

## MAKING SENSE OF THE AGGREGATE DEMAND-SUPPLY MODEL \*

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### INTRODUCTION

In almost all recent textbooks on macroeconomics, the Keynesian theory of effective demand is sought to be generalized by explicitly incorporating the supply side. This results in a convenient macroeconomic construction which is familiar from its partial equilibrium counterpart: a

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falling aggregate demand ( $AD$ ) and a rising aggregate supply ( $AS$ ) curve intersect in the price-quantity space to determine simultaneously the equilibrium levels of price and output (*e.g.* Baumol and Blinder, 1991, pp. 181-182, Felderer and Homburg, 1992, pp. 97-101, 109-112, Sachs and Larrain, 1993, pp. 66-68, Stiglitz, 1993, p. 694, Dornbusch and Fischer, 1994, pp. 202-208). This construction also serves in many empirically oriented research papers to distinguish especially a supply-shock from a demand-shock. This amounts to keeping either the  $AD$  or  $AS$  curve unchanged, while shifting the other curve to examine the comparative static properties of the shift on price and output (*e.g.* Bruno, 1986, Blanchard, 1989, Bernanke, 1994).

A central purpose of this paper is to show that neither the usual  $AD/AS$  generalization of Keynesian economics nor its comparative static applications in more applied work can be considered legitimate from a logical point of view.<sup>1</sup> The construction is fundamentally flawed, as it leads to logical inconsistencies when applied to out-of-equilibrium situations (section 1). Consequently, despite the claims by the above-mentioned textbook authors and researchers, the  $AD/AS$  analysis cannot be used to visualize any kind of price or quantity adjustment process towards equilibrium; nor can it be used for deriving comparative static results, since the "stability" of the system cannot even be discussed meaningfully.<sup>2</sup> The  $AD/AS$  apparatus has to be reformulated before it can be used in any logically coherent sense. As section 2 of this paper shows, there are two different routes to making this analysis logically consistent. Section 3 relates our reformulated approach to disequilibrium theory based on the "short side" of the market principle. The last section sums up the analysis with some comments on its implications.

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<sup>1</sup> Hall and Treadgold (1982) were among the first to hint at the difficulty resulting from various feedbacks between  $AD$  and  $AS$ , but failed to pinpoint the logical inconsistency. Since then other authors have also recognized independently the problematic nature of this construction, as was brought to our attention while the first version of our paper (Bhaduri *et al.*, 1994) was in circulation (*cf.* Barro, 1994; Fields and Hart, 1990; Colander, 1994).

<sup>2</sup> Via Samuelson's "Correspondence Principle" (1947) which requires the stability property of a system to be used to derive comparative static results. However, the  $AD/AS$  apparatus is used as a rule to analyse out-of-equilibrium price adjustment.

## A LOGICAL INCONSISTENCY

The construction of the  $AD/AS$  curve relates price  $P$  to that level of real output  $y$  which would produce demand-side equilibrium, *i.e.* generate just enough demand to match output at that price. This entails income-expenditure equilibrium of Keynesian analysis via the multiplier mechanism which underlies the usual formulation of the  $AD$  curve along either the familiar  $45^\circ$ -diagram or the Hicksian  $IS$  curve. To keep the exposition at its simplest, we treat real investment as autonomous at  $I=\bar{I}$  in a closed economy without a government sector.<sup>3</sup> Thus, aggregate demand consists only of private consumption and autonomous investment, both in real terms. Moreover, assuming uniform propensities to consume for both wage-earners and profit-earners, consumption  $C$  may be postulated as proportional to output  $Y$ , namely,  $cY$  ( $1 > c > 0$ ). The negative response of demand to the price level is captured through the real balance effect, by allowing another part of private consumption  $\tilde{C}$  to be a decreasing function of the price level.

