior, and is determined by the profit rate and the flow of innovation. (5) Corporations finance the bulk of their investment spending via retained profits. The role of household saving is to cover any corporate financial shortfall. Note, households do not fund investment since investment is pre-determined without reference to household saving. If corporations are short of finance, they issue new equity which is sold to households and realizes households' saving plans. If households desire to save in excess of corporate new issuance, they bid up the price of stocks. That induces a wealth effect, which increases consumption and lowers saving. The stock market is in equilibrium when aggregate saving equals investment, which implies household saving equals new corporate equity issuance as follows:

(20) $S_H = I/K - S_C$

The comparative statics are reported in Table 1 and can be understood with the help of Figure 1. For a wage-led regime the effects are as follows:

(i) An increase in the wage share increases the rate of accumulation ($g_K$) which increases growth ($g_Y$). It also lowers the stock market price (q) as the rate of accumulation increases and saving decreases, which increases the supply of new equity issue while decreasing demand for new equity.

(ii) An increase in autonomous investment increases the rate of accumulation ($g_K$) and growth ($g_Y$). The stock market price falls as the rate of accumulation increases, which increases the supply of new equity issue.

(iii) An increase in autonomous saving increases demand for new equity and raises equity prices. It has no effect on the rate of accumulation and growth.

(iv) An increase in Hicks-neutral technical progress increases the rate of accumulation and growth, and lowers stock prices by increasing the supply of new equity.

(v) An increase in Harrod-neutral technical progress raises growth, but has no other effects.

Table 1. Comparative statics results.

| | | $ds_W$ | $d\alpha_1$ | $ds_0$ | $dt_a$ | $dt_A$ |
|---|---|---|---|---|---|---|
| **Wage-led** | $dq$ | - | - | + | - | 0 |
| | $dg_k$ | + | + | 0 | + | 0 |
| | $dg_y$ | + | + | 0 | + | + |
| **Profit-led** | $dq$ | ? | - | + | - | 0 |
| | $dg_k$ | - | + | 0 | + | 0 |
| | $dg_y$ | - | + | 0 | + | + |

For a profit-led regime the effects are as follows:

(i) An increase in the wage share lowers the rate of accumulation ($g_K$) and growth ($g_Y$). The effect on the stock market price (q) is ambiguous. On one hand, new issue supply falls because of reduced investment. On the other hand, new issue demand falls because of lower saving.

(ii) For all the other experiments the effects are the same as in the wage-led case.

## 7. Adding the labor market and unemployment

Following the approach described in Palley (2012, 2013, 2014, 2018a, 2018b), the labor market and unemployment can be added to close the model. The Kaldor-Hicks endogenous technical progress function is critical for labor market stability as it provides the mechanism that balances labor demand and supply.

The equations of the labor market are given by:

(21) $U = 1 - L/N$

(22) $g_{\mathit{L}} = g_L + g_a$

(23) $g_U = g_N - g_L$

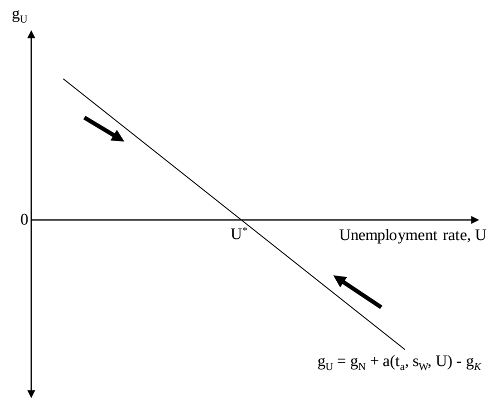
U = unemployment rate, L = employment, N = population, *L* = effective labor input, $g_{\mathit{L}}$ = growth of effective labor input, $g_L$ = employment growth, $g_N$ = labor force growth, $g_U$ = rate of change of the unemployment rate. Equation (21) is the definition of the unemployment rate. The unemployment rate depends on actual labor employed rather than effective labor employed. Equation (22) defines the rate of effective labor input growth, which is equal to employment growth plus the rate of labor augmenting technical progress. Effective labor input is what is used in the production process. Equation (23) determines is the rate of change of the unemployment rate, which is equal to labor force growth minus actual employment growth.

