KEYNESIAN THEORY AND THE AGGREGATE-SUPPLY/AGGREGATE-DEMAND FRAMEWORK:

A DEFENSE

Amitava Krishna Dutt

University of Notre Dame

and

Peter Skott

University of Aarhus, Denmark

INTRODUCTION

In a paper published earlier in this journal Barro argues that the widely used aggregate-supply/aggregate-demand (AS/AD) framework is "unsatisfactory and should be abandoned as a teaching tool" [1994, 1]. This recommendation is based on the claim that the models usually represented by the AS/AD framework fall into two categories: those that are inconsistent or those that can be represented more conveniently in a different way. Barro is not alone in having misgivings about the AS/AD framework: others, including Fields and Hart [1990], Colander [1995] and Bhaduri, Laski and Riese [1995],¹ have also recently argued that the framework is internally inconsistent and fundamentally flawed, although they have not called for its abandonment as a pedagogic device.

As we understand it, the AS/AD framework is a general diagrammatic approach. The defining characteristics of the framework is the use of a price-output diagram to illustrate two reduced-form relations, the (misleadingly labelled) AS and AD curves. The AS curve represents a reduced form of equations describing the labor market and pricing behavior while the AD curve represents a reduced form of equations depicting the nature of asset markets and the demand for goods.

Since this definition of the AS/AD framework says nothing about the nature of labor, goods, and assets markets, it cannot be called a model of the economy. For present purposes, this observation has two implications. First, many different models can be depicted using the AS/AD framework. Second, while specific AS/AD models may have inconsistencies, such inconsistencies are not necessarily attributable to the framework itself.

In this paper we argue that Barro's judgment regarding the AS/AD framework is incorrect, that his analysis is riddled with some basic and fundamental errors, and that the AS/AD framework, *pace* Barro, can represent a variety of macroeconomic models in a consistent way. As such, it may be useful in teaching basic macroeconomic theory, enabling students to appreciate the differences among alternative

macroeconomic approaches in terms of a common simple framework. We hope to convince others not to join Barro in abandoning what can be a useful teaching device.²

Our main disagreement with Barro does not concern pedagogical issues, however, for Barro's paper is not primarily about how one should teach a given material. Underlying the discussion of teaching tools loom substantive issues of economic theory. In Barro's view there are currently only "two types of internally-consistent models that allow for cyclical interactions between monetary and real variables" [1994, 4]: the fix-price models associated with the work of Barro and Grossman [1976] and others, and the new classical models of market clearing.

This position is blatantly wrong. In fact, Barro (somewhat inconsistently) acknowledges the existence of other types of models elsewhere in his paper when he refers to "what used to be called the complete Keynesian model" [ibid., 1]. Barro does not criticize this model on grounds of internal inconsistency but suggests that the model "was rejected long ago for good reasons" [ibid., 1]. These reasons, we are told are partly theoretical (essentially that it does not capture some of the main Keynesian ideas) and partly empirical (it is inconsistent with the observed cyclical pattern for the real wage) [ibid, 4]. Barro's theoretical criticisms are in our opinion unjustified, and the empirical objection — which has a long history going back to Dunlop [1938] and Tarshis [1939] and which applies to monetarist and new classical models as well — can be met by a straightforward reformulation of the theory to take account of imperfect competition and non-diminishing returns to labor.

The other aforementioned authors who have criticized the *AS/AD* framework have put forward their own suggestions about how the framework can be modified to free it of its internal inconsistencies and empirical shortcomings. Although we do not concern ourselves with the details of their arguments, we do comment on their work to the extent that it is directly related to the issues relevant for understanding the problems with Barro's criticisms and our own interpretation of the *AS/AD* framework and models. We should say at the outset that we disagree with many of the claims made by these authors and our interpretation of consistent *AS/AD* models are significantly different from theirs.

The rest of this paper proceeds as follows. The next section uses a common *AS/AD* framework to illustrate simple versions of four well-known macroeconomic models. Drawing on this analysis, the subsequent section shows the weaknesses in Barro's arguments and comments on some issues raised by the other authors.

THE *AS/AD* FRAMEWORK AND SOME ILLUSTRATIVE MODELS

Since the "*AS/AD* models" are well known, our presentation can be extremely brief.³ We consider four models, the first three of which Barro discusses; reversing his order, we start with the traditional "complete Keynesian model." Table 1 compares some of central assumptions and implications of the models.

TABLE 1
Comparison of Alternative *AS-AD* Models

Model	Ultra Short Run	Short Run	Long Run
Neoclassical-Synthesis Keynesian (Price and interest rate always flexible)	Firms' price expectations and money wage given, output predetermined. Price varies to clear goods market. In equilibrium, economy on AD curve, with unemployment possible.	Money wage given. Firms' price expectations adjusts to the actual price. In equilibrium, economy at intersection of AD and AS curves, with unemployment possible.	Money wage changes in response to unemployment. AS curve shifts. In equilibrium, AD and AS curves intersect at full-employment level.
Monetarist Mark I (Price, wage, and interest rate always flexible)	Firms' and workers' price expectations given. In equilibrium labor markets and goods market clear and economy on AD curve. No unemployment.	Workers' price expectations given, but firms' price expectations adjust to the actual price. In equilibrium economy at intersection of AS and AD curves. No unemployment	Workers' price expectations adjust to the actual price and the AS curve shifts. In equilibrium AS and AD curves intersect at natural rate. No unemployment.
Rational expectations New Classical (Price, wage, and interest rate always flexible)	Not applicable.	Workers' and firms' expectations formed "rationally." In equilibrium economy at intersection of AS and AD. Full employment. Economy at natural rate (apart from random shocks).	Same as short run.
Kaleckian/post-Keynesian (Wage and interest rate given)	Money wage given. Output predetermined. Price varies to clear in goods market. In equilibrium economy on AD curve. Unemployment possible.	Firms adjust output (if excess capacity exists) when market-clearing price deviates from marked-up price. In equilibrium economy at intersection of AS and AD. Unemployment possible.	Money wage changes do not remove unemployment. Unemployment can persist.