Consequently the demand-side equilibrium, derived from the usual multiplier analysis, is

$$Y_d = \bar{I} + \tilde{C}(P) + cY_d \quad [1]$$

implying

$$\frac{dY_d}{dP} = \frac{1}{s} \frac{d\tilde{C}(P)}{dP} \leq 0 \text{ where } s = (1 - c) \quad [2]$$

While [2] establishes the negatively sloped conventional  $AD$  curve, owing to the real balance effect, the income-expenditure equilibrium through

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<sup>3</sup> The model could be complicated by making investment a function of the interest rate, price level etc., *e.g.* in the  $IS/LM$  framework. However, these complications are unnecessary for our present purpose, since none of these complications—in contrast to the real-balance effect—provides unambiguous argument in favour of a negatively sloped  $AD$  curve.

the multiplier mechanism along the  $AD$  curve entails that aggregate demand determines the level of output actually produced. However, the question arises as to whether firms would actually produce that level of output in accordance with their supply behaviour.

The supply side is usually constructed on the postulate of profit maximization under diminishing returns to labour as the only variable factor of production in the short run. Thus, at nominal wage  $w$ , price equals rising marginal cost under competitive conditions to yield

$$P = \frac{w}{f'} \quad [3]$$

where  $f(L)$  represents the short-period production function with labour as the only factor subject to diminishing return, *i.e.*

$$Y_s = f(L), f' > 0, f'' < 0 \quad [4]$$

At any given money wage  $w = \bar{w}$ , [3] and [4] imply,<sup>4</sup>

$$\left. \frac{dY_s}{dP} \right|_{w = \bar{w}} = (f') \cdot \frac{dL}{dP} > 0 \quad [5]$$

In other words, from [5]  $AS$  increases with price at a given nominal wage  $\bar{w}$ , because real wage falls to induce more employment and output at profit-maximizing equilibrium.

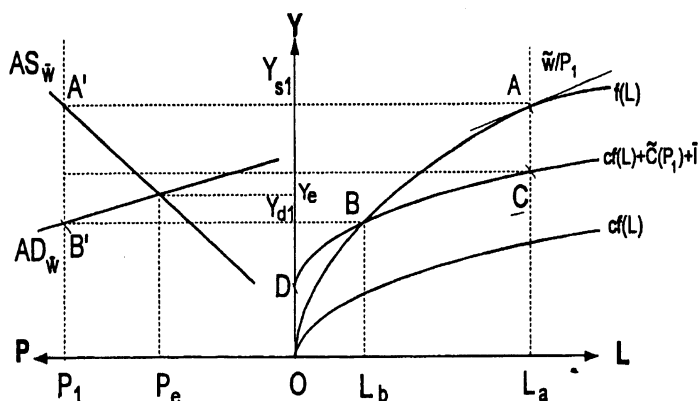
Figure 1 reformulates geometrically the  $AD/AS$  framework familiar from many textbooks. For a specified nominal wage  $w$  and a certain price, say  $P_1$  the corresponding real wage  $\bar{w}/P_1$  represented by the slope of the tangent to  $f(L)$  at point  $A$ , determines via profit maximization a certain amount of employment  $L_a$  on the right-hand side. On the left-

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<sup>4</sup> Since,  $\left. \frac{dL}{dP} \right|_{w = \bar{w}} = - [f']^2 / w f'' > 0$

hand side of the diagram this corresponds to aggregate supply  $P_1A'$ . Parametric variation of  $P$  at given nominal wage  $w$  traces out the  $AS(P)$  curve in accordance with [5].

FIGURE 1.



Turning to the demand side, the individual components of aggregate demand in [1] are exhibited on the right-hand side of figure 1. Aggregate real consumption  $cY$  becomes just a scaled-down version of the utilization function. By adding the constant term  $\bar{I} + \tilde{C}(P_1)$  at price  $P_1$  we derive total demand at price  $P_1$  along the curve  $DBC$ .

