Old and New Growth Theories: An Assessment

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Taxation and Economic Growth: Kalecki's Contribution

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1. Summary

Even in the hey day of Keynesianism, the principal macroeconomic role perceived for fiscal policy was stabilisation. With the demise of Keynesianism, even that limited role for fiscal policy has largely disappeared. A major enigma of Kalecki's contribution to the development of macroeconomics, and growth theory in particular, was his recognition as early as 1937 that with the publication of Keynes's *General Theory* there came the need to develop a whole new approach to taxation which would have 'quite unexpected results' of 'practical importance' (Kalecki, 1937). Surprisingly, apart from this essentially short period analysis of 1937, Kalecki never formally integrated taxation into his theories of the business cycle and economic growth.

The doyen of public finance, Richard Musgrave, has recognised that the role of fiscal policy depends on both the macro as well as the micro functioning of the economy. But, while micro analysis has moved along what he calls 'a steady path', macro models have remained in a 'state of flux', as have perceptions of the macro role of fiscal policy (Musgrave, 1997). Much of the thrust of public finance has been the development of the theory of optimal taxation, but as Stern (1992) has observed 'the theory of optimal taxation has not had a great deal to say about dynamics and the theory of growth has been reticent on taxation'.

There is a need to incorporate study of the effects of taxation on growth in a way that properly links the micro and macro elements within a genuinely dynamic framework. This can be achieved by integrating taxation into Kalecki's theories of the business cycle

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and economic growth (Laramie and Mair, 1996, 2000). The incorporation of taxation into Kalecki's growth theory is not straightforward because of the unsatisfactory state in which he left it at the time of his death. Gomulka, Ostaszewski and Davies (1990) have produced a corrected version of Kalecki's growth model which gives equal weight to both 'cautious' and 'rash' capitalism.

Within this corrected Kaleckian growth model, it is then possible to study the effects of revenue-neutral changes in the taxation of wages and profits on stability, growth and unemployment. A Kaleckian approach requires integration of his theories of taxation, income distribution and income determination with his theory of investment. The impact of changes in the structure of taxation on investment will be through either or both of two channels – the level of profits and/or the rate of depreciation. The impact on the level of profits will depend on the extent of tax shifting which will be determined by what happens to income distribution which, in turn, depends on the degree of monopoly. The impact on the rate of depreciation depends on the rate of technical progress.

In Kalecki's corrected growth model, it is possible to specify the effects of changes in the structure of taxation on the conditions for economic stability under alternative shifting assumptions. Similarly, the impact of taxation on the balanced rate of growth and long period unemployment can also be identified. The results are sensitive to tax shifting (i.e. changes in income distribution) and to the stability of the trend growth rate.

The principal conclusion that follows from the integration of taxation into Kalecki's growth model is that far from being peripheral or ineffectual as modern theory would have us believe, it can have two profound sets of implications. First, taxation and fiscal policy can modify the very nature of capitalism itself; and, second, the incidence and effects of changes in tax structures can have a major impact on the structure of the business cycle, the balanced rate of growth and long term unemployment.

2. Introduction

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In this paper we present a Kaleckian approach to the long-run effects of taxation stability, growth and unemployment. By presenting a model in which the micro and macroeconomic elements are fully integrated and theoretically compatible, we can demonstrate the long-term impact of taxation on economic stability, growth and unemployment. To do so requires us to abandon the standard approach in which pre-Keynesian microeconomics is harnessed to Keynesian macroeconomics (or some variant thereof).

Kalecki (1937) argued that the publication of Keynes's *General Theory* required a new approach to the effects of taxation on the level of effective demand. He showed that, under conditions of less than full employment, the legal and economic incidence of taxes on commodities, incomes and capital can vary even in the short period and that the economic incidence of taxation has an impact on the aggregate levels of income and employment. This early profound insight of Kalecki's has been largely ignored in the literature on public finance. Kalecki himself did not pursue the implications of his 1937 paper into his later work on business cycles and growth in which he generally assumed a minimal role for taxation and government spending.

There are, in our opinion, three principal grounds for preferring Kalecki to Keynes as the starting point from which to study the macroeconomic effects of taxation as they affect the long-term behaviour of the economy. First, although Keynes and Kalecki may be regarded as the co-founders of modern macroeconomics, Kalecki was always concerned to try to understand the dynamics of capitalist economies in a way that Keynes never was. Second, income distribution, and its effects on aggregate economic behaviour, plays a central role in Kalecki, whereas Keynes never appreciated that a consequence of the *General Theory* had to be the abandonment of the marginal productivity theory of income distribution (Rothschild, 1961). But the third, and most important, reason concerns the dichotomy between micro- and macro- economics.

In order to address the issue of how taxation may affect the long-term behaviour of the economy, we incorporate taxation into Kalecki's theory of growth. Unfortunately, we are unable to proceed directly to utilize Kalecki's growth theory because of the unsatisfactory state to which he had developed it by the time of his death. This, however, has been rectified by Gomulka, Ostaszewski and Davies (hereafter G.O.D.) (1990) who correct the mistake in Kalecki's (1962) version of his theory and explore the mathematical properties of Kalecki's theory of the business cycle and trend.[2]

We further extend Kalecki's analysis of the dynamic effects of taxation by introducing the effects of wage and profit taxes into his growth theory as amended by G.O.D. In so doing, we consider we have produced a theory which addresses the long term effects of taxation on stability, growth and unemployment by integrating the micro and macroeconomic elements in a consistent manner, not hitherto achieved.

