1st Draft

AS-AD with Debt: A 75th Anniversary Tribute to Keynes' *General Theory*

Abstract

This paper provides a Post Keynesian model analyzing the effects of changes in nominal wages and income distribution in the presence of nominal debt. The model uses a conventional AS-AD framework, confirming the framework's relevance for Post Keynesian economics.The model confirms Keynes' claim that price and nominal wage reductions can lower employment and output. However, the result is a "possibility" theorem and reductions can also increase employment and output. The key mechanism is the real burden of debt and debt interest payments. Lower prices and nominal wages benefit capitalist owners of debt, but they injure worker household debtors and corporate debtors. If the latter impacts dominate, AD will fall in response to lower prices and nominal wages. Increases in the wage-share can lower output, both for familiar reasons associated with profit-led economies and because of perverse nominal debt effects.

Keywords: AS-AD, nominal debt, nominal wages, nominal prices, income distribution.

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I Introduction

2011 marks the 75th anniversary of the publication of Keynes' (1936) *General Theory* and it is a bitter – sweet occasion: bitter because the global economy is trapped in stagnation with high unemployment; sweet because recent events have confirmed the general validity of Keynes' analysis of free market economies. Absent the Keynesian styled interventions of 2008/09, the global economy would likely have fallen into depression, and even with those interventions the recession was deep and the economy has failed to recover robustly.

Today's economic conditions are strikingly at odds with the outcomes predicted by new classical and so-called new Keynesian economics, and strikingly congruent with Keynesian economics. That has made *The General Theory* vitally relevant on its 75th anniversary and created an opening for revival of the Keynesian revolution in macroeconomics.

One feature of the aftermath of the financial crisis and Great Recession is a new interest in the economic impact of debt. Unfortunately, this is an issue that Keynes did not adequately address, despite it being key to his rejection of the claim that market economies automatically restore full employment via price and nominal wage adjustment. The current paper aims to help fill this lacuna in Keynesian analysis. It presents a simple Post Keynesian construction of the AS-AD model that adds nominal debt. An important contribution of the paper is to distinguish between different types of debt (consumer debt, corporate debt, and government debt) which act through different channels and have different impacts on the AD schedule.

The model is Post Keynesian for three reasons. First, Post Keynesians have long been concerned with the AD impacts of debt and almost all the modern literature on this topic is by economists identified with the Post Keynesian tradition. Second, the treatment of the link between the money supply and bank lending is rooted in the logic of the Post Keynesian theory of endogenous money. Third, the treatment of production, pricing and employment is in accordance with the Post Keynesian theory of the firm.

The model provides a simple theoretical framework for understanding important issues in Post Keynesian macroeconomics. The theoretical analysis complements simulation analyses contained in large scale stock-flow consistent macro models of the sort pioneered by Godley and Lavoie (2007). Those large scale simulation models show how economies track over time under alternative parameter assumptions but the mechanisms of that tracking process can appear to be a black box. Theoretical analyses can help open up that black box.

II Links to existing literature

The focus on nominal debt links to a theoretical literature that traces back to Irving Fisher's (1933) debt – deflation explanation of depressions. After lying dormant for several decades, Tobin (1980) reintroduced the issue of aggregate demand (AD) effects of debt into macroeconomics, arguing along Fisherian lines that inside debt is deflationary because debtors have a higher propensity to consume than creditors. Since then the issue of the macroeconomic effects of debt has been taken up by Caskey and Fazzari (1987) and Palley (1991, 1996, 2008, 2009). It has also been raised in the context of discussion of the AS-AD model by Dutt (1986, 2002) and Palley (1997). When

considered within the AS-AD framework, the issue of inside debt concerns the slope of the AD schedule and its response to changes in nominal wages.