Consequently, on the right-hand side of figure 1 for price level  $P_1$ ,  $Y_{d1} = f(L_b)$  where  $L_b$  denotes the amount of employment determined via the multiplier, which brings total expenditure and output into equilibrium. Again, by varying  $p$  parametrically the negatively sloped  $AD(P)$  curve may be traced out, in accordance with equations [1] and [2]. However, unlike the  $AS(P)$  curve, the  $AD(P)$  curve is traced out without any reference to any specific nominal wage rate. This implies that the real wage rate does not enter directly in defining  $AD$ .<sup>5</sup>

<sup>5</sup> This is due to the assumption of uniform savings propensity for both profit – and wage-earners. —Note also that in figure 1, the level of production and employment are explicitly shown. When demand depends on distribution, e.g. in the form of a classical

Nevertheless, for consistency of comparisons, we need to assume that the nominal wage in the construction of  $AD$  is the same as that for  $AS$ , viz.  $w$ . It is evident from the right-hand side of figure 1 that the profit maximization at real wage  $w/P_1$  implies point  $A$ , but at the same real wage  $w/P_1$  demand-determined equilibrium is achieved at point  $B$ . On the left-hand side of figure 1, this out-of-equilibrium position is shown explicitly: while aggregate demand ( $AD$ ) at  $B'$  is less than aggregate supply ( $AS$ ) at  $A'$  these two positions  $A'$  and  $B'$  cannot be meaningfully compared because they entail two inconsistent levels of employment  $L_a$  and  $L_b$  respectively. The former  $L_a$  is the derived demand for labour at real wage  $w/P_1$  on the assumption of profit maximization. The latter,  $L_b$  is another level of demand for labour derived on the assumption that the firms produce to satisfy the level of aggregate demand.<sup>6</sup>

To avoid misunderstanding we emphasize that these two different levels of employment  $L_a$  and  $L_b$  corresponding to point  $A$  (or  $A'$ ) and  $B$  (or  $B'$ ) on the right- (or left-)hand side of figure 1 have nothing to do with disequilibrium in the labour market, because the labour supply function does not enter the argument at all.<sup>7</sup> Instead it points precisely to the logical contradiction inherent in the  $AD/AS$  construction. It arises necessarily from subjecting firms to two different rules of behaviour *i.e.* either producing according to profit maximization or producing to satisfy the level of aggregate demand. Except, in equilibrium where the distinction between the two rules is blurred, the same economic agent, namely the firm cannot obey both rules! This inconsistency becomes all

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savings function making consumption equal to the wage bill, multiple equilibria may emerge naturally in this diagram, so that the conventional  $AD$  curve is no longer unique. This can be seen from the right-hand side of figure 1 when a straight line with intercept equal to investment plus the price-sensitive component of consumption, has a slope equal to the given real wage, *e.g.* at  $(w/P_1)$ . For prices above equilibrium this straight line may intersect the utilization function twice.

<sup>6</sup> Indeed, the Kahn-Keynes multiplier process generating round by round demand operates on the assumption that employment increases with each round of demand to generate further demand and employment in a convergent geometric series (Kahn, 1931).

<sup>7</sup> Nor is there any presumption about full-employment at the equilibrium point where  $AD$  and  $AS$  intersect.

the more apparent when the consequences of a price change are investigated. Assume that the initial situation of the economy is represented by the coordinates of the equilibrium point  $E$ . At price  $P_e$  and output  $Y_e$  income-expenditure equilibrium (along curve  $AD$ ) is achieved by firms which are also maximizing profit (along curve  $AS$ ). At the constant money wage  $w$ , if the price level increases (decreases) from  $P_e$ , then profit-maximizing firms are expected to increase (decrease) employment along the supply curve  $AS$ , while the same firms are expected to decrease (increase) employment along the demand curve  $AD$  to satisfy demand! This demonstrates how the two rules for the firms, profit maximization along  $AS$  and satisfying demand along  $AD$ , become self-contradictory outside equilibrium.