In simple terms, the micro-macro relationships in Kaleckian tax theory are as follows. At the macroeconomic level, aggregate spending flows determine the level of profits. At the microeconomic level, the degree of monopoly determines the distribution of income. Tax policy can affect the aggregate flow of spending and profits, but pricing decisions, as reflected in firms' price/cost markups, determine the intra/inter-industry and class distributions of income. Ultimately, the confluence of these factors determines the short-period incidence of taxes and this incidence, insofar as it has an impact on firms' investment decisions, generates a long-period effect. These relationships are developed formally in the model below.

The structure of the paper is as follows. First, we rewrite Kalecki's (1962) growth equation, as corrected by G.O.D., to account for the effects of wage and profit taxes; next, we consider the effects of wage and profit taxes on economic stability, the

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[2]Kalecki (1962) examined the determinants of the trend rate of growth by expressing the investment-to-capital ratio as a lagged function of the savings-to-capital ratio, (workers' savings assumed to be zero), the change in the profitability of investment, and innovations-induced investment. In integrating the profit equation into the investment equation, Kalecki failed to account for innovations-induced investment's impact on the trend rate of profits (which impacts on future investment).

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balanced rate of growth, the nature of capitalism, and the trend rate of unemployment under non-shifting and shifting assumptions of each tax; we conclude the paper by summarizing our findings.

3. Kalecki's corrected growth equation

Kalecki, like Keynes, focused on the private sector, particularly investment as a source of cyclical fluctuations and economic growth. Kalecki believed that changes in the economic environment of the firm guide investment decisions, and that these changes were reflected in firms' savings out of profits and in changes in the level of profitability of firms. Following Kalecki, we ignore the effect of changes in the rate of interest. Thus, investment decisions, in the absence of innovations, can be written as:

$$D_t = aSp_t + b(K_t\Delta\ (P/K))/\Delta\ t \tag{1}$$

where D_t = investment decisions, Sp = savings out of profits, P = profits, K = the capital stock, $K_t[\Delta\ (P/K)]$ = change in the level of profits, Δt = the time period in which changes in profitability are monitored for the purpose of making investment decisions (G.O.D., 1990, p.528) and where $a,\ b > 0$. These investment decisions are then translated into actual investment expenditures, I, via a lag; i.e.: $I_{t+1} = D_t$. Thus actual investment expenditures are written as:

$$I_{t+1} = aSp_t + b(K_t\Delta\ (P/K))/\Delta t \tag{1'}$$

Net investment is rewritten by approximating the change in profitability as the difference between the change in total profitability, ΔP, and the change in the trend profitability, $(P^*/K^*)\Delta K$; i. e.: $(K_t\Delta\ (P/K) = \Delta P - (P^*/K^*)\Delta K^*$, where '*' denotes a trend value and by adding innovations induced investment, εK^*, as a determinant (see G.O.D. 1990, p. 528); i. e.:

$$I_{t+1} = aSp_t + b[\Delta P_t - (P^*_t/K^*_t)\Delta K_t]/\Delta\ t + \varepsilon K^*_{t+1} \tag{2}$$

The net investment equation is transformed into a difference equation by finding expressions for savings, Sp, and the change in the level of profits, ΔP_t. This difference

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equation is then used to illustrate the impact of taxation on the trend rate of growth, economic stability and unemployment.

To achieve this, we derive expressions for national income, Y, and profits. We define national income so as to include government purchases. We write national income as:

$$Y = I + C_1 + C_2 + G \quad (3)$$

where C_1 = consumption out of profits, C_2 = consumption of out wages and G = government purchases. Following Kalecki (1968), we write profits, ignoring the foreign sector, as:

$$P = I + C_1 + G - T - Vs \quad (4)$$

where T = taxes (and $T = T_p + T_v$; where T_p = profit taxes; and T_v = wage taxes); and Vs = worker savings.

Assuming that:

$$C_1 = c_1(P) + A_1 \quad (5)$$

$$V_g = \alpha(Y) \quad (6)$$

where Vg = pre-tax wage income, and α = the wage share;[3] and where:

$$T_v = t_v(V_g) \quad (7)$$

where Tv = wage tax receipts and t_v = wage tax rate; and where:

$$C_2 = c_2(V_g - T_v) \quad (8)$$

where C_2 = consumption derived from wage income, and c_2 is the marginal propensity to consume out of wage income.

Thus, worker savings can be written as:

$$V_s = (1 - t_v)(1 - c_2)\alpha (Y) \quad (9)$$

and profits and national income can be rewritten as:

[3]Kalecki (1971/1968) originally expressed the wage share as: $V/Y = \beta/y + \alpha$; where β = the fixed portion of the wage bill.

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$$P = [I + A_1 + G - T]m_1 \qquad (10)$$

and

$$Y = [I + A_1 + G - T]m_2 \qquad (11)$$

where:

$m_1 = [(1 - \alpha)(1 - t_p)]/[(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)];$

and:

$m_2 = 1/[(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)];$

where $m_1 > 1$, $m_2 > 1$, and $m_2 > m_1$, where $m1/m2 = (1 - \alpha)(1 - t_p)$.