A Neoclassical-Synthesis Keynesian Model

This model — a version of the neoclassical-synthesis Keynesian model developed by Hicks [1937], Modigliani [1944] and others and used in many standard textbooks — is described by the following equations:

- (1) $C = C(Y), \quad C' > 0$
- (2) $I = I(r), \quad I' < 0$
- (3) $L = L(Y, r), \quad L_Y > 0, L_r < 0$
- (4) $Y = F(N), \quad F' > 0, F'' < 0$
- (5) $W/P = F'(N^d)$
- (6) $N^s = N_0$
- (7) $N = \min [N^d, N^s]$
- (8) $W = W_0 \text{ for } N < N_0$
- (9) $Y = C + I$
- (10) $M/P = L(Y, r)$

where, following standard notation, C denotes real consumption, Y , real output and income, I , real investment, r , the rate of interest (we do not distinguish between real and nominal levels for simplicity), L , real money demand, N , the level of labor employed, N^d , labor demand, N^s , labor supply, W , the money wage, P , the price level, and M , the nominal money supply. Equations (1) through (6) are, respectively, the consumption function, investment function, money demand function, production function, inverse labor demand function (where firms are price takers), and labor supply function. In this model we assume that the labor supply is exogenously given at the level N_0 ; it would be straightforward to introduce a positive labor supply elasticity (as below, in the monetarist and new classical models). Equation (7) makes actual labor employed equal to the short side of the market, and equations (8) through (10) close the model. Equation (8) specifies a constant money wage rate,⁴ while equations (9) and (10) give the equilibrium conditions for the goods and asset markets, respectively.

The model can be represented using the AS/AD framework. For any given level of Y , equations (1) through (3) and (9) and (10) yield values of P and r . If we plot the values of P for different values of Y we obtain the downward-sloping AD curve in Figure 1.

FIGURE 1
AS/AD Diagram for Neoclassical Synthesis Keynesian Model

This AD curve can be given the following Marshallian interpretation. The existence of production lags implies that the level of output is predetermined at any given moment; current output is determined by past production decisions. These past decisions have been made in the light of expectations of current demand, and under pure competition, demand conditions can be represented (at the level of the individual firm) by an expected price level. With output predetermined in this way, the realized price is now determined by actual demand. Equations (1) through (3) and (9) and (10) describe this Marshallian, ultra-short-run determination of demand price for any given output.⁵ Note that the economy, on this interpretation, will always be on the AD curve; it is assumed that the price level adjusts to clear the output market in the very short run (Marshall's 'day' or market period).

Turning to the AS curve, for $N^d \leq N_0$, equations (5) through (7) imply that

$$(11) \quad W/P = F'(N)$$

Combined with equations (4) and (8), equation (11) yields an upward-sloping relation between P and Y , shown as the AS curve in Figure 1. Equation (11) holds only in short-run equilibrium, and the economy need not be on the AS curve in 'daily' equilibrium. Profit-maximizing firms always choose output and employment such that

$$(12) \quad W/P^e = F'(N)$$

where P^e denotes firms' price expectations when output and employment decisions for the current period were being made (that is, their demand expectations, since we

FIGURE 2
Effects of a Rise in Money Supply in
Neoclassical Synthesis Keynesian Model

assume pure competition). Condition (11), on the other hand, requires that short-term expectations are being met, so that $P = P^e$. Out of short-run equilibrium, the economy will be on the AD curve but not on the AS curve. With stable adaptive expectations,⁶ the economy will move to short-run equilibrium at E_1 along a path such as the one shown by arrows in Figure 1.⁷

The AD and AS curves have been drawn to intersect at $Y < Y_0 (=F(N_0))$, so that there is unemployed labor in short-run equilibrium. This short-run equilibrium may not persist. The upward-sloping AS curve will move downwards if W falls. Hence, if W falls over time due to the existence of unemployed labor, the economy will move to full employment as the AS curve moves down over time; this non-Keynesian implication of the model will be discussed further in a later section.

Demand policies affect the AD curve. Starting from E_1 , a rise in M due to expansionary monetary policy will push the AD curve to the right, as shown in Figure 2. The economy will move from E_1 to E_2 in the ultra-short run if the expansion was unanticipated and firms' demand expectations (the value of P^e) are taken to be given initially; changing expectations subsequently take the economy to E_3 as the economy attains its new short-run equilibrium level. If we replace the assumption that P^e is formed adaptively and assume Muth-rational expectations—that is, that economic agents form expectations of the future with full knowledge of the actual parameters of the model and past values of variables—the economy will always be at the intersection of AS and AD curves in daily equilibrium, and the economy will move instantly from E_1 to E_3 (abstracting from unanticipated shocks).

A Monetarist Mark I Model

This model, which follows Friedman [1968] and Phelps [1970],⁸ is obtained by changing equations (6) and (8) in the neoclassical synthesis model. Thus, it is assumed that:

$$(6') \quad N^s = g(W/P^e), \quad g' > 0$$

$$(8') \quad N^d = N^s$$

where P^e (to be distinguished from firms' expectations P^f) is the price level expected by labor suppliers, and equation (8') embodies the assumption of labor market clearing.