The economic fallacy in using the  $AD/AS$  framework as a macroeconomic apparatus to analyse out-of-equilibrium positions should now be apparent. In partial-equilibrium analysis of demand and supply, as a first approximation it may be plausible to posit two separate economic agents in the product markets —households as consuming units whose demand responds negatively, and firms as producing units whose supply responds positively, to higher price. This separation becomes untenable in aggregate demand-supply analysis, because firms are not only producers, but also —through their derived demand for labour— providers of employment to households which, in turn, determines the level of consumption expenditure. Viewed from this angle the problem with the  $AD/AS$  analysis lies in the inconsistency of postulating the level of aggregate demand independently of the level of employment actually offered by the firms. The two levels of employment or derived demand for labour in out-of-equilibrium situations emphasizes precisely this absurdity underlying the construction.

A class of macroeconomic models (*e.g.* Mankiw, 1992, chapter 8, pp. 214-234) tries to escape the problem arising from the circularity of the income-expenditure flow by taking resort to the quantity theory of money for providing the  $AD$  locus. With the quantity of money  $M$  and its velocity of circulation  $v$  constant, the quantity equation  $Mv = PY$  is used to trace an inverse relation between  $P$  and  $Y$ , which is treated as the  $AD$  curve. The underlying idea that the quantity of money determines the

level of nominal income and through a generalized real-balance effect also the level of aggregate demand, means that it is the exogenous supply of money which determines the demand for goods. This idea postulates again that aggregate demand has nothing to do with the actual level of employment offered by firms. To deny this link between the level of employment and the level of expenditure is to ignore the circular nature of the flow of income —the central innovation of macroeconomics since Keynes.<sup>8</sup>

### TWO ROUTES TO CONSISTENCY

Since the logical inconsistency of the *AD/AS* analysis arises essentially from subjecting the same economic agent, namely the firm to two different rules of behaviour —profit-maximization along *AS* versus satisfying aggregate demand along *AD*— this also suggests naturally two routes to resolving this logical difficulty. Firms may be assumed either to maximize profits and remain always on their supply curve *AS* with aggregate demand derived from *AS*. Alternatively, the firms may be assumed to satisfy aggregate demand on the basis of some principle of “bounded rationality” and remain always on the *AD* curve with aggregate supply derived from *AD*.

These two routes correspond to two well-established models in macroeconomics, the former termed “neo-classical” and the latter termed Kaleckian, after the name of its innovator (Kalecki, 1933; 1971 ). The model of Keynes in the *General Theory* (1936) is a more complex hybrid case lying between these two extremes, on which we comment later in this section.

With profit maximization as the ruling principle in the neo-classical model, conditions [3] to [5] are always satisfied to yield profit-

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<sup>8</sup> Contrary to chapter 8, in chapters 9-10 Mankiw (1992) takes into account the circular nature of the flow of income. In these chapters it is the level of production which determines the demand for goods and —in turn— for money. This demand for money in relation to the supply of money determines the equilibrium rate of interest. Note that the quantity theory of money is used here (ch. 9-10) essentially as a theory of transaction demand for money, but not for goods (unlike in ch. 8).



maximizing output  $Y_s$  at each price (given nominal wage  $w$ ) and this level of output  $Y_s$  enters to determine the derived aggregate demand schedule ( $DAD$ ). Formally, this satisfies,

$$Y_{dd} = \bar{I} + \tilde{C}(P) + cY_s \quad [6]$$

in place of former  $AD$  equation [1].

So long as the real-balance effect is relatively weak,  $Y_{dd}$  can be seen to be less responsive than  $Y_s$  to variations in the price level. Because, from [6],

$$\frac{dY_{dd}}{dP} = \frac{d\tilde{C}(P)}{dP} + c \frac{dY_s}{dP} \quad [7]$$

so that  $d\tilde{C}(P)/dP$  as a relatively small (negative) term is dominated by the (positive) term  $c(dY_s/dP)$  to make the hand side of [7] positive, while  $1 > c > 0$  ensures