III The model

This section presents the model which consists of a supply-side, a goods market, and a rudimentary financial sector. Table 1 contains five equations that describe the supply side of the economy. Equation (1) is the production function in which labor is the variable input. Equation (2) is the pricing rule and firms price as a mark-up over marginal cost. Equation (3) relates marginal costs to average costs. If $z = 0$ then marginal costs and the marginal product of labor (f_N) are constant; if $z > 0$ marginal costs are rising and the marginal product of labor is falling; and if $z < 0$ marginal costs are falling and the marginal product of labor is rising. Equation (4) determines labor supply as a positive function of the real wage. Equation (5) defines the real wage.

Table 1. Supply-side equations of the model.

- (1) $y = f(N)$ $\quad f_N \geq 0,\ f_{NN} \leq 0$
- (2) $p = [1 + m]MC$ $\quad m \geq 0$
- (3) $MC = [1 + z]AC$ $\quad z \gtrless 0$
- (4) $N^s = N(\omega)$ $\quad N_\omega > 0$
- (5) $\omega = w/p$
- y = real output, N = employment, p = price level,
- m = mark-up, MC = marginal cost, AC = average cost,
- N^s = labor supply, ω = real wage, w = nominal wage.
- z and m are exogenously given parameters.

Equations (1) – (5) solve for the price level, real wage, and labor share. The solutions are shown in Table 2. Equation (6) yields the price level; equation (7) yields the real wage; and equation (8) yields the wage share. Equation (6) can be expressed in terms

of output to yield an aggregate supply (AS) schedule given by equation (9). Equation (7) constitutes an employment function that yields firms' real wage – employment offers. Both the AS schedule and the employment function derive from firms' mark-up pricing rule.

Table 2. Solutions for the supply-side.

- (6) $p = [1 + m][1 + z]wN/f(N)$
- (7) $w/p = \omega = f(N)/[1 + m][1 + z]N$
- (8) $s_w = wN/py = 1/[1 + m][1 + z]$ $\quad 0 < s_w < 1$
- (9) $p = [1 + m][1 + z]wf^{1}(y)/y$
- **Standard competitive model (m = 0, z > 0):**
- (6.1) $p = [1 + z]wN/f(N)$
- (7.1) $w/p = \omega = f(N)/[1 + z]N$
- (8.1) $s_w = wN/py = 1/[1 + z]$
- **Standard Kaleckian model (m > 0, z = 0):**
- (6.2) $p = [1 + m]wN/f(N)$
- (7.2) $w/p = \omega = f(N)/[1 + m]N$
- (8.2) $s_w = wN/py = 1/[1 + m]$

The model nests the standard competitive model which obtains if $m = 0$ and $z > 0$. The competitive model solutions for the price level, the real wage and wage share are given by equations (6.1), (7.1) and (8.1) in Table 2. It also nests the standard Kaleckian model which obtains if $z = 0$. The Kaleckian model solutions for the price level, the real wage and wage share are given by equations (6.2), (7.2) and (8.2) in Table 2.

The analytically simplest case is the Kaleckian constant average cost model. However, the important point is that the logic of Keynesian and Kaleckian economics carries through with diminishing marginal labor product which is the standard assumption in orthodox economics. The paper therefore works with this assumption so as to make clear that Keynesian results are not driven by special assumptions about the marginal product of labor.

Table 3 shows the properties of the AS schedule and employment functions under alternative assumptions about technology and returns to labor (RTL). With DRTL the AS schedule is positively sloped in output – price space and the employment function is negatively sloped in employment – real wage space. With CRTL the AS schedule and employment function are both horizontal. With IRTL the AS schedule is negatively sloped and the employment function is positively sloped. Increases in the mark-up shift the AS schedule up and shift the employment function down, as does increasing the strength of diminishing returns to labor.

Table 3. Properties of the AS and employment functions under alternative assumptions about technology.