Equations (1) through (3) and (9) and (10) describing the AD curve are unchanged so the AD curve in Figure 2 is the same as before. The new AS curve is derived from equations (4) through (8). For any given value of P^e , a higher price level P is associated with a higher level of output. This AS curve describes positions that are consistent with labor market equilibrium and price-taking behavior of firms. If it is assumed that firms' price expectations are fulfilled, the economy must always be on the AS curve as well as on the AD curve. Abandoning the assumption that $P^e = P$, deviations from the AS curve become possible as in the synthesis model of the previous subsection.

Note that the AS curve is drawn for a given value of workers' price expectation, P^e : an increase in P^e will push the curve upwards. Workers' price expectation, P^e , plays a role that is closely analogous to the money wage rate in the synthesis model. The synthesis model describes the formation of a short-run equilibrium conditional on a given money wage. The monetarist model replaces the assumption of given money wages by an assumption of given (workers') price expectations and assumes labor market clearing. High price expectations make workers demand a high money wage rate, and high price expectations (in the monetarist model) or high wage rates (in the synthesis) therefore both lead to a reduction in employment and output.

In long-run equilibrium all expectations will be realized; that is, $P = P^e = P^f$ and the equilibrium level of Y will be at the "natural rate." Starting from this equilibrium at E_1 in Figure 3, an increase in M due to expansionary monetary policy will push the AD curve to the right, taking the economy to a short-run equilibrium at E_2 , with P^e unchanged (assuming, as in standard presentations of the monetarist model, that $P = P^f$). Since $P > P^e$, suppliers of labor will revise P^e upwards, which will push the AS curve upwards until it reaches $A'S'$ and a new long-run equilibrium is established at E_3 , with output at its natural rate.

A Rational Expectations New Classical Model

This model, which follows Lucas [1972], Sargent and Wallace [1975] and others, differs from the previous one only in the way P^e is formed. Maintaining all of the assumptions of the previous model (and assuming perfect foresight on the part of

FIGURE 3
AS/AD Diagram for Monetarist and
Rational Expectations Model

firms, so that $P=P^l$), we replace the assumption that P^l is given in the short run and changes adaptively in the long run with the assumption that labor suppliers form price expectations Muth-rationally, so that they instantly adjust expectations taking all relevant information into account (see above).

For this model the AD curve is the same as before since all the equations are identical. The AS curve for a given P^l is also the same as before. Initially, as in the case of the previous model, suppose that $P = P^l$; we are thus at E_1 in Figure 3. Now if there is a (non-random) shift in the AD curve, suppliers of labor will not keep their P^l unchanged as in the adaptive expectations case. Instead, P^l will equal the new equilibrium price, and the economy moves instantly from E_1 to E_3 . Disregarding random shocks to the system, the AS curve becomes vertical at the "natural rate."

A Kaleckian/Post-Keynesian Model

All three models presented above are logically consistent. But, as noted by Barro, each has implications that contradict some stylized facts. In the case of the Keynesian synthesis model (he is curiously silent about the other cases) Barro suggests that the empirical difficulty should lead to a rejection of the model.

The synthesis model predicts countercyclical real wages and labor productivity. This counterfactual prediction has been well known since the late 1930s and can be

overcome by a straightforward reformulation. The reformulated model, perhaps unfamiliar to mainstream economists, has post-Keynesian features and draws especially on Kalecki's [1971] work.⁹ Some components of the previous models are preserved, making the version of this model presented here different from standard post-Keynesian treatments. The model is not usually represented using the AS/AD framework perhaps because that framework is viewed as a neoclassical Trojan horse.

Compared with the Keynesian synthesis, represented by equations (1) through (10), we introduce changes in equations (1), (4), (5) and (10). Equation (1) is extended to allow different saving propensities out of wage and non-wage income. Assuming for simplicity that wage income is entirely consumed and a fixed fraction, s , of non-wage income is saved, we replace that equation by

$$(1') \quad C = (W/P)N + (1 - s)[Y - (W/P)N].$$

Equation (4) is modified by assuming constant returns to labor (below full capacity utilization). This follows from assuming that the possibility of factor substitution is limited in the short term and that excess capacity exists (assumptions which post-Keynesians claim are consistent with stylized facts); indeed, the existence of overhead labor may even give rise to a positive relation between employment and average labor productivity. Thus, we replace equation (4) by

$$(4') \quad Y = F(N), \quad F' = a_L > 0, \quad F'' = 0 \quad \text{for } Y < Y^{cap}$$

where Y^{cap} is full capacity output.

Assuming that firms do not hire more labor than they need for production, equation (4') implies

$$(4'') \quad N = a_L Y.$$

Firms are assumed to operate under imperfect competition and to plan to set their price as a fixed markup on variable costs. If, for simplicity, labor is the only variable input, we get

$$(5') \quad P = (1 + z)a_L W_0$$

where z is the markup over prime costs. If desired, this markup behavior can be derived from profit maximization with a constant-elasticity conjectured demand curve. More generally, the markup may be assumed to depend on such factors as the degree of industrial concentration, the elasticity of demand, and the bargaining power of workers [Kalecki, 1971; Sen and Dutt, 1995]. Equation (5') replaces (5).

Finally, we replace the assumption of an exogenously-given supply of money with the assumption of an endogenously-determined money supply at a given interest rate.¹⁰ Equation (10) is replaced by the equation

(10')

$$r = r_0$$

where r_0 is determined by factors such as monetary policy.