$$\frac{dY_s}{dP} > \frac{dY_{dd}}{dP} > 0 \quad [8]$$

or equivalently (in terms of inverse functions),

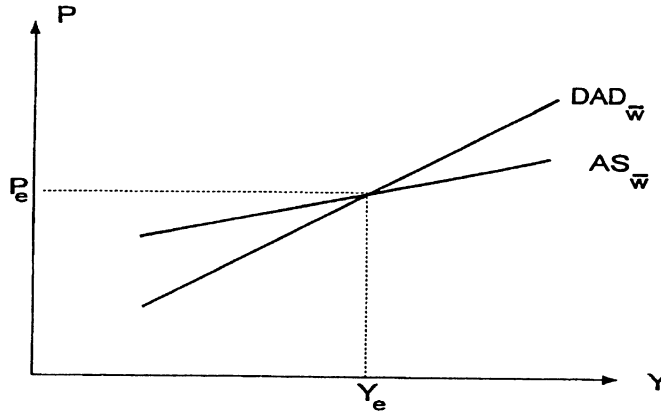
$$\frac{dP}{dY_{dd}} > \frac{dP}{dY_s} > 0 \quad [9]$$

where customarily price is measured on the vertical axis, as in figure 2.<sup>9</sup>

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<sup>9</sup> More precisely, the price elasticity of  $\tilde{C}(P)$  would have to be considerably larger than that of  $Y_s(P)$  to produce a negatively sloped  $DAD$  curve. It is worth emphasizing that condition [8] or, equivalently [9], is economically the most plausible outcome, since  $c(dY_s/dP)$  is usually considerably larger in magnitude than  $[d\tilde{C}(P)/dP]$ .

FIGURE 2.



The fact that the *DAD* curve is an increasing function of price has important consequences for the stability equilibrium. So long as the *DAD* curve crosses the *AS* curve from below, price adjustment, imagined to be conducted by a Walrasian auctioneer, leads to equilibrium —because, as figure 2 shows, below (above) the equilibrium price  $P_e$  there is excess demand (supply) raising (lowering) price. In contrast, quantity adjustment, now imagined to be conducted by a Marshallian auctioneer, would lead away from equilibrium —because, below (above) the equilibrium output  $Y_e$  demand price quoted by the auctioneer is lower (higher) than the supply price, inducing firms to contract (expand) output further. More formally, the Walrasian price adjustment guided by the equation

$$\frac{dP}{dt} = a[DAD(P) - AS(P)], a > 0 \quad [10]$$

is locally stable, if the relevant derivatives evaluated at equilibrium  $P_e$  satisfy,

$$DAD'(P_e) - AS'(P_e) < 0$$

i.e.,

$$\frac{dY_s}{dP} > \frac{dY_{dd}}{dP}$$

which is our earlier condition [8]. However, Marshallian quantity adjustment, guided by the equation involving inverse functions,

$$\frac{dY}{dt} = b[DAD^{-1}(Y) - AS^{-1}(Y)], b > 0 \quad [11]$$

is locally stable if the relevant derivatives evaluated at equilibrium  $Y_e$  satisfy,

$$\frac{dDAD^{-1}(Y)}{dY} - \frac{dAS^{-1}(Y)}{dY} < 0$$

*i.e.*,

$$\frac{dP}{dY_s} > \frac{dP}{dY_{dd}}$$

which violates the same earlier condition [8] or, equivalently, [9]. Consequently, we arrive at a familiar result (Allen, 1965, pp.19-23; Henderson and Quandt, 1980, p. 160) of dual instability when the demand curve ( $DAD$ ) is also positively sloped —stability of Walrasian price adjustment implies instability of Marshallian quantity adjustment and vice versa.