Substituting equations (3) and (17) into equation (23) yields

(24) $g_U = g_N + a(t_a, s_W, U) - g_{\mathit{K}}$

Equation (24) is a first-order differential equation and it governs the evolution of the unemployment rate. It is illustrated in Figure 2. The necessary condition for stability is $dg_U/dU < 0$. As the unemployment rate increases, the rate of increase decreases so that the unemployment rate eventually stabilizes. A necessary condition is that $a_U < 0$.

Figure 2. The stable unemployment rate adjustment mechanism.




Substituting equations (17') and (18) into equation (24) yields a specific form linear differential equation given by

(25) $g_U = g_N + [1 - \alpha_3]t_a + [1 - \alpha_3]\lambda_1 s_W - [1 - \alpha_3]\lambda_2 U - \alpha_1 - \alpha_2[1 - s_W]$

The differential equation is stable if $dg_U/dU = -[1 - \alpha_3]\lambda_2 U < 0$ which requires $1 - \alpha_3 > 0$. A lower unemployment rate stimulates labor-saving innovation, which increases effective labor supply. It also stimulates investment via the Schumpeterian channel, which increases labor demand. Stability requires that the labor supply innovation effect ($\lambda_2 U$) be larger than the Schumpeterian investment effect ($\alpha_3\lambda_2 U$). That implies wage-led economies, in which $\alpha_3$ is large, are more prone to instability in the labor market. Why? Wage-led economies require a strong Schumpeterian investment effect, but that strong effect can drive cumulatively unstable increases in labor demand.

The fundamental equation of motion for the labor market can be solved for the equilibrium unemployment rate. That involves setting equation (25) equal to zero and solving for U, which yields

(26) $U^* = \{g_N + [1 - \alpha_3]t_a + [1 - \alpha_3]\lambda_1 s_W - \alpha_1 - \alpha_2[1 - s_W]\}/[1 - \alpha_3]\lambda_2 U = U(\alpha_1, s_W, t_a, g_N)$

$$U_{\alpha 1} < 0,\ U_{SW} \gtrless 0,\ U_{ta} > 0,\ U_{gN} > 0$$

Assuming the economy is stable so that $1 - \alpha_3 > 0$, the comparative statics are:

$dU^*/dg_N = 1/[1 - \alpha_3]\lambda_2 U > 0$

$dU^*/dt_a = [1 - \alpha_3]/[1 - \alpha_3]\lambda_2 U > 0$

$dU^*/d\alpha_1 = -1/[1 - \alpha_3]\lambda_2 U < 0$

$dU^*/ds_W = [\alpha_2 - \alpha_3\lambda_1]/[1 - \alpha_3]\lambda_2 U \gtrless 0$

Faster population growth increases the steady state unemployment rate by increasing labor supply growth. The same holds for faster labor-saving technical progress which increases the growth of effective labor supply. An autonomous increase in the rate of accumulation lowers the steady state unemployment rate by raising the rate of employment growth. Lastly, a higher wage share lowers the steady state unemployment rate if the economy is wage-led ($\alpha_2 - \alpha_3\lambda_1 < 0$), and raises it if the economy is profit-led ($\alpha_2 - \alpha_3\lambda_1 > 0$).