The AS/AD representation of this model is shown in Figure 4. As in the earlier models, equations (1'), (2) through (3), (9) and (10) imply a downward-sloping AD curve, but the reasons for this shape of the curve are different. With a given interest rate, a reduction in the price level cannot produce a "Keynes effect" according to which an excess supply of money reduces the interest rate and increases investment (and the model contains no real-balance effects). However, lower prices lead to an increase in the real wage (for a given nominal wage), and this shift in income distribution entails an expansion of demand since, by equation (1'), consumption depends positively on the share of wages in income. Algebraically, the equation for the AD curve is given by

$$(13) \quad P = a_L W s Y / (s Y - I(r_0)).$$

The AS curve is simply the horizontal line defined by equation (5') when there is excess capacity; the curve becomes vertical at the full-capacity level of output. We focus on the interesting case in which the AS and AD curves intersect at a level at which there is excess capacity as well as unemployed labor.

If we take output to be given in the ultra-short run, the AD curve shows the (hypothetical) price level that will equate the demand for goods to this given level of output. We then assume that firms compare this market-clearing price with the markup-determined price curve (given by the AS) that they plan to set: if the market-clearing price exceeds (is less than) the markup-determined price, they increase (reduce) output. This adjustment will take the economy to a short-run equilibrium at the intersection of the AD and AS curves, with the price level determined at the marked-up level shown by the AS curve, as long as excess capacity prevails.¹¹ If firms adjust output instantaneously (when excess capacity exists), the economy will always be at the intersection of the AS and AD curves, and deviations between the market-determined and markup price will never be observed. This is the case actually considered by Kalecki [1971].

Starting from a position of short-run equilibrium with excess capacity, if the money wage were to fall due to the existence of unemployed labor and all other parameters were unchanged, the AS curve would move downwards (as shown by equation (5')) but so would the AD curve (as shown by equation (13)). In fact, the two curves would fall by the same vertical distance at the equilibrium level of Y , implying that the equilibrium levels of output and employment would be the same as before. This is easily verified from equations (5') and (13) which imply

$$(14) \quad Y = I(r_0)(1+z)/sz.$$

Equation (14) shows that equilibrium level of output is independent of the level of the money wage. The price level simply falls proportionately with the money wage.

FIGURE 4
AS/AD Diagram for
the Kaleckian/post-Keynesian Model

The inability of money wage changes to secure full employment in this model is *not* due to downward inflexibility of the real wage. If the fall in money wages implies a rise in the markup z (since the price level does not fall equi-proportionately with the money wage) and thus a decline in the *real* wage, the AD curve will shift down more than the AS curve, implying a *fall* in output. As shown by equation (14), a rise in the markup reduces the equilibrium level of output: the redistribution of income from wage to non-wage income reduces consumption demand and leads to a contraction in output. Hence, in this model wage flexibility either has no real effect on employment (when the markup is constant) or may be counterproductive in the sense that falling money wages cause output and employment to fall if real and nominal wage rates move together. This conclusion, which is in line with Keynes' conclusions in chapter 19 of the *General Theory*, forms a striking contrast to the results for the neoclassical synthesis Keynesian model, in which wage flexibility leads to full employment.

PROBLEMS WITH BARRO'S CLAIMS

Having defined what we mean by the AS/AD framework and having provided brief descriptions of what we believe are four consistent "AS/AD models" we are in a position to examine the flaws in Barro's arguments. We consider in turn Barro's dis-

cussion of the *AD* curve, and his comments on the three *AS/AD* models he discusses. When we discuss Barro's comments on the *AD* curve we also discuss briefly some related criticisms of the *AS/AD* framework.

First, Barro argues that the *AD* curve represents a situation in which *P* is sticky and there is excess supply in the markets for goods and services. Regarding the issue of excess supply, he is not precise in what he means by excess supply in the goods and services market, but two interpretations can be given. In one, Y^s refers to output at which labor is fully employed and employment is at its natural rate and Y^d refers to aggregate demand for output. In this interpretation Barro is right, since only a single point on the *AD* curve in all our models corresponds to the natural rate of output. But this interpretation is a trivial one; it is more likely that Barro has in mind that Y^s is the actual quantity supplied by firms. But in this interpretation Barro is quite wrong. All of our *AS/AD* models imply that on the *AD* curve the goods market clears in the sense that aggregate demand (*C+I*) equals actual quantity supplied by firms. This clearing of the output market occurs due to variations in *P*. Since it is this flexibility of the price level that brings supply and demand to equality in the market for goods and services, the models clearly do not rely on price stickiness. The post-Keynesian model assumes that money wages are given, and the synthesis and monetarist models take the money supply as given in the derivation of the *AD* curve. Thus in all four cases the *AD* curve is conditional on the given value of some nominal variable. But this is hardly surprising: how else could one derive a determinate relation between a real variable (output) and a nominal variable (the price level)? Certainly, no internal inconsistency is involved in this derivation.

Barro is surely right in pointing out that some textbooks make a mess of the derivation of the *AS/AD* curves by using the fix-price interpretation in deriving the *AD* curve, but this does not imply that either of the two curves is intrinsically inconsistent. In fact similar problems of misuse and misinterpretation can be found with many widely used models and expository frameworks. A prime example is the *IS-LM* model, and Barro's own *misunderstanding of this alternative framework may account for his mistaken criticism of the AS/AD framework*.