The second route to consistency comes from the primary role assigned to aggregate demand. In its starkest schematization, Kalecki assumed a "conventional" profit margin on the basis of mark-up pricing which allows firms to respond to aggregate demand by expanding or contracting the quantity of output without any effect on price, so long as firms have significantly underutilized capacity. In this case, the relevant supply curve is a flat, horizontal line, where each price level is defined in relation to a different mark-up on constant unit variable (= marginal) cost, on the assumption of given labour productivity and money wage, consequently, any shift in aggregate demand leads to correspondingly

greater production along this perfectly elastic supply curve, through the usual rounds of the multiplier mechanism.<sup>10</sup>

This assumption of mark-up pricing establishes the primacy of aggregate demand in determining the level of output by departing from the neo-classical rule of precise profit maximization. Its justification in terms of “satisficing behaviour” based on “bounded rationality” is well-known (*e.g.* Bhaduri and Falkinger, 1990; Simon, 1979). However, unlike Kalecki, Keynes accepted precise profit maximization as the “first postulate of Classical Economics” (1936, pp.17-31). Nevertheless, despite accepting this postulate, he elaborated on a framework of analysis where the level of output is determined by the level of aggregate demand, and not by the real wage rate from the supply side through profit maximization. His argument follows a line of economic causation in which investment determines effective demand which leads correspondingly to a higher level of output through the multiplier mechanism. Nevertheless, as our preceding discussion shows, implied in this view is the assumption that firms follow the rule of satisfying higher aggregate demand, even if it means departing, at least temporarily, from the rule of precise profit maximization. The higher level of output subsequently leads to upward revision in price to restore profit maximizing equilibrium. This means upward revision in price by equating the lower marginal product of labour at that higher level of output with a lower real wage rate. Schematically,

$$\left( \begin{array}{c} \text{autonomous} \\ \text{investmet} \end{array} \right) \xrightarrow[\text{step 1 (multiplier)}]{\text{quantity adjusment}} \left( \begin{array}{c} \text{effective} \\ \text{demand} \end{array} \right) =$$

$$\left( \begin{array}{c} \text{real output at} \\ \text{initial price level} \end{array} \right) \xrightarrow[\text{step 2 (profit maximization)}]{\text{price adjustment}} \left( \begin{array}{c} \text{real} \\ \text{wage rate} \end{array} \right) = \left( \begin{array}{c} \text{marginal product} \\ \text{of labour} \end{array} \right)$$

Therefore, in the Keynesian theory the real wage rate is determined by, but is not a determinant of the level of employment. It is an endogenous variable determined through relative movements of price and money

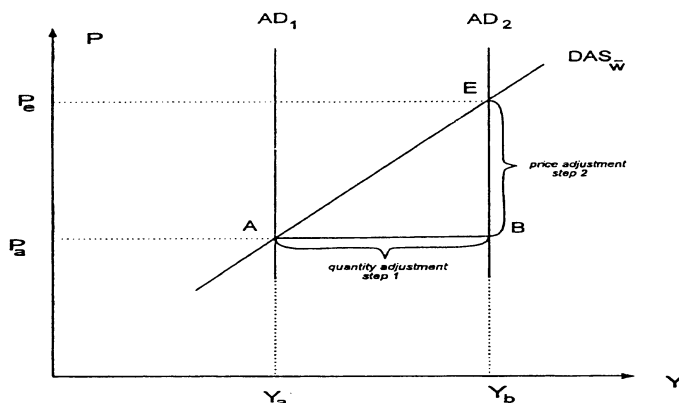
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<sup>10</sup> See also footnote 6.

wage to satisfy the “first postulate of Classical Theory”. This suggests both the important difference and the similarity between the Kaleckian and the Keynesian scheme. In the former case, the constancy of the conventional profit margin implies a constant real wage which permits price only to move in strict proportion to money wage (at given labour productivity). However, in the Keynesian case, price has to rise more than proportionally in relation to money wage so that real wage is depressed at a higher level of output. But despite this difference, both models recognize the dominant influence of aggregate demand on output through the multiplier with (Keynes) or without (Kalecki) the postulate of precise profit maximization, as encapsulated in figure 3. In conformity with our preceding discussion the shift from  $AD_1$  to  $AD_2$  (in both cases aggregate demand represented without real balance effect), brought about by an exogenous increase in real investment, results in increased output at fixed price  $P_a$  from  $Y_a$  to  $Y_b$  in accordance with the multiplier. Thus, point  $B$  represents the Kalecki-Keynes quantity adjustment at given price. However, Keynes postulates a further adjustment, as firms increase prices (given nominal wage) along  $BE$  to restore profit-maximizing equilibrium by equating marginal value product of labour with the nominal wage rate.