**8. Long-run equilibrium and comparative statics**

The endogeneity of unemployment means that there are feedback effects via unemployment on accumulation and growth. The steady state is described by a three equation reduced form system given by

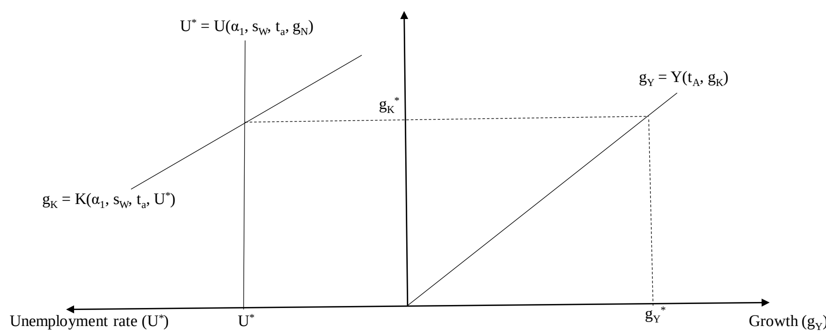
(27) $U^* = U(\alpha_1, s_W, t_a, g_N)$ $\qquad U_{\alpha 1} < 0,\ U_{SW} \gtrless 0,\ U_{ta} > 0,\ U_{gN} > 0$

(28) $g_K = K(\alpha_1, s_W, t_a, U^*)$ $\qquad K_{\alpha 1} > 0,\ K_{SW} \gtrless 0,\ K_{ta} > 0,\ K_U < 0$

(29) $g_Y = Y(t_A, g_K)$ $\qquad Y_{tA} > 0,\ Y_{gK} > 0$

The determination of equilibrium is illustrated in Figure 3. The left hand panel shows the determination of the rate of capital accumulation for a given steady state unemployment rate, and the right hand panel shows the determination of the rate of output growth for a given rate of capital accumulation.

Figure 3. The determination of steady state accumulation and growth




The effect of an increase in autonomous investment is:

$dg_K/d\alpha_1 = K_{\alpha 1} + K_U U_{\alpha 1} > 0$

$dg_Y/d\alpha_1 = Y_{gK}[dg_K/d\alpha_1] > 0$

An increase in autonomous investment directly spurs capital accumulation. Additionally, it lowers the unemployment rate which spurs labor-saving innovation, which in turn spurs capital accumulation via the Schumpeterian channel. Output growth increases. In terms of the left hand panel of Figure 3, the increase in autonomous investment shifts the unemployment rate function right, and shifts the accumulation rate function up.

The effect of an increase in the rate of labor saving technical progress is:

$dg_K/dt_a = K_{ta} + K_U U_{ta} \;{}^{>}_{<}\; 0$

$dg_Y/dt_a = Y_{gK}[\, dg_K/dt_a] \;{}^{>}_{<}\; 0$

An increase in the rate of labor-saving technical progress directly spurs investment. However, it raises the unemployment rate, which diminishes innovation and investment. The effect on accumulation is therefore ambiguous, and so too is the effect on output growth. In terms of Figure 3, the unemployment rate function shifts left, while the accumulation function shifts up.

The impact of a change in the wage share depends on whether the economy is wage-led or profit-led. For a wage-led economy the comparative statics are:

\+ - -

$dg_K/ds_W = K_{sW} + K_U U_{sW} > 0$

$dg_Y/ds_W = Y_{gK}[dg_K/d\alpha_1] > 0$

An increase in the wage share directly spurs innovation which spurs investment via the Schumpeterian channel. It also lowers the unemployment rate which further spurs labor-saving innovation and capital accumulation via the Schumpeterian channel. Output growth increases.

For a profit-led economy the signs of the comparative statics are reversed, and the effect on the rate of accumulation and output growth are negative.

\- - +

$dg_K/ds_W = K_{sW} + K_U U_{sW} > 0$

$dg_Y/ds_W = Y_{gK}[dg_K/d\alpha_1] > 0$

Lastly, the effects of faster Harrod-neutral technical progress are given by:

$dg_K/dt_A = 0$

$dg_Y/dt_A \quad = Y_{tA} > 0$

Faster Harrod-neutral technical progress has no impact on accumulation, but it raises output growth.