According to Barro, the *AD* curve is derived from the *IS/LM* model, and — again, according to Barro—the notion that “the distinguishing features of the *IS/LM* model involve excess supply of goods and labor in the context of sticky prices and wages was well understood in the 1970s, but is now often forgotten. This is a clear example of technological regress” [Barro, 1994, note 2, 5]. This claim is quite curious. The inventor of the *IS/LM* approach (or *SI/LL* as he called it) clearly did not agree: Hicks [1937] assumed neither fixed output prices nor quantity constraints in Barro's sense, and nothing in the *IS/LM* framework dictates that these assumptions must be imposed. Later textbooks may have made these additional assumptions, in the process producing models that are sometimes inconsistent or hard to interpret. Thus, it is Barro's current position (and that of some 1970s versions of the *IS/LM* model) which exemplifies technological regress!

Barro is not alone in his interpretation of the *AD* curve. Fields and Hart [1990], Colander [1995] and [Bhaduri, Laski and Riese, 1995] essentially make the same one when they take the *AD* curve to show the goods market-clearing level of output (at

which output equals the demand for output) at a given price level, and assume that level of output is not necessarily equal to the actual level of output as determined by the supply side of the model. This interpretation leads them all to argue that the *AD* curve is inconsistent with the *AS* curve in standard “Keynesian” models which do not assume that the price level is given. Colander [1995] points out that the *AD* curve (in the standard “Keynesian” model) does not hold the level of output constant, but assumes that actual output changes without inducing any changes in the price level (as in the 45° diagram of the fix-price income expenditure model or the fix-price textbook *IS-LM* model). He then claims that on the *AS* side of the model, a different story—with flexible prices and price-taking profit-maximizing producers—is introduced. Similarly, Bhaduri, Laski and Riese [1995] argue that in the *AS/AD* model firms are made to follow two inconsistent rules of behavior at a given price level: the *AD* curve makes them produce according to the level of aggregate demand, while the *AS* curve makes them produce to maximizing profit.

While Barro recommends the rejection of the *AS/AD* framework, the other three papers suggest ways out of the alleged inconsistency. Fields and Hart [1990] argue that when the price level is changed, one needs to examine the effects of this price change on output supply to find the new level of aggregate demand. But in examining the effect on output they use the Lucas surprise-supply function (according to which output deviates from its natural rate only—abstracting from persistence effects due to slow output adjustment—if there are expectational errors). The resultant model, of course, is not the neoclassical-synthesis Keynesian model with unemployment due to wage rigidity, but one which makes the economy always produce along the Lucas supply curve! Bhaduri, Laski and Riese [1995] suggest that one of two possible routes be followed. In one, they derive an *AD* curve in which they take aggregate demand at each price to be actually determined by output supply, and use the profit-maximization condition (with a given money wage) to find output supply. Thus the *AD* curve does not imply market clearing in the goods market, but gives the level of aggregate demand at each price level and the corresponding level of output at that price level which follows from profit maximization by firms. They combine this with the standard *AS* curve of the synthesis model. In the other, they depart from profit maximization altogether, assuming that firms satisfy by using a markup to set price, and adjust their output according to the demand for goods. While there is no logical problem with the second route, and it is similar to that taken in our Kaleckian/post-Keynesian model, the first route is unclear about its microeconomic foundations and firm behavior; the same is true of the other hybrid models presented by Bhaduri et al. Colander [1995] proposes the use of an *AD* curve that does not incorporate multiplier effects and takes into account only the direct effects of the price level on aggregate demand; his suggestion is thus similar to Bhaduri et al.'s first route. To introduce “complicated” dynamics into the model, Colander also introduces a coordination technology which uses capital and labor as an additional argument into his production function for output. He argues that this modification of the standard model can give rise to a fall in output due to self-fulfilling coordination shocks without changes in the real wage. Short of noting that this construction is—to say the

very least—extremely vague, we do not address this aspect of his proposed solution this paper, since it is not directly related to Barro's criticisms or our interpretation of the *AS/AD* framework.

These solutions, whatever their merits, are all unnecessary, since the criticism of the *AS/AD* framework is unwarranted. The criticisms are rooted in the mistaken interpretation of the *AD* curve: that it determines equilibrium output at a given price. Many textbooks do derive the *AD* curve using this method—going from the income-expenditure model with a given rate of interest, to a textbook *IS-LM* model with a given price, to the *AS/AD* model with a variable price—which suggests that output clears the market at a given price in the *AD* curve. Though the *AD* curve derived in this way is formally equivalent to one which determines the price level at a given level of output, the two constructions imply different adjustment dynamics. All of our *AD* curves show the ultra-short run equilibrium price at the given actual level of output. Except in short-run equilibrium this demand price, of course, does not coincide with the price shown by the *AS* curve corresponding to that level of output, because the *AS* curve shows the price level expected or planned by firms, which need not coincide with the actual market-clearing price found from the *AD* curve. Interpreted in this way, the *AD* curve implies market clearing at each level of actual output, and there is no inconsistency between the *AD* and *AS* curves.

We should clarify that we do not claim that product prices are always so flexible as to equilibrate the demand and supply of goods in the ultra-short run. However, it is one thing to claim that a model is empirically unrealistic, and quite a different thing to argue that it is internally inconsistent. Moreover, if price expectations change very quickly in the synthesis model, the degree of price flexibility implied by the model need not be very great. If one believed that prices are sticky and that firms change output levels very quickly in response to changes in demand, one would simply choose the Kaleckian/post-Keynesian *AS/AD* model, in which it would make no substantive difference to interpret the *AD* curve as solving for the equilibrium output for a given price or as solving for the equilibrium price for a given output, since the price level would in fact be fixed when the economy is below the level of full capacity.