In figure 3, only by assigning a subsidiary role to the rule of profit maximization, the Kalecki-Keynes theory of demand-determined output escapes the neo-classical strait-jacket of output being determined from the supply side through profit maximization with real wage as the autonomous causal variable.

FIGURE 3.



More formally, the model underlying the General Theory, accommodating demand- determined output with profit maximization, needs to be viewed in terms of sequential dynamics. Thus, corresponding to step 1 in figure 3, the quantity adjustment is governed by the equation

$$\frac{dY}{dt} = f'(L) \cdot \frac{dL}{dt} = \alpha \cdot P[\bar{I} - sf(L)], \alpha > 0 \quad [12]$$

Note, price adjustment can play no role in [12] for closing the gap between real investment and real savings. It can only be closed via adjustment in real income and employment, assuming that reserve labour force is available. This system is locally stable if,

$$s > 0 \quad [13]$$

so that higher savings out of higher output always matches higher investment.

Price adjustment takes place in the subsequent sequence to restore profit maximization, with output and employment already in equilibrium, by equating real savings with real investment. Higher demand (investment) causing higher output lowers the marginal (and average)

product of labour, so that firms raise their price even at a given nominal wage,  $w = \bar{w}$  to restore profit-maximizing equilibrium. This price adjustment, corresponding to step 2 in figure 3, is governed by the equation,

$$\frac{dP}{dt} = \beta[\bar{w} - Pf'(L)], \beta > 0 \quad [14]$$

where the relevant derivative is evaluated at  $L = Le$  which has already attained equilibrium value (in step 1); consequently local stability of the system is guaranteed if,<sup>11</sup>

$$f' > 0$$

The revolutionary novelty of the model of the General Theory is often lost sight of by insisting that Keynes had also accepted the inverse relation between real wage and employment through profit maximization. Our formalization should make it clear that the methodological novelty lay in postulating a sequential dynamics, where output adjustment precedes (or has a faster speed of) price adjustment, in total contradiction to conventional wisdom of Marshallian short-period analysis (*cf.* Leijonhufvud, 1968). And, it is precisely on this point that the neo-classical interpretation of Keynes differs, since it requires price rise (due to higher demand/investment or money supply) to precede in

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<sup>11</sup> It is a common misconception to believe that nominal wages are constant in the Keynesian system. The system needs a relatively slower movement in nominal wage compared to price to attain stability, *e.g.* [14] is stable so long as,

$$\frac{dw}{dP} - f'(L) < 0$$

or, evaluated at full equilibrium (*i.e.* setting [12] and [14] both at stationary value)

$$\frac{dw}{w} < \frac{dP}{P}$$

order to reduce real wage for profit-maximizing firms to be induced to produce more (*cf.* Blanchard, 1990, especially pp. 782-784, 803).<sup>12</sup>

### REINTERPRETING DISEQUILIBRIUM ANALYSIS

The sequential dynamics of the General Theory, where quantity adjustment precedes (or is faster than) price adjustment, suggests a way of removing the logical inconsistencies in the *AD/AS* framework. In a temporal sense, it implies that firms "first" produce to satisfy higher aggregate demand, and "then" (more slowly) raise price to restore profit-maximizing equilibrium (figure 3). This temporal division, aimed at reconciling the two apparently contradictory rules of satisfying aggregate demand and maximizing profit, has reappeared in a different way in modern disequilibrium theory (Clower, 1965; Malinvaud, 1977). In this latter formulation, two different economic states are distinguished according to which particular rule operates. Thus, whether firms pursue the satisfaction of demand or maximization of profit depends on the binding macroeconomic constraint characterizing the economy.