	AS function				**Employment function**		
	dp/dy	dp/dw	dp/dy	dp/dy	$d\omega/dN$	$d\omega/dm$	$d\omega/dz$
DRTL: m> 0, z > 0	+	+	+	+	-	-	-
CRTL: m > 0, z = 0	0	+	+	0	0	-	0
IRTL: m > 0, z < 0	-	+	+	+	+	-	-

Table 4 describes the equations of the goods market. Equation (10) is the goods market clearing condition whereby output equals AD. Equation (11) decomposes aggregate demand into consumption of worker (poor) households, consumption of manager-capitalist (rich) households, investment, and government expenditures. All assets in the economy are owned by rich households which receive the interest and profit income thereon. All debt is floating rate and government bonds are one-period bonds.

Worker households receive a share α of the wage bill and they also have consumer debt. Manager-capitalist households receive a share [1 – α] of the wage bill and they receive all profits and interest on bank deposits, corporate debt, and government debt.

Table 4. Equations of the goods market.

- (10) $y = E$
- (11) $E = C_W + C_K + I + G$
- (12) $C_W = C([1-t]\alpha s_w y - i_L L/w, -L/w)$ $\quad C_1 > 0, C_2 > 0$
- (13) $C_K = K([1-t]\{[1-\alpha]s_w y + \Pi + i_M M/p + i_D D/p + i_B B/p, [M+B+p_S S]/p)$
- $\quad K_1 > 0, K_2 > 0$
- (14) $I = I(\Pi, i_D, i_D D/p, D/p)$ $\quad I_1 > 0, I_2 < 0, I_3 < 0, I_4 < 0$
- (15) $\Pi = E - \omega N - i_D D/p$

- E = aggregate demand $\quad C_W$ = worker consumption
- C_K = capitalists' consumption $\quad I$ = investment
- G = government spending $\quad t$ = income tax rate
- α = workers' share of wage bill $\quad \Pi$ = profits
- i_L = consumer debt interest rate $\quad L$ = consumer debt
- i_M = deposit rate $\quad M$ = bank deposits
- i_D = corporate debt interest rate $\quad D$ = corporate debt
- i_B = government bond rate $\quad B$ = government debt
- p_S = price of equities $\quad S$ = equities in issue

Equation (12) is the consumption function of worker households. Their consumption depends positively on after tax wage income less debt service payments. There is a negative wealth effect from debt. Equation (13) is the consumption function of manager-capitalist households. Their consumption depends positively on after tax wage and investment income. There is a positive wealth effect from financial asset holdings.[1]

Equation (14) determines investment spending which depends positively on profits and negatively on the corporate debt interest rate, debt interest payments, and the level of corporate debt. The first two arguments are standard. The third argument

[1] Manager-capitalist consumption depends on profits which are assumed to be fully distributed. However, out of equilibrium, when demand is less than output ($E < y$), profits are less than $1 - s_w$. That is because profits depend on sales and firms earn no profit on unsold production. As discussed further in the section on dynamic adjustment, unsold production is assumed to be discarded (like unsold newspapers).

represents a cash flow effect that has been empirically documented by Fazarri et al. (1988). The fourth argument is a balance sheet congestion effect, reflecting the fact that firms may be unable to access finance when they are heavily indebted. It is the corporate analogue of the household wealth effect. Lastly equation (15) defines profits as sales minus wage costs minus debt service. All profits are distributed as dividends to rich households.

There are two important features about the consumption functions. First, worker household debt burdens are scaled by reference to the nominal wage. Higher nominal wages reduce worker debt burdens, generating a positive impact on worker consumption spending. When prices rise because of a higher mark-up there is no wealth benefit for workers and hence the reason for not scaling by prices. Second, the marginal propensity to consume of workers is assumed to be greater than that of manager-capitalists in accordance with the idea that debtors have a higher propensity to consume than creditors. This implies $C_1 > K_1$ and $C_2 > K_2$.