To simplify, we suppose that $G = T$ and, like Kalecki, assume that the ratio of non-investment determinants of profits to the trend capital stock, K^* is constant. Equations (10) and (11) are rewritten as:

$$P = m_1(I) + n_1(K^*) \qquad (10')$$

$$Y = m_2(I) + n_2(K^*) \qquad (11')$$

where:

$$n_1(K^*) = [A_1]m_1 \qquad (12)$$

$$n_2(K^*) = [A1]m_2 \qquad (13)$$

Given equations (10′) and (11′) and by noting that savings out of profits is equal to total savings less worker savings, $Sp = S - Vs$, and that total savings equals investment ($S = I$), by incorporating the G.O.D. correction to Kalecki's original equation that $P^*/K^* = m_1(I^*/K^*) + n_1$,[4] and assuming $\Delta t = h$, equation (2) can be rewritten as:

$$I_{t+1} = \{a' - b[m_1(I^*_t/K^*_t) + n_1][I_t] + (bm_1/h)[\Delta I_t] + bn_1(I^*_t) + \varepsilon' K^*_{t+1}\} \qquad (2')$$

where $a' = a[1 - (1 - t_v)(1 - c_2)\alpha\, m_2]$; and $\varepsilon' = \varepsilon - a(1 - t_v)(1 - c_2)\alpha\, n_2$.

Now we can consider briefly the impact of taxation on investment. The wage tax rate and the profits tax rate affect investment through; 1) the level of savings out of

[4]As mentioned in note 2, Kalecki mistakenly ignored the impact of innovations investment on the trend rate of profits, and, therefore, simply treated the trend rate of profits as a parameter in the model.

profits; and 2) changes in profitability. These effects are reflected in equation (2′) in the parameters a', m_1 and ε'.

The impact of taxes on profits is reflected in equation (10′). Assuming a balanced budget constraint, a constant and positive propensity to save out of wages ($0 < c_2 < 1$), a constant propensity to save of profits ($0 < c_1 < 1$), an increase the wage tax rate reduces worker savings and increases profits and savings out of profits through a balanced budget multiplier effect and, therefore, increases net investment (if $I_t > 0$ and $\Delta I_t > 0$). The increases in profits, savings out of profits and net investment are dampened, if the wage tax is shifted. The shifting of the wage tax is reflected in a reduction in the markup over prime costs which increases the wage share, increasing the distribution of income in favour of pre-tax wages. This pushes up worker savings which dampens the effects of the wage tax on profits, savings out of profits, and net investment.

An increase in the profit tax rate, assuming a balanced budget constraint, reduces the level of profits. An increase in the profit tax causes national income to increase, given the wage share. The increase in national income pushes up the wage bill and worker savings. The rise in worker savings reduces the level of profits and savings out of profits.. However, the shifting of the profits tax, as reflected in an increase in the markup of price over prime costs, reduces the wage share and worker savings and heighten the effects of the profits tax on profits, savings out of profits and net investment.[5]

As G.O.D. (1990, p. 529) note, Kalecki developed a third version of the investment equation to comply with the Harrod requirement that investment which justifies itself results in a constant investment to trend capital stock ratio. The investment equation is adjusted accordingly and is written as:

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[5]We ignore the impact of taxation on the marginal propensities to save out of profits and wages, but such effects are easy to consider. If, for example, the marginal propensities to consume vary positively with the profits and wage tax rates, then the effects of taxation as described above are to some degree modified. An increase in the marginal propensity to consume out of wages, reduces workers' savings and increases profits, savings out profits and investment, and, therefore heightens the effect of a wage tax increase. Likewise, an increase in the marginal propensity to consume out of profits, increases capitalists' consumption, profits, savings out of profits and investment.

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$$I_{t+1}/K^*_{t+1} = \{a' - b[m_1(I^*_t/K^*_t) + n_1][I_t/K^*_t]\} + (bm_1/h)[\Delta I_t/K^*_t] + bn_1(I^*_t/K^*) + \varepsilon' \tag{14}$$

By defining $I_t/K^*_t = g_t$ and $\Delta I_t = \square(g_t K^*_t) = \Delta g_t K^*_t + g_{t-h}\Delta K^*_t = \Delta g_t K^*_t + g_{t-h} h I^*_t$ we derive the G.O.D. corrected version of Kalecki's growth equation:

$$g_{t+1} = a'g_t + [bm_1/h](g_t - g_{t-h}) + bm_1 g_t(g_{t-h} - g_t) + \varepsilon' \tag{15}$$

This expression is used to consider the impact of taxation on stability, economic growth, the nature of capitalism and unemployment.

5. Taxation and economic stability

Following G.O.D. (1990, pp. 531 - 2), a sufficient condition for an asymptotically stable growth rate can be found. In terms of equation (15), a sufficient condition for stability, using the corrected version of Kalecki's growth equation, can be written as:

$$h > h^* = 2bm_1/(1 - a')^{6} \tag{16}$$

The wage and profits tax rates affect the conditions for stability through the terms m_1 and a'. Recall that m_1 is the investment coefficient in the profit equation and that a' is the savings coefficient in the investment equation. By differentiating h^* with respect to the wage and profits tax rates, we consider the impact of changes in the tax rates on economic stability. A change in any parameter that increases h^* relative to h and makes h^* greater than h causes the growth rate to be unstable. In addition, if h^* initially is greater than h, a change in any parameter that increases h^* increases the instability of the growth rate; and if h^* is initially less than h, a change in any parameter that reduces h^* increases the stability of the growth rate. For example, as mentioned above, with a balanced budget constraint an increase in the wage tax rate, t_v, increases profits and

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[6]G.O.D (1990, p. 532) state that the zero solution is unstable when $h^*>h$ and 'either h is irrational, or h is rational and is of the form *p/q,* with p odd and q even.' These conditions suggest that growth rate is 'virtually only stable,' if equation (16) is satisfied, since most numbers are irrational.