Second, Barro argues that the *AS/AD* model with given workers' price expectations in the short run is internally inconsistent because it combines price stickiness (in the derivation of the *AD* curve) with market clearing *P*. Barro is wrong in this argument since, as we have shown above, the *AD* curve for this model (which we have called the Monetarist Mark I model) does *not* assume price stickiness. Barro also argues that the model is not Keynesian. In this he is quite correct, but, unfortunately, for the wrong reasons! He states that this model is not Keynesian because firms are "always able to sell whatever they wish to at the going price level: they are not constrained by aggregate demand" [Barro, 1994, 3]. In Keynes' [1936] analysis, however, firms are also able to sell whatever they wish to at the going price; thus this characteristic of the model hardly makes this model non-Keynesian. This is a point to which we will return. What makes the monetarist model non-Keynesian is that (1) the labor market always clears, even when the economy is not at its natural rate of

output and (2) the model implies the existence of automatic tendencies for actual output to converge to the "natural rate" level.

Third, Barro endorses the rational-expectations new-classical model as consistent, but argues that it is not Keynesian. We agree with him regarding these claims. However, we should point out that the model is non-Keynesian for the same reason as the Monetarist Mark I model. The only difference between the rational-expectations new-classical model and the Monetarist Mark I model relates to the way expectations are formed. It is therefore unclear to us why Barro should think that the former model is consistent but the latter is not. While we agree with Barro's endorsement of the new classical model on grounds of internal consistency, we are not convinced of its empirical relevance, given the overwhelming evidence regarding the nature and duration of unemployment. This is not the place, however, to enter a discussion of this issue.

Fourth, regarding the neoclassical-synthesis Keynesian model, Barro does not argue it to be inconsistent, but claims that it is not Keynesian, and that it is inconsistent with empirical evidence. On the issue of Keynesian pedigree, Barro argues (unlike Keynes) that unemployment is due to an excessively high real and nominal wage, and that firms are never constrained by aggregate demand because the goods market clears due to price changes. While it is certainly true that unemployment in this model is associated with a high real and money wage, it is not true that firms are unconstrained by aggregate demand in Keynes' sense. As Barro correctly notes, a rise in aggregate demand (following, say, an exogenous increase in investment due to higher long-period expectations) will push the *AD* curve to the right and increase employment.

Barro seems to think that output cannot be constrained by aggregate demand if the goods market clears due to price variations. In the neoclassical-synthesis Keynesian model firms always assume that they can sell any amount they want to at the price they expect. Their price expectations may not be accurate but they actually end up selling the amount they produce at a price which is exogenously given to each firm: the price level adjusts to clear the market during the 'day' and under assumptions of pure competition no firm is in a position to affect this market price. But output is still constrained by aggregate demand in the sense that if aggregate demand had been higher, the resultant rise in market price would have induced all firms to produce more goods and services and employ more labor. A reading of *The General Theory* should make it clear that Keynes was thinking of aggregate demand constraints in this sense rather than in terms of an excess supply of goods and the appearance of quantity rationing at the level of the individual firm.^{12,13}

Although the clearing of the output market is fully consistent with Keynes' *General Theory* model, there is another, very important, inconsistency. The synthesis model implies that money wage flexibility would cure the problem of unemployment. This implication of the model is inconsistent with Keynes' own analysis [Keynes, 1936, Ch. 19]. Thus we agree with Barro that the model is not truly Keynesian, but we dispute his reasoning in support of this conclusion. One of the revolutionary aspects of Keynes' analysis was his 'wage theorem' (in Hicks' [1974] terminology). According

to this theorem, variations in money wages will have no net effects on real output and employment in a closed economy. Falling money wages will influence the economy in a number of different ways, but on balance are unlikely to stimulate output; if anything, declining money wages will, in Keynes' view, have adverse effects on employment and output by reducing the level of aggregate demand. Thus, he concludes his examination of changes in money wage by noting that

if labor were to respond to conditions of gradually diminishing employment by offering its services at a gradually diminishing money-wage, this would not as a rule, have the effect of reducing real wages [and thus increase output and employment, AKD & PS] and might even have the effects of increasing them, through its adverse influence on the volume of output. The chief result of this policy would be to cause a great instability of prices, so violent perhaps as to make business calculations futile in an economic society functioning after the manner of that in which we live. To suppose that a flexible wage policy is a right and proper adjunct of a system which on the whole is one of *laissez-faire*, is the opposite of the truth. [Keynes, 1936, 269]

The post-Keynesian model presented above echoes this conclusion, but the result is not restricted to monetary regimes in which the interest rate is kept constant through monetary policy as in the Kaleckian/post-Keynesian model above. In models with a variable interest rate, the Keynes effect of reduced interest rates and (empirically insignificant) real balance effects on consumption may be more than offset by the adverse influences of debt deflation, distributional shifts, and expectations of continuing reductions of wages and prices.