Finally, Table 5 provides the equations of a rudimentary banking and financial sector. Equation (16) is the banking sector's balance sheet constraint. Bank loans create deposits and banks only hold loans and have no reserves or equity. Equation (17) has the loan rate equal to the deposit rate implying no costs of intermediation. All bank income is paid over to depositors who are the effective owners of the bank. Equations (18) and (19) determine the government and corporate bond rates respectively. These rates are priced off banks' consumer loan rate and are slightly lower reflecting the better credit risk properties of governments and firms. Equation (20) determines the price of equities, with the right hand side being the equity demand function. Equity demand depends negatively

on the rates available on other financial assets and positively on profits. The bank loan rate is exogenous, as are financial quantities (L, B, D, S).

Table 5. Equations of the financial sector.

- (16) $L = M$
- (17) $i_L = i_M$
- (18) $i_B = [1 - \gamma]i_L$
- (19) $i_D = [1 - \theta]i_L$ $\quad \gamma > \theta > 0$
- (20) $p_S S/p = q(i_M, i_B, i_D, \Pi)$ $\quad q_1 < 0, q_2 < 0, q_3 < 0, q_4 > 0$
- γ = conglomerate liquidity preference – default risk characteristic for government debt.
- θ = conglomerate liquidity preference – default risk characteristic for corporate debt.

Substituting (15), (17), (18) and (19) into (20) yields an expression for the real value of stock market wealth given by

(20.1) $p_S S/p = q(i_L, \gamma, \theta, E, s_w, D)$ $\quad q_1 < 0, q_2 < 0, q_3 < 0, q_4 > 0, q_5 < 0, q_6 > 0$

Before proceeding to solving and applying the model two comments are in order. First, the introduction of debt makes macro models exponentially more complicated. That is because debt involves a borrower and a lender, which increases the number of agents and creates transfers between agents. Second, each type of debt carries its own interest rate that needs determination, which complicates the financial sector. In the current model interest rates are determined through a series credit structure conditions in which the parameters γ and θ represent conglomerate liquidity preference – default risk characteristics.

IV The AD function, the AD schedule and equilibrium

The AD function is the macroeconomic analogue of the microeconomic market demand function, yielding aggregate quantity demanded as a function of the current price level and income. It is obtained by substituting equations (12) – (20) in equation (11), which yields

(21) $E = C([1-t]\alpha s_w y - i_L L/w, -L/w) +$

$K([1-t]\{[1-\alpha]s_w y+[1-s_w]y+i_L L/p+[1-\theta]i_L D/p+[1-\gamma]i_L B/p, [L+D+B]/p+ q(i_L, \gamma, \theta, E, s_w, D))$

$+ I([1-s_w]y - [1-\theta]i_L D/p, [1-\gamma]i_L, [1-\theta]i_L D/p, D/p) + G$

$= E(y, p, w, t, \alpha, s_w, G, L, D, B, i_L, \gamma, \theta)$

Equation (21) reveals a key feature of debt which is that it generates interest payment transfers. Consumer debt involves a transfer from debtor to creditor households that unambiguously reduces AD. Government debt involves a transfer from the government to creditor households that unambiguously increases AD. However, this claim rests on rejection of the neo-Ricardian hypothesis (Barro, 1974). Corporate debt involves a transfer from firms to creditor households and its effect is ambiguous. On one hand the transfer to creditor households increases their disposable income and consumption. On the other hand it reduces corporate profitability and free cash flow, which reduces investment. It also reduces the value of stock market wealth which reduces consumption. If the former effect dominates, increased corporate debt increases AD. If the latter effects dominate, increased corporate debt decreases AD.

The right hand side of equation (21) is the AD function and Table 6 shows the partial derivatives. AD is a positive function of income but it is ambiguous with respect to the price level. On one hand higher prices reduce creditor income and wealth which reduces creditor consumption. On the other hand they strengthen firms' cash flows and

balance sheets, which increases investment. AD is a positive function of the nominal wage because higher nominal wages reduce the debt burden of debtor households. AD is a negative function of taxes and a positive function of government spending.

Table 6. Partial derivatives of the AD function.