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savings out of profits and net investment. Therefore, an increase in the wage tax rate would tend to increase the likelihood that the growth rate is unstable, and this effect would be dampened if the wage tax rate is shifted. If the profits tax rate, t_p increases, profits and savings out of profits decline assuming the tax change is unshifted; and, the increase in the profits tax rate would reduce h^* relative to h, and increase the likelihood that the growth rate is stable. If the profits tax is shifted, profits and savings out of profits both increase and, thus, increase the likelihood that the growth rate is unstable. These results are formally presented in the Appendix.

6. The impact of taxation on the balanced rate of growth

For balanced growth to occur: $g_t = g_{t-h} = g_{t+1}$. Thus, from equation (15), the balanced growth rate, g^*, can be written as:

$$g^* = \varepsilon'/(1 - a') \qquad (17)$$

As implied, the balanced growth rate is positive when both ε' and $(1 - a')$ are positive or both are negative. If we suppose that ε' is positive, then for the balanced growth rate to be positive, $(1 - a')$ must also be positive. For $(1 - a')$ to be positive, a' must be between zero and one ($1 > a' > 0$).[7]

We now consider the impact of taxation on the balanced growth rate. These results are formally presented in the appendix. Taxation affects the balanced rate of growth through changes in ε', the constant in the investment function, and a', the savings coefficient in the investment function. An increase in the wage tax rate that is not shifted reduces workers' savings, which increases profits and savings out of profits. The increase in the wage tax rate simultaneously causes both ε' and a' to increase ($(1 - a')$ to decrease), which increases the balanced rate of growth. If the wage tax is shifted, $k_{t_v} < 0$, then these effects are diminished, because the shifting of the wage tax results in an increase in worker savings, a reduction in savings out of profits.

[7]Generally, since $a > 0$, $1 > a'$, if $1/a' > [(1 - \alpha)(1 - c_1)(1 - t_p)]/[(1 - \alpha)(1 - c_1)(1 - t_p) + \alpha(1 - c_2)(1 - t_v)]$.

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The change in the balanced growth rate with respect to a change in the profits tax rate is negative, if the markup is constant with respect to a change in the profits tax. An increase in the profits tax reduces the level of profits and savings out profits. If the markup is positively related to the profits tax, then the shifting of the profits tax dampens the negative effect that the profits tax has on the balanced rate of growth.

From the discussion above, two implications arise. First, taxation and fiscal policy modify the 'nature' of capitalism. Second, the incidence and effects of taxation have an impact on the long-run unemployment rate when 1) the growth rate is stable; and 2) when the growth rate is unstable. We consider each briefly.

7. Taxation and the nature of capitalism

In describing the stability characteristics of Kalecki's growth theory, G.O.D. distinguish two types of capitalism - 'rash' and 'cautious' - and show that 'cautious' capitalism arises when 1) investors react slowly to changes in profitability (b is relatively small or h is relatively large in equation (16)); and 2) either the rate of innovation is low or the response of innovators to innovations is weak. The results presented above imply that fiscal policy can counter or reinforce the nature of capitalism. For example, an increase in the wage tax that is not shifted, coupled with a balanced budget constraint, heightens instability (or reduces the degree of stability). In other words, 'rash' capitalism is being accommodated. The opposite is true with respect to increases in the profits tax, if the profits tax is unshifted and a balanced budget constraint is maintained. Furthermore, these results suggest that budget deficits (surpluses) heighten (dampen) economic stability, but that the ultimate effect of fiscal policy, in particular tax changes, on stability depends upon the reaction of the markup and the marginal propensity to save out of wage income.

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8. Taxation and trend unemployment

We can now consider the implications for unemployment when the growth rate is stable and unstable. We begin by examining the impact of taxation on the trend growth rate in employment when the growth rate is stable.

As implied above, assuming no government sector, the growth rate of output, g^*, is positively related to the rate of innovation-induced investment, ε. Kalecki (1962) assumed that innovations-induced investment is positively related to the rate of innovation, λ. Thus, growth in employment can be written as:

$$g_L = g^*(\varepsilon(\lambda)) - \lambda \tag{18}$$

where g_L = the trend employment growth rate.

Assuming that g^* is less than the 'natural' growth rate (the growth rate in the labour force plus the rate of innovations), the employment growth rate is demand-determined, determined by ε, and is less than the 'natural' employment growth rate. When the government sector is absent and when $\lambda = 0$, then ε and g are zero, and $g_L = 0$. Under this condition, assuming the labour force is growing, the trend level of unemployment is increasing and the trend level of employment is constant. For the trend unemployment rate to remain constant, the rate of innovation-induced investment, ε, would have to be of a magnitude ε^* such that $g(\varepsilon^*) - \lambda = g_L$. Kalecki did not develop his theory sufficiently to say anything specific about the properties of ε. But his theory implies that if $g_L > 0$, then either the rate of innovation or the investment-inducing power of innovations would have to be sufficiently high to prevent the unemployment rate from increasing. G.O.D. (p. 526) call this proposition that technological innovation is good for employment 'Kalecki's Growth Proposition' and it is this they argue that brings Kalecki close to Schumpeter and away from Marx.