On the empirical side Barro points out that the synthesis model predicts a pattern of countercyclical real wages and labor productivity, a prediction which fits badly with observed patterns of procyclical real wages and procyclical productivity. This empirical problem was noted by Dunlop [1938] and Tarshis [1939] soon after the appearance of *The General Theory*. It occurs in the neoclassical-synthesis model due to the assumptions of diminishing returns to labor and pure competition. However, the Kaleckian/post-Keynesian model of the previous section, which jettisons both diminishing returns and pure competition, does not imply that a rightward shift in the AD curve reduces the real wage. In this model, when Y increases, the real wage, given from equation (5') to be $1/a_L(1+z)$, will not change if z and a_L are fixed. Furthermore, if one adds on to the model the assumption that z declines when Y rises due to a tightening in the labor market which increases the bargaining position of workers [Kalecki, 1971], or because of the pricing policies of firms [Stiglitz, 1984, Rotemberg and Saloner, 1986], then this particular AS/AD model does produce procyclical variations in the real wage. With respect to the pattern of productivity, the simple Kaleckian/post-Keynesian AS/AD model assumes a constant labor productivity; allowing for overhead labor, efficiency wage effects or labor hoarding, a procyclical pattern would emerge in this model. Thus, simple modifications of the Keynesian model—modifica-

tions which preserve Keynes' insights into the determination of output by effective demand—make the model consistent with the empirical evidence cited by Barro.

CONCLUSION

This paper has argued that Barro's call for rejecting the AS/AD framework as a teaching tool is unwarranted, and that the criticisms by others regarding the framework are also misplaced. The AS/AD framework can be useful for the presentation and comparison of a variety of different macroeconomic models. We have briefly discussed four such models and argued against Barro's tirade against the AS/AD framework.

Barro's attacks on the AS/AD framework appear to be motivated by a hostility towards models in which the economy can suffer persistent unemployment due to demand constraints. He has not, however, produced convincing reasons to show that such models should be abandoned. We have argued this in particular using a Kaleckian/post-Keynesian model.

Although we have argued in favor of the AS/AD framework, we should end with two cautionary remarks. First, the name AS/AD framework misleadingly conjures up images of demand and supply curves with which the reduced-form AS and AD curves have no relation.¹⁴ Perhaps a new name is in order such as GA/LP (goods-assets/labor-pricing). Second, the AS/AD framework presents models which are quite complex. If they appear to confuse an economist of the caliber of Barro, they may certainly confuse students in introductory economics courses. We thus agree with Geithman's [1994] recommendation that the AS/AD framework not be used in such courses before students learn about the functioning of goods, assets, and labor markets. However, once students reach the stage of intermediate courses and develop an understanding of how these markets function, the AS/AD framework can be used to analyze and compare different macroeconomic models and thereby help students develop their own ability to think about the complexity of macroeconomics.

NOTES

We are grateful to Amit Bhaduri, David Colander, Thomas Palley, Jaime Ros and the editor of this *Journal* for their comments on an earlier draft of this paper, and to the first two for making their unpublished work available to us. This paper was written while Peter Skott was Visiting Professor in the Department of Economics at the University of Notre Dame.

1. See the references in these papers for names of additional critics.
2. In his response to Barro's paper, Geithman, while admitting that "Barro's judgement is overdrawn and his recommendation excessive," argues that he is "too lenient toward the AS/AD apparatus" [1994, 475]. Geithman takes the view that the framework "offers textual neatness and expository convenience at the cost of impeding the development of student analytical abilities." He also seems to endorse Barro's claim that "the typical AS/AD textbook treatments are ... logically flawed" [ibid., 477].
3. We should note explicitly that we do not consider any of the ideas discussed in this paper as original. Had the papers by Barro and the other authors mentioned not appeared, we would have thought that these ideas were widely known, and not considered it necessary to put them to paper. The ideas have

- been put forward by a number of authors in a variety of contexts, too numerous to exhaustively recount. The fact that we, at various points in this paper, refer to our own earlier work, should not be interpreted to mean that we consider ourselves to be their originators.
4. A fixed level of W is not required for this analysis. A positive relation between W and N would produce a similar model. We assume that W is fixed for expository simplicity. Keynes [1936, Ch. 21] discusses the reasons for the empirically-observed wage stickiness. See also Hicks [1974, Ch. 3], Wood [1978], Bhaskar [1990] and Skott [1992].
 5. This structure follows Keynes [1936]. The Marshallian interpretation of Keynes is discussed in greater detail in Chick [1983], Skott [(1983) 1990] and Dutt [1994].
 6. We assume that the rate of change of expected price is determined by the difference between the actual price and the expected price, and that the speed of adjustment in expected price is not large enough to destabilize the economy.
 7. This analysis assumes that the position of the short-run equilibrium remains unchanged. Shifts in the short-run equilibrium (due to induced changes in some of the parameters) imply that the sequence of ultra-short run equilibria will be chasing a moving target; the economy may never reach a position of short run-equilibrium. Skott [(1983) 1990; 1989] discusses this issue in greater detail; Skott [1989] contains a dynamic analysis along these lines.
 8. The name Mark I is due to Hahn [1980] and Tobin [1980] and is meant to distinguish this approach from Monetarism Mark II, which is called the Rational Expectations New Classical approach below.
 9. A good exposition of some of the ideas contained in this model will be found in Lavoie [1992], who also discusses the empirical relevance of several of the assumptions used here.
 10. Moore [1988] calls this the horizontalist position as opposed to the verticalist position; see also Lavoie [1992, Ch. 4]. Although some post-Keynesian authors argue that this approach is generally applicable, more skeptical readers may take this assumption to imply that the central bank follows the policy rule of pegging the interest rate.
 11. If the AD and AS curves intersect at the vertical portion of the AS curve, output will be at the full-capacity level and the price will be determined at the market-clearing level shown by the AD curve. The adjustment of output by the firms due to the fact that the market-clearing price is higher than the markup price is no longer possible, since the economy is at full capacity.
 12. See Skott and Dutt [1996] for a fuller discussion of this point. Clower [1994] agrees with this interpretation but then concludes that Keynes's analysis did not really contain a formal treatment of aggregate demand failures. In this he seems to be accepting Barro's definition of aggregate demand constraints.
 13. Barro also states that in this model some key features like the "Keynesian consumption function, the investment accelerator (or Keynesian investment function)..." do not apply. Since the model does include the consumption and investment functions, it is not clear what Barro means. The accelerator was not mentioned by Keynes himself, but the clearing of the output market certainly does not exclude a strong accelerator-type influence of the degree of capital utilization (and hence of changes in aggregate demand) on investment.
 14. Keynes's own aggregate demand and aggregate supply curve, in PY and N space, face the same problem.