- $E_y = \{C_1[1-t]\alpha s_w + K_1[1-t]\{[1-\alpha]s_w + 1-s_w\}\}/[1 - K_2 q_E] > 0$
- $E_p = -K_1\{[1-t][L+[1-\theta]D+[1-\gamma]B]i_L/p^2 - K_2[L+D+B]/p^2$
- $\quad + [I_1 - I_3 - I_4][1-\theta]i_L D/p^2 \gtrless 0$
- $E_w = [C_1 i_L + C_2]L/w^2 > 0$
- $E_t = -C_1\alpha s_w y - K_1\{[1-\alpha]s_w y+[1-s_w]y+[L+[1-\theta]D+[1-\gamma]B]i_L/p\} < 0$
- $E_\alpha = C_1[1-t]s_w y - K_1[1-t]s_w y > 0$
- $E_{sw} = \{C_1[1-t]\alpha - K_1\{[1-t][[1-\alpha] - 1\} - I_1\}y + K_2 q_{sw} \gtrless 0$
- $E_G = 1$
- $E_L = -[C_1 i_L + C_2]/w + K_1\{[1-t]i_L + K_2\}/p < 0$
- $E_D = \{[-I_1 + I_3][1-\theta]i_L + K_1\{[1-t][1-\theta]i_L + K_2\}/p + K_2 q_D \gtrless 0$
- $E_B = K_1\{[1-t][1-\gamma]i_L + K_2\}/p > 0$
- $E_{iL} = -C_1 L/w + K_1[1-t]L/p + K_1[1-t]\{M+[1-\theta]D/p+[1-\gamma]B/p\} + K_2 q_{iL}$
- $\quad + [-I_1 D/p + I_2 + I_3 D/p][1-\theta] \gtrless 0$
- $E_\gamma = -K_1[1-t]i_L B/p + K_2 q_\gamma \gtrless 0$
- $E_\theta = -K_1[1-t]i_L D/p + K_2 q_\theta + I_1 i_L D/p - I_2 i_L - I_3 i_L D/p \gtrless 0$

The effect of the wage share is ambiguous. This relates to the familiar wage-led vs. profit-led distinction (Taylor, 1983; Bhaduri and Marglin, 1990). Aggregate consumption is positively impacted by an increased wage share but investment is negatively impacted.

AD is a positive function of the worker share of the wage bill. A higher worker wage bill share increases aggregate consumption by shifting wage income to worker households from managerial capitalist households.

An increase in consumer debt reduces AD because it increases interest transfers from workers to capitalists. An increase in government debt increases AD because it increases the interest income and wealth of capitalists. Government debt is the polar

opposite of consumer debt. An increase in corporate debt is ambiguous. On one hand it makes capitalist households better off and increases their consumption. Balanced against this it lowers investment by weakening the financial position of firms.

A decrease in the government bond rate resulting from a flatter term structure has an ambiguous effect on AD. On one hand it reduces capitalists' interest income, but on the other hand it increases their stock market wealth. A decrease in the corporate bond rate resulting from reduced perceived risk also has a theoretically ambiguous effect. On one hand it reduces capitalists' interest income, but it also increases stock market wealth and increases investment by strengthening firms' financial position.

The AD schedule yields the price level for which AD equals output (E = y) for all levels of output. It is a goods market clearing schedule (as distinct from a demand function) that provides the price that clears the goods market given the level of AD contingent on the level of income and other factors affecting AD. The AD schedule is obtained by setting equation (21) equal to y and solving which yields