With our modifications, we now rewrite the trend employment growth rate. In the discussion above, the national income multiplier, m_2, was implicitly held constant. Thus, the trend rate of growth in output was identical to the trend rate of growth in investment,

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g^*. Since we are allowing for changes in tax rates, and, therefore, changes in the income multiplier, the rate of growth in output can be approximated as the sum of the rate of growth in investment and the rate of growth in the income multiplier. The rate of growth in investment, g^*, depends on the tax rates, t_v and t_p, the wage share, α, and the rate of innovations induced investment $\varepsilon(\lambda)$. The growth rate in the income multiplier, g_{m2}, depends upon the tax rates, t_v and t_p, the wage share, α. Thus the trend growth rate in output is given as:

$$g^*_Y = g^*(t_v, \alpha, t_p, \varepsilon(\lambda)) + g_{m_2}(t_v, t_p, \alpha) \qquad (19)$$

Since $g^*_Y = g_L + \lambda$, the growth rate of employment is now written as:

$$g_L = g^*(t_v, \alpha, t_p, \varepsilon(\lambda)) - \lambda + g_{m_2}(t_v, t_p, \alpha) \qquad (19')$$

As suggested by equation (19′), tax policy impacts on the trend employment rate through two channels: 1) g^*, the trend rate of capital accumulation; and 2) g_{m_2}, the rate of growth in the multiplier effect. We now consider both of these channels.

The impact of taxation on g^* is described above. Given the rate of innovations and the rate at which these innovations are absorbed into new investment, increases in the wage tax rate increase the trend rate of employment when a balanced budget constraint is imposed and when the tax is not shifted. Likewise, an increase in the profits tax rate decreases the trend rate of employment only when the tax is unshifted (again, assuming a balanced budget constraint).

Assuming the tax rates, the marginal propensities to consume and the wage share have no trends, the trend rate of growth in the income multiplier is zero. Thus, the introduction of a tax change temporarily shocks the multiplier and alters the rate of growth in output. For example, the income multiplier is positively related to changes in the wage tax rate and the profits tax rate (where the taxes are not shifted). Thus, following an increase in either tax, the trend rate of growth in employment may increase, via the shock to the multiplier, but then be restored to the rate of growth that is determined by the trend rate of capital accumulation.

When the rate of growth is unstable, we are able to obtain some quite different results. Following G.O.D. (p. 534), the average of the floor and ceiling levels of investment is used to approximate the trend growth rate. Whenever investment is below the ceiling, unemployment arises. Thus, the greater is the gap between the ceiling and the floor levels of investment, the greater will be the average (trend) unemployment rate (relative to any measure of full employment unemployment). To consider how taxation impacts on the trend unemployment rate, we therefore determine how taxation impacts on the ceiling and floor levels of investment. Any change in taxation that widens the gap between the floor and the ceiling increases the trend rate of unemployment.

The floor level of net investment is defined as the difference between the innovations-induced gross investment, εK^*_t, and the depreciated capital stock, δK^*_t; i. e.:

$$I_t >= \varepsilon K^*_t - \delta K^*_t = I^f_t \tag{20}$$

where I^f_t = the floor level of net investment.

The ceiling level of net investment, as determined by available resources, is derived from equation (4.11′) where ‘labour is the only binding input’ (G.O.D.,p. 535), and is given as:

$$I_t <= [1/m_2](y_t(L_t) - n_2K^*_t) = I^c_t \tag{21}$$

where y = labour productivity; L = the supply of labour; I^c_t = the labour-constrained ceiling level of investment. By defining the gap as the difference between the ceiling and the floor, we have:

$$GAP = I^c_t - I^f_t \tag{22}$$

Now we consider the impact on changes in the wage and profits tax rates on the *GAP*. (The mathematical results are presented in the appendix.) Again, the results depend on whether or not the taxes are shifted. Assuming no tax shifting, an increase in the wage tax rate reduces the ceiling level of investment and raises the floor level of investment, and, therefore reduces the trend unemployment rate. If the wage tax is shifted, the shifting increases the negative effect of the tax on the ceiling and heightens

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the positive effect of the tax on the floor causing a further decline in the gap between the ceiling and floor levels of investment, further reducing trend unemployment.

With no tax shifting, an increase in the profits tax reduces the ceiling level of investment and increases the floor level of investment, and, therefore, reduces trend unemployment. However, if the profits tax is shifted, the shifting of the tax heightens the negative effect of the tax on the ceiling (makes the effect more negative) and dampens the positive effect of the tax on the floor. Thus under a tax shifting scenario, the impact of the profits tax on the gap between the ceiling and floor levels of investment is indeterminate.

9. Conclusion

The Kaleckian approach set out in this paper avoids the micro - macro tensions that bedevil the orthodox approach. The microeconomic elements are captured in the pricing decisions of firms in response to changes in wage or profits taxation. The ability of firms or workers to shift increased tax burdens depends on the 'degree of monopoly' which is reflected in the markup of price over prime cost (Reynolds, 1996). Increases in markups have an inverse effect both on real wages and on the income share of wages, thereby affecting the level of aggregate consumption. Thus, tax-induced changes in income distribution have an important role to play in a Kaleckian model. The level of consumption and the distribution of income as between wages and profits have a critical role in the determination of profits and investment. And what happens to investment critically affects the long-run performance of the economy.

We have used the corrected version of Kalecki's theory of the business cycle to assess the effects of tax policy on stability, the balanced rate of growth, the nature of capitalism, and unemployment. With a balanced government budget constraint, increases in the wage tax rate, when the wage tax is unshifted, increase the degree of instability, and, therefore, accommodate rash capitalism. The shifting of the wage tax diminishes

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this effect. An increase in the profits tax rate, when the profits tax is unshifted, has no impact on stability. However, an increase in the profits tax, when unshifted, decreases the degree of instability. The shifting of increases in profits taxes dampens the negative effect that the tax has on instability.

Unshifted increases in the wage tax increase the balanced rate of growth, while unshifted increases in the profits tax reduce the balanced rate of growth. The shifting of taxes dampens their respective effects.