REFERENCES

- Barro, R. J. The Aggregate-Supply/Aggregate-Demand Model. *Eastern Economic Journal*, Winter 1994, 1-6.
- Barro, R. J. and Grossman, H. I. *Money, Employment and Inflation*. Cambridge: Cambridge University Press, 1976.
- Bhaduri, A., Laski, K. and Riese, M. Making Sense of the Aggregate Demand-Aggregate Supply Model, Working Paper, The Vienna Institute for Comparative Economic Studies (WIIW), 1995.
- Bhaskar, V. Wage Relativities and the Natural Rate of Unemployment. *Economic Journal*, 1990, 60-66.
- Chick, V. *Macroeconomics After Keynes. A Reconsideration of The General Theory*. London and Cambridge: Philip Allan and the MIT Press, 1983.
- Clower, R. The Effective Demand Fraud. *Eastern Economic Journal*, Fall 1994, 377-85.

- Colander, D. The Stories We Tell: A Reconsideration of AS/AD Analysis. *Journal of Economic Perspectives*, Summer, 1995, 169-88.
- Dunlop, J. G. The Movement of Real and Money Wage Rates. *Economic Journal*, 1938, 413-34.
- Dutt, A. K. Wage Rigidity and Unemployment: the Simple Diagrammatics of Two Views. *Journal of Post Keynesian Economics*, Winter 1986-7, 279-90.
- _____. Keynes with a Perfectly Competitive Goods Market. *Australian Economic Papers*, December 1987, 275-93.
- _____. Keynes, Market Forms and Competition, in *The Philosophy and Economics of J. M. Keynes*, edited by B. Gerrard and J. Hillard. Aldershot: Edward Elgar, 1994.
- Fields, T. W. and Hart, W. R. Some Pitfalls in the Conventional Treatment of Aggregate Demand. *Southern Economic Journal*, January 1990, 676-84.
- Friedman, M. The Role of Monetary Policy. *American Economic Review*, March 1968, 1-17.
- Geithman, D. T. A Note on Teaching the Aggregate-Supply/Aggregate-Demand Model. *Eastern Economic Journal*, Fall 1994, 475-77.
- Hahn, F. Monetarism and Economic Theory. *Econometrica*, February, 1980, 1-17.
- Hicks, J. R. Mr. Keynes and the Classics: A Suggested Interpretation. *Econometrica*, April 1937, 147-59.
- _____. *Crisis in Keynesian Economics*. Oxford: Blackwell, 1974.
- Kalecki, M. *Selected Essays on the Dynamics of the Capitalist Economy*. Cambridge: Cambridge University Press, 1971.
- Keynes, J. M. *The General Theory of Employment Interest and Money*. London: Macmillan, 1936.
- Lavoie, M. *Foundations of Post-Keynesian Economic Analysis*. Aldershot: Edward Elgar, 1992.
- Lucas, R. E. Expectations and the Neutrality of Money. *Journal of Economic Theory*, April 1972, 103-24.
- Modigliani, F. Liquidity Preference and the Theory of Interest and Money. *Econometrica*, January, 1944, 45-88.
- Moore, B. J. *Horizontalists and Verticalists. The macroeconomics of credit money*. Cambridge: Cambridge University Press, 1988.
- Phelps, E. S. The New Macroeconomics in Employment and Inflation Theory, in *Microeconomic Foundations of Employment and Inflation Theory*, by E. S. Phelps et al. New York: Norton, 1970.
- Rotemberg, J. J. and Saloner, G. A. Supergame-theoretic Model of Price Wars during Booms. *American Economic Review*, June 1986, 390-407.
- Sargent, T. J. and Wallace, N. 'Rational' Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule. *Journal of Political Economy*, April 1975, 241-54.
- Sen, A. and Dutt, A. K. Wage Bargaining, Imperfect Competition and the Markup: Optimizing Microfoundations. *Economic Letters*, 1995, 15-20.
- Skott, P. An Essay on Keynes and General Equilibrium Theory. *Thames Papers in Political Economy*, 1983, reprinted in *Theory and Policy in Political Economy. Essays in Pricing, Distribution and Growth*, edited by P. Arestis and Y. Kitromilides. Aldershot: Edward Elgar, 1990.
- _____. *Conflict and Effective Demand in Economic Growth*. Cambridge: Cambridge University Press, 1989.
- _____. Inflation, Unemployment and the Distribution of Income, in *Macroeconomic Policies for the 1990s*, edited by E. Amoroso and J. Jespersen. London: Macmillan, 1992.
- Skott, P. and Dutt, A. K. Clower on Effective Demand. *Eastern Economic Journal*, Winter 1996, 89-96.
- Stiglitz, J. E. Price Rigidities and Market Structure. *American Economic Review*, May 1984, 350-55.
- Tarshis, L. Changes in Real and Money Wages. *Economic Journal*, 1939, 150-54.
- Tobin, J. *Asset Accumulation and Economic Activity*. Oxford: Blackwell, 1980.
- Wood, A. *A Theory of Pay*. Cambridge: Cambridge University Press, 1978.