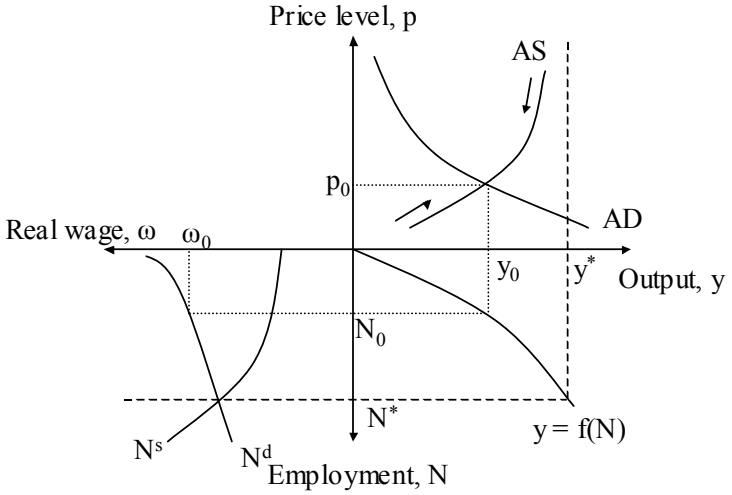
(22) $y = E(p, w, t, \alpha, s_w, G, L, D, B, i_L, \gamma, \theta)$

The AD schedule can then be drawn in output – price level space and its slope is given by $y_p = E_p = E_p/[1 - E_y] \gtrless 0$. Assuming the standard expenditure multiplier stability condition is satisfied then $E_y < 1$ and the denominator is positive. However, the sign of the numerator is ambiguous. On one hand a lower price level increases the purchasing power of creditor households by increasing their interest income and the real value of their financial wealth. That positively affects AD and output and make for a negatively sloped AD schedule. On the other hand a lower price level increases corporate debt burdens, which reduces investment. That weakens AD and output and makes for a

positively sloped AD schedule. If the former dominates the AD schedule is negatively sloped. If the latter dominates it is positively sloped.

Figure 1 provides a graphical representation of the full model under the assumption of diminishing marginal labor product and a negatively sloped AD schedule. The lower south-west quadrant shows the labor market which consists of the labor supply schedule and the employment function relating employment and the real wage. The employment function is given by equation (6). Assuming diminishing returns to labor and a falling average labor product, it is negatively sloped.[2] The intersection of the employment function and the labor supply schedule determine full employment, N^*. The lower south east quadrant shows the aggregate production function and it maps employment into output and vice-versa. The north-east quadrant represents the goods market and shows the AD schedule and AS function. The AD schedule is drawn with a negative slope which implies a lower price level increases AD and output.

Figure 1. Diagram of the model with DRTL.



[2] With constant returns and a constant average labor product the employment function has zero slope, and with increasing returns and an increasing average labor product it is positively sloped.

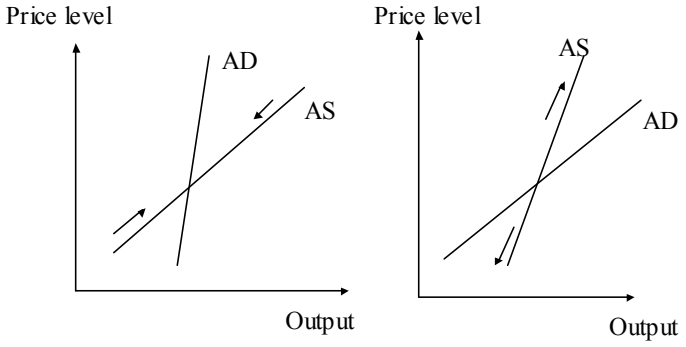
The goods market is in equilibrium at the point of intersection of the AS function and AD schedule. At this point output equals AD and firms are producing on their supply functions. The process of dynamic output adjustment is governed by the following mechanism

(23) $\Delta y/y = g(E(y, p,..) - y)$ $\qquad g_1 > 0$

Output is sluggish to adjust and firms are always on the AS schedule. Output expands if AD exceeds output at the existing price level and contracts if AD is less than output. Firms therefore slide along the AS function as indicated by the arrows, and the economy is stable if the AD schedule is negatively sloped.[3]

Figure 1 shows the case of a negatively sloped AD schedule. The AD schedule can also be positively sloped as shown in Figure 2. If it is positively sloped and steeper than the AS function the economy remains stable: if the AS function is steeper the economy is unstable.

Figure 2. Stability implications of a positively sloped AD schedule.