These results have implications for the trend unemployment rate. If the growth rate is stable, the trend (un)employment rate is tied to the rate of capital accumulation (the balanced rate of growth). If the growth rate is unstable, the average of the ceiling and the floor is positively related to the trend (long-period) unemployment rate. With a balanced budget constraint, an increase in the wage tax or profit tax rates results in lower long-period unemployment. The shifting of the wage tax further reduces long-period unemployment, but the shifting of the profit tax has an indeterminate effect

Appendix

1. The impact of taxation on stability

To consider formally the impact of changes in the wage and profits tax rates on economic stability, we allow for tax shifting through the change in the impact of the markup on the wage share, α. The wage share is simply written as:

$$\alpha = (1/k) \tag{1A}$$

where k is the markup of price over prime costs.

From equation (16) the change in h^* with respect to the tax rate i, where $i = v, p,$ is found by substituting the expressions for m_1 and a' into equation (16) and is written as:

$$dh^*/dt_i = (\partial h^*/\partial m_1)(\partial m_1/\partial t_i) + \partial h^*/\partial a'[\partial a'/\partial t_i + (\partial a'/\partial m_2)(\partial m_2/\partial t_i) + (\partial a'/\partial \alpha)(\partial \alpha/\partial t_i)] \tag{2A}$$

where:

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$$(\partial h^*/\partial m_1) = 2b/(1 - a') > 0, \text{ if } 0 < a' < 1 \quad (3A)$$

$$(\partial m_1/\partial t_v) = \{\alpha (1 - c_2)(1 - \alpha)(1 - t_p) + (1 - t_p)(1 - c_2)(1 - t_p)\alpha^2 k_{t_v}\}/$$
$$[(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)]^2 >=< 0, \text{ but}$$
$$> 0, \text{ if } k_{t_v} = 0 \quad (4A)$$

$$(\partial m_1/\partial t_p) = \{-\alpha (1 - c_2)(1 - \alpha)(1 - t_v) + (1 - t_p)(1 - c_2)(1 - t_p)\alpha^2 k_{t_p}\}/$$
$$[(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)]^2 >=< 0, \text{ but}$$
$$< 0, \text{ if } k_{t_p} = 0 \quad (5A)$$

$$\partial h^*/\partial a' = 2bm_1/(1 - a')^2 > 0 \quad (6A)$$

$$\partial a'/\partial t_v = a\alpha m_2(1 - c_2) > 0 \quad (7A)$$

$$(\partial a'/\partial m_2) = -a\alpha (1 - t_v)(1 - c_2) < 0 \quad (8A)$$

$$(\partial m_2/\partial t_v) = [\alpha (1 - c_2) - [(1 - t_p)(1 - c_1) - (1 - t_v)(1 - c_2)]\alpha^2 k_{t_v}]$$
$$/[(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)]^2 > 0 \quad (9A)$$

$$(\partial m_2/\partial t_p) = [(1 - \alpha)(1 - c_1) - [(1 - t_p)(1 - c_1) - (1 - t_v)(1 - c_2)]\alpha^2 k_{t_p}]$$
$$/[(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)]^2 >=< 0, \text{ but}$$
$$> 0, \text{ if } k_{t_v} = 0 \quad (10A)$$

$$(\partial a'/\partial \alpha)(\partial \alpha/\partial t_v) = am_2(1 - t_v)(1 - c_2)\alpha^2 k_{t_v} < 0, \text{but} = 0, \text{ if } k_{t_v} = 0 \quad (11A)$$

$$(\partial a'/\partial \alpha)(\partial \alpha/\partial t_p) = am_2(1 - t_v)(1 - c_2)\alpha^2 k_{t_v} > 0, \text{ but} = 0, \text{ if } k_{t_p} = 0 \quad (12A)$$

where:
$\partial \alpha/\partial t_v = k_{t_v} < 0.$

To consider the effect of the wage tax on h^*, we first assume that the wage tax is not shifted. Under this assumption, we can show that h^* is positively related to the wage tax. First assume that $(\partial h^*/\partial m_1) > 0$, thus $(\partial h^*/\partial m_1)(\partial m_1/\partial t_v) > 0$. Since $\partial h^*/\partial a' > 0$, $\partial a'/\partial t_v > 0$, and $(\partial a'/\partial m_2) < 0$, and since $(\partial m_2/\partial t_v) > 0$ and $(\partial a'/\partial \alpha)(\partial \alpha/\partial t_v) = 0$ (when no shifting is present), then the sign of the derivative of h^* with respect to t_v can be written as:

$$dh^*/dt_v = \overset{(+)}{(\partial h^*/\partial m_1)}\overset{(+)}{(\partial m_1/\partial t_v)} + \overset{(+)}{\partial h^*/\partial a'}[\overset{(+)}{\partial a'/\partial t_v} + \overset{(-)}{(\partial a'/\partial m_2)}\overset{(+)}{(\partial m_2/\partial t_v)} +$$

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$$\overset{(0)}{(\partial a'/\partial \alpha)(\partial \alpha/\partial t_v)}] > 0, \text{ if } k_{t_v} = 0 \qquad (13A)$$

The term in brackets is strictly positive. To prove this, assuming no shifting, the term in brackets is given as: $a\alpha m_2(1 - c_2) - a\alpha(1 - t_v)(1 - c_2)\,[\alpha(1 - c_2)]/[(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)]^2$. This term is greater than zero, since $(1 - \alpha)(1 - t_p)(1 - c_1) > 0$.