**9. Endogenizing the wage share**

A final complication is to endogenize the wage share, which allows for the introduction of Marx – Goodwin (1967) labor market conflict. That can be done by making the wage share a function of the unemployment rate as follows:

(30) $s_W = \sigma(U^*, X) \qquad \sigma_{U^*} < 0, \sigma_X > 0$

X = worker bargaining power. The wage share is a negative function of the unemployment rate, and a positive function of worker bargaining power.

The model economy is described by a four equation system given by equations (27) – (30). The character of the economy depends on whether it is wage-led or profit-led. Figure 4 shows the case of a profit-led economy. Equilibrium prevails when the rate of unemployment is constant ($g_U = 0$) and the wage share is consistent with the wage function. The equilibrium unemployment rate is a positive function of the wage share, reflecting the profit led nature of the economy.

<To be completed>

**10. Conclusion**

<To be completed>

## References


Dutt, A.K. (1984), “Stagnation, income distribution and monopoly power,” *Cambridge Journal of Economics*, 8, 25 – 40.

Eichner, A.S. (1976), *The Megacorp and Oligopoly: Micro Foundations of Macro Dynamics*, Cambridge University Press, Cambridge: UK.

Galbraith, J. K. (1967), *The New Industrial State*, Houghton Mifflin Company, Boston.

Goodwin, R.M. (1967): “A growth cycle,” in Feinstein, C.H. (ed.), *Capitalism and Economic Growth*, Cambridge: Cambridge University Press, 54 – 58.

Harrod, R. F. (1939), "An essay in dynamic theory," *Economic Journal*, 49, 14-33.

Hicks, J.R. (1932), *The Theory of Wages*, London: Macmillan.

Kaldor, N. (1957), “A model of economic growth,” *Economic Journal*, 67, 591 – 624.

Marris, R. (1964), *The Economic Theory of Managerial Capitalism*, Free Press, Glencore, Ill..

Palley, T.I. (1996), "Growth Theory in a Keynesian Mode: Some Keynesian Foundations for New Endogenous Growth Theory", *Journal of Post Keynesian Economics*, 19 (Fall 1996), 113 35.

------------ (2012), “Growth, Unemployment and Endogenous Technical Progress: A Hicksian Resolution of Harrod’s Knife-Edge,” *Metroeconomica*, 63 (3), 512 – 541.

------------ (2013), “A Kaldor - Hicks - Goodwin - Tobin - Kalecki model of growth and distribution,” Metroeconomica, 64 (2013), 319 - 345.

-------------- (2014), “A neo-Kaleckian - Goodwin model of capitalist economic growth: Monopoly power, managerial pay, and labor market conflict,” *Cambridge Journal of Economics*, 38 (6) (November), 1355 – 1372.

-------------- (2018a), “Unemployment and Growth: Putting Unemployment into Post Keynesian Growth Theory,” IMK-FMM Working Paper No. 21 (May), Dusseldorf, Germany.

-------------- (2018b), "The economics of the super-multiplier: a comprehensive treatment with labor markets," *Metroeconomica*, forthcoming.

Penrose, E. (1959), *The Theory of the Growth of the Firm*, John Wiley & Sons, New York: NY.

Rowthorn, R. (1982), “Demand, real wages and growth,” *Studi Economici*, 19, 3 – 54.

Ruggles, R. (1993), “accounting for Saving and Capital Formation in the United States, 1947 – 1991,” *Journal of Economic Perspectives*, 7(2), 3 – 17.

Ruggles, R. and Ruggles, N.D. (1986), “Household and Enterprise Saving and Capital Formation in the United States: A Market Transactions View,” *Review of Income and Wealth*, 38 (2), 119- 163.

Schoder, C. (2014), “Effective Demand, Exogenous Normal Utilization and Endogenous Capacity in the Long Run: Evidence From a Co-Integrated Vector Auto-Regression Analysis for the USA,” *Metroeconomica*, 65 (2), pp. 298 – 320.

Shleifer, A. (1986), “Implementation Cycles,” *Journal of Political Economy*, 94 (6), 1163 – 1190.

Wood, A.(1975), *A Theory of Profits*, Cambridge University Press, Cambridge, UK.