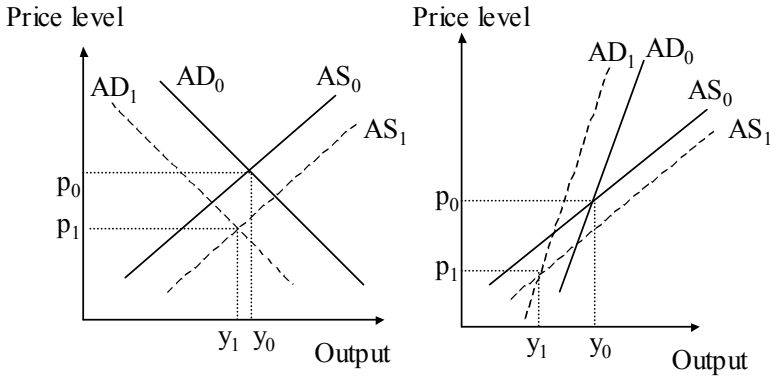


[3] In the model there is no inventory. Excess output is assumed to be thrown away (like unsold newspapers) and there is no carry-over of unmet demand. The introduction of inventories adds realism and can introduce cycles (see Metzler, 1951). However, it also adds complexity and the addition of inventories do not seem to change the underlying properties of equilibrium in Keynesian models. Instead, they change the adjustment dynamics and can also introduce instability.

V Comparative statics

The model can now be used to examine the comparative static effects of changes in exogenous variables. A reduction in the nominal wage shifts the AS function down and the AD schedule left. The downward shift of the AS function is because firms lower prices and lower prices then have wealth effects for capitalist households and firms. The leftward shift of the AD schedule reflects the adverse impact on worker household consumption. As shown in Figure 3, the effect on output is ambiguous if the AD schedule is negatively sloped. In this case, output falls if the worker consumption effect dominates. If the AD schedule is positively sloped output falls unambiguously.

Figure 3. Price and output effects of a fall in nominal wages.



An increase in the worker share of the wage bill shifts the AD schedule right and has no effect on the AS function. Output and prices both rise unambiguously. An increase in the wage share (i.e. a reduction in the mark-up) shifts the AS function down. However the effect on the AD schedule depends on whether the economy is wage-led or profit-led.

Table 7 shows the sign of effect of increases in the wage share, resulting from a lower mark-up, on output and the price level. For a negatively sloped AD schedule in a wage-led economy the AD shifts right, output increases, but the change in prices is ambiguous. For a negatively sloped AD schedule in a profit-led economy the AD shifts left, the price level falls, but the change in output is ambiguous. For a positively sloped AD schedule in a wage-led economy the AD shifts right and the change in both output and the price level are ambiguous and depend on the relative size of the AS and AD shifts. For a positively sloped AD schedule in a profit-led economy the AD shifts left and both output and the price level fall. The effect of changes in the functional distribution is surprisingly complicated owing to induced price level – nominal debt interactions. These complications are invisible in models without nominal debt effects.

Table 7. Effect of an increase in the wage share on output and the price level.

	AD negatively sloped	AD positively sloped
Wage-led	$\Delta y > 0$, $\Delta p = ?$	$\Delta y = ?$, $\Delta p = ?$
Profit-led	$\Delta y = ?$, $\Delta p < 0$	$\Delta y < 0$, $\Delta p < 0$

In the labor market a lower mark-up shifts the employment function up. Employment increases if output increases and falls if output falls. Real wages rise if output falls. If output rises real wages may still fall despite the higher wage share if diminishing returns to labor are strong.

A decrease in the loan interest rate has no impact on the AS function and the direction of shift of the AD is ambiguous. A lower interest rate benefits firms and worker households but hurts capitalist households. This highlights the distributional implications of interest rates. If the impact on worker households and firms dominates, the AD shifts right and prices and output rise. This type of outcome has clear relevance to the travails of the U.S. economy after the collapse of the house price bubble. Interest rates have fallen but many households have been unable to refinance their mortgages. That has kept the benefit of lower rates from flowing through to worker households, diminishing the AD benefit of lower interest rates.