If the wage tax is shifted, the shifting reduces the positive effect of a change in the wage tax on h^*. As reflected above, the shifting of the wage tax, increases the wage share,α. The increase in the wage share directly reduces a', and indirectly reduces a' through an increase in m_2 while the decline in a' reduces h^*. In addition, the shifting of the wage tax reduces m_1, which reduces h^*. One further note, if the marginal propensity to consume out of disposable wage income is assumed to equal one (worker savings is equal to zero), then the wage tax, whether shifted or not, has no impact on h^* or economic stability.

To consider the effect of the profits tax on h^*, we first assume that the profits tax is not shifted. Under this assumption, we can show that h^* is negatively related to the profits tax. This conclusion holds under the following conditions: $(\partial h^*/\partial m_1) > 0$, thus $(\partial h^*/\partial m_1)(\partial m_1/\partial t_p) < 0$. Since $\partial h^*/\partial a' > 0$, $\partial a'/\partial t_p = 0$, and $(\partial a'/\partial m_2) < 0$, and since $(\partial m_2/\partial t_p) > 0$ and $(\partial a'/\partial \alpha)(\partial \alpha/\partial t_v) = 0$

$$dh^*/dt_p = \overset{(+)}{(\partial h^*/\partial m_1)}\overset{(-)}{(\partial m_1/\partial t_p)} + \overset{(+)}{\partial h^*/\partial a'}[\overset{(0)}{\partial a'/\partial t_p} + \overset{(-)}{(\partial a'/\partial m_2)}\overset{(+)}{(\partial m_2/\partial t_p)} +$$

$$\overset{(0)}{(\partial a'/\partial \alpha)(\partial \alpha/\partial t_p)}] < 0, \text{ if } k_{t_v} = 0 \qquad (14A)$$

If the profits tax is shifted, the shifting reduces the negative effect of a change in the profits tax on h^*. The shifting of the profits tax, reduces the wage share,α. The reduction in the wage share directly increases a', and indirectly increases a' through a decrease in m_2 while the increase in a' increases h^*. In addition, the shifting of the profit tax increases m_1, which increases h^*. Again, if the marginal propensity to consume out

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of disposable wage income is assumed to equal one (worker savings is equal to zero), then the profits tax, whether shifted or not, has no impact on $h*$ or economic stability.

2. The impact of taxation on the balanced rate of growth

By differentiating equation (17) with respect to the wage and profits tax rates; i.e.:

$$dg^*/dt_i=(\partial g^*/\partial\varepsilon')[(\partial\varepsilon'/\partial t_i) + (\partial\varepsilon'/\partial\alpha)(\partial\alpha/\partial t_i)] + (\partial g^*/\partial a\alpha)[(\partial a\alpha/\partial t_i) + (\partial a\alpha/\partial\alpha)(\partial\alpha/\partial t_i) + (\partial a'/\partial m_2)(\partial m_2/\partial t_i)] \quad (15A)$$

where $i = v$ and p, and where:

$$\partial g^*/\partial\varepsilon' = 1/(1 - a\alpha) > 0;\ if\ 0 < a' < 1 \quad (16A)$$

$$(\partial\varepsilon/\partial t_v) + (\partial\varepsilon'/\partial\alpha)(\partial\alpha/\partial t_v) = an_2(1 - c_2)(\alpha + (1 - t_v)\alpha^2 k_{t_v}) >=< 0,$$
$$\text{but} > 0 \text{ if } k_{t_v} = 0 \quad (17A)$$

$$(\partial\varepsilon'/\partial t_p) + (\partial\varepsilon'/\partial\alpha)(\partial\alpha /\partial t_p) = an_2(1 - c_2)(1 - t_v)\alpha^2 k_{t_p} > 0,$$
$$\text{but} = 0 \text{ if} = k_{t_p} = 0 \quad (18A)$$

$$\partial g^*/\partial a' = \varepsilon/(1 - a')^2 > 0 \quad (19A)$$

$$(\partial a'/\partial t_v) + (\partial a'/\partial\alpha)(\partial\alpha/\partial t_v) = a\alpha m_2(1 - c_2)[1 + (1 - tv)\alpha\, k_{t_v}]>=< 0,$$
$$\text{but} > 0\text{, if } k_{t_v} = 0 \quad (20A)$$

$$(\partial a'/\partial t_p) + (\partial a'/\partial\alpha)(\partial\alpha /\partial tp) = am_2(1 - t_v)(1 - c_2)\alpha^2 k_{t_p} > 0\text{, if } k_{t_p} > 0; \quad (21A)$$

$$(\partial a'/\partial m_2) = -a\alpha(1 - c_2)(1 - t_v) < 0 \quad (22A)$$

$$(\partial m_2/\partial t_v) = [\alpha (1 - c_2)- [(1 - t_p)(1 - c_1) - (1 - t_v)(1 - c_2)]\alpha^2 k_{t_v}]$$
$$/[(1 -\alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)]^2 >0 \quad (23A)$$

$$(\partial m_2/t_p) = [(1 -\alpha)(1 - c_1) - [(1 - t_p)(1 - c_1) - (1 - t_v)(1 - c_2)]\alpha^2 k_{t_p}]$$
$$/[(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)]^2 >=< 0\text{, but}$$

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$$> 0, \text{ if } k_{t_v} = 0 \qquad (24A)$$

To consider the effects of taxation on the balanced rate of growth, first assume the shifting effect is zero. Thus the derivatives of the balanced rate of growth with respect to a change in the wage and profit tax rates are given as:

(+) (+)

$$dg^*/dt_v=(\partial g^*/\partial \varepsilon')[(\partial \varepsilon'/\partial t_v)+(\partial \varepsilon'/\partial \alpha)(\partial \alpha/\partial t_v)]$$

(+) (+) (-) (+)

$$+ (\partial g^*/\partial a')\{[(\partial a'/\partial t_v) + (\partial a'/\partial \alpha)(\partial \alpha /\partial t_v)] + (\partial a'/\partial m_2)(\partial m_2/\partial t_v)\} > 0,$$

$$\text{if } k_{t_v} = 0 \qquad (25A)$$

and:

(+) (0)

$$dg^*/dt_p=(\partial g^*/\partial \varepsilon')[(\partial \varepsilon'/\partial t_p)+(\partial \varepsilon'/\partial \alpha)(\partial \alpha /\partial t_p)]$$

(+) (0) (-) (+)

$$+ (\partial g^*/\partial a')\{[(\partial a'/\partial t_p) + (\partial a'/\partial \alpha)(\partial \alpha /\partial t_p)] + (\partial a'/\partial m_2)(\partial m_2/\partial t_p)\} < 0,$$

$$\text{if } k_{t_p} = 0 \qquad (26A)$$

The derivative of the balanced rate of growth with respect to wage tax rate is strictly positive, assuming no tax shifting, because the term in brackets, {.}, is strictly positive as shown for equation (14A). The shifting of the wage tax dampens this positive effect. The shifting of the wage tax increases the wage share and directly reduces a' and indirectly reduces a' through an increase in m_2 (assuming $C2 > C1$). The reduction in a' reduces the balanced rate of growth.

The derivative of the balanced rate of growth with respect to the profit tax rate is strictly negative, assuming no tax shifting. The shifting of the profits tax dampens this negative effect. The shifting of the tax reduces the wage share. The reduction in the

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wage share directly increases a', and indirectly increases a' through a reduction in m_2. The increase in a' increases the balanced rate of growth.

3. The impact of taxation on trend unemployment when the growth rate is unstable

To illustrate the impact of a change in the wage or profit tax rates on the gap between the ceiling and floor levels of investment consider the following:

$$dGap/dt_i = dI^c{}_t/dt_i - dI^f{}_t/dt_i \qquad (27A)$$

where $i = v, p$ and where:

$$dI^c{}_t/dt_i = [(\partial I^c{}_t/\partial m_2) + (\partial I^c{}_t/\partial K^*)(\partial K^*/\partial m_2)](\partial m_2/\partial t_i) \qquad (28A)$$

and

$$dI^f{}_t/dt_i = (\partial I^f{}_t/\partial K^*)(\partial K^*/\partial m_2)(\partial m_2/\partial t_i) \qquad (29A)$$

By finding expressions for equations (15A) and (16A), we can consider the effects of a change in the wage and profits tax rates on gap and the trend unemployment rate. The derivatives of equation (29A) are given as:

$$(\partial I^c{}_t/\partial m_2) = [-1/m_2{}^2](y_t(L_t) - n_2K^*{}_t) > 0 \qquad (30A)$$

$$(\partial I^c{}_t/\partial K^*) = -n_2/m_2 < 0 \qquad (31A)$$ [8]

$$(\partial K^*/\partial m_2) = [1/n_2] > 0 \qquad (32A)$$

$$(\partial m_2/\partial t_v) = [\alpha(1 - c_2) - [(1 - t_p)(1 - c_1) - (1 - t_v)(1 - c_2)]\alpha^2 k_{t_v}] / [(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)]^2 > 0 \qquad (33A)$$

$$(\partial m_2/\partial t_p) = [(1 - \alpha)(1 - c_1) - [(1 - t_p)(1 - c_1) - (1 - t_v)(1 - c_2)]\alpha^2 k_{t_p}] / [(1 - \alpha)(1 - t_p)(1 - c_1) + \alpha(1 - t_v)(1 - c_2)]^2 >=< 0, \text{ but } > 0, \text{ if } k_{t_v} = 0 \qquad (34A)$$

Thus:

[8]Recall $n_2(K^*{}_t) = m_2(A_1)$, thus, $(K^*{}_t) = [m_2/n_2](A_1)$.

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(-) (-) (+) (+)

$$dI^{c}{}_{t}/dt_{v}= [(\partial I^{c}{}_{t}/\partial m_{2})+(\partial I^{c}{}_{t}/\partial K^{*})(\partial K^{*}/\partial m_{2})](\partial m_{2}/\partial t_{v})<0 \qquad (35A)$$

and assuming the profits tax is not shifted:

(-) (-) (+) (+)

$$dI^{c}{}_{t}/dt_{p}= [(\partial I^{c}{}_{t}/\partial m_{2}) + (\partial I^{c}{}_{t}/\partial K^{*})(\partial K^{*}/\partial m_{2})](\partial m_{2}/\partial t_{p}) < 0 \qquad (36A)$$

Since $(\partial I^{f}{}_{t}/\partial K^{*}) = \varepsilon - \delta$, and assuming that this term is greater than zero, the change in the floor level of investment with respect to a change in the tax rates can be written as:

(+) (+) (+)

$$dI^{f}{}_{t}/dt_{v} = (\partial I^{f}{}_{t}/\partial K^{*})(\partial K^{*}/\partial m_{2})(\partial m_{2}/\partial t_{v}) > 0 \qquad (37A)$$

and, assuming the profits tax is not shifted:

(+) (+) (+)

$$dI^{f}{}_{t}/dt_{i} = (\partial I^{f}{}_{t}/\partial K^{*})(\partial K^{*}/\partial m_{2})(\partial m_{2}/\partial t_{p}) >0 \qquad (38A)$$

The shifting of the profits tax reduces the positive effect that an increase in the profits tax has on the income multiplier, m_2.

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