Increased worker and corporate debt have no effect on the AS function. With regard to AD, it hurts worker households and firms respectively, and benefits capitalist households. If the former effects dominate, the AD schedule shifts left and output and prices fall.

Finally, an increase in government debt increases capitalist household income. This shifts the AD schedule right, raising output and prices. The same holds for an increase in the government bond rate. This reveals how government bonds and interest payments constitute demand stimulus in the Post Keynesian model, something that is contested by adherents of the neo-Ricardian debt neutrality hypothesis.

VI future extensions of the model

The model presented in the previous sections provides an analysis of how the economy responds to price and nominal wage developments given existing stocks of nominal debt. It also shows how different types of debt impact the economy differentially.

With regard to future research the most significant extensions concern the financial sector. One needed extension is to take account of new borrowing and repayment of debt, to which there are two aspects. One aspect is the goods market impact of borrowing and repayment. Borrowing is likely to be expansionary to the extent that it finances new spending by debtors, while repayment is likely to be contractionary in that debtors cut back on spending. Such arguments have been developed by Palley (1994, 1997) in consumer credit model of the business cycle.

The second aspect is modeling of borrowing and debt repayment. This is difficult since borrowing and repayment flows are connected to the stock demand for debt. Modeling flow demands therefore requires modeling stock demands. That leads in the direction of the modeling approach pioneered by Tobin (1982) and extended by Godley and Lavoie (2007).

In zero-growth economies stocks of debt and financial assets must be constant in the long-run to ensure they do not explode or go to zero relative to income. Consequently, accounting for persistent borrowing requires shifting the analysis to a growth theoretic frame.

Another related extension concerns endogenizing determination of the spectrum of interest rates. Once again that leads in the direction pioneered by Tobin (1982). However, the difficulty with Tobin-styled multi-asset and multi-liability models is they are always replete with theoretical ambiguity and quickly become analytically intractable.

That said, it is easy to see the general thrust of pro-cyclical interest rates. If higher interest rates negatively impact AD because of the higher debt burdens they impose, then pro-cyclical interest rates will tend to steepen the AD schedule. With a negatively sloped

AD schedule a lower price level is needed to offset the adverse demand effects of higher interest rates. With a positively sloped AD schedule a higher interest rate requires a higher price level to offset the adverse demand effects.

Finally, the discussion of pro-cyclical interest rates connects with monetary policy and policy reaction functions. Central bank interest rate policy reaction functions embody a counter-cyclical intent that renders the interest rate pro-cyclical. That pro-cyclicality therefore shows up in the AD schedule, and it will make the AD schedule steeper for reasons just discussed. That policymakers should want a steeper AD makes sense as it minimizes the impact of AS shifts. The slope of the AD schedule is therefore affected by policy and is not natural or given. Such an effect is consistent with the Lucas' (1976) analysis of the impact of policy on the economy and it clearly has implications for policy assessment.

VII Conclusion

This paper has provided a tractable Post Keynesian model for analyzing the effects of nominal debt and nominal wage change. The model uses a conventional AS-AD framework, confirming the relevance of this framework for Post Keynesian economics. The application of the AS-AD framework to Post Keynesian analysis opens the space for increased dialogue with orthodox economists, as well as facilitating inclusion of Post Keynesian economics in the undergraduate teaching curriculum.

The main findings of the model are that price and nominal wage reductions can lower employment and output as claimed by Keynes in Chapter 19 of *The General Theory*. However, the result is only a "possibility" theorem and it is also possible reductions increase employment and output. The key mechanism is the real burden of

debt and debt interest payments. Lower prices and nominal wages benefit capitalist owners of debt, but they injure worker household debtors and corporate debtors. If the latter impacts dominate, AD will fall in response to lower prices and nominal wages.

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