Viewed from this angle, the logical inconsistencies in the *AD/AS* apparatus seem to disappear at first sight, especially because this interpretation does not insist that spontaneous market forces drive the system towards equilibrium. Instead, in its simplest version it posits that the "short side" of the market determines the rule to be followed to determine the actual outcome. Nevertheless, this does not escape the problem of inconsistency, because actual employment is still guided either by the rule of profit maximization by the firms or by their meeting aggregate demand. If actual employment is guided by the rule of profit maximization by firms along the *AS* curve then desired expenditure at this level of employment can not correspond meaningfully to the *AD* curve in figure 4 in so far as it is determined in isolation from the income

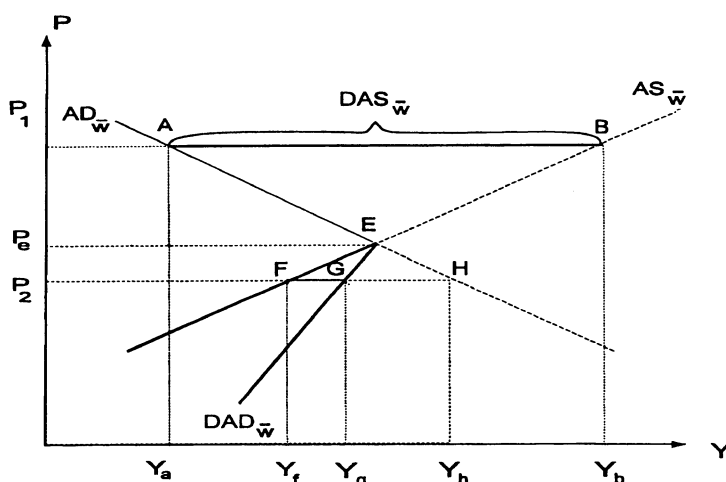
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<sup>12</sup> Indeed, this view seems to be widely accepted following Friedman's (1977) interpretation of Keynes. However, as Keynes (1939) himself argued against Pigou, the "good effect of an expansionist investment policy on employment" worked through demand expansion, and not through lower real wages. In addition, Keynes also revised his assumption that real wage moves contracyclically (Skarstein, 1992).



received by the households, and thus violates the principle of the “circular flow” of income. Alternatively, if actual employment is guided by the rule of satisfying aggregate demand by firms along the  $AD$  curve then the implied supply curve can no longer correspond to the  $AD$  curve for the same reason.

FIGURE 4.



However, in terms of our preceding discussion of the two routes to consistency, we obtain a more transparent macroeconomic characterization of the nature of “rationing” under disequilibrium. If the price level happens to be below the equilibrium, at level  $P_2 < P_e$  (figure 4) aggregate supply is the shorter side of the market and equals  $Y_f$  while the notional aggregate demand is equal to  $Y_h$ . Since the latter is determined in complete isolation from the actual employment,  $Y_f$  and  $Y_h$  can be compared only in a very hypothetical way. This makes the notion of “quantity rationing” outside equilibrium so problematic. However, previous analysis suggests the simpler solution, that at actual aggregate supply  $Y_f$  the actual derived aggregate demand ( $DAD$ ) would be  $Y_g$ . Consequently, an actual (not notional) excess demand equal to the distance  $FG$ ; in figure 4 obtains which would make the persistence of the price level  $P_2$  below  $P_e$  rather difficult in a market economy.

On the other hand, if the price level is above equilibrium at  $P_l > P_e$  the conventional  $AD/AS$  construction tells us that output determined by actual aggregate demand is  $Y_a$  while notional aggregate supply that would maximize profit is  $Y_b$ . This situation, interpreted in terms of our second (Kalecki) route to consistency, corresponds to  $AB$ , representing simply the actual derived supply curve. So long as the aggregate demand increases (not beyond  $Y_b$ ) aggregate supply would passively adjust at the given price. The horizontal derived aggregate supply curve  $AB$  corresponds fully to the Kaleckian framework with the  $AS$  curve playing no other role than providing a boundary constraint to demand-determined output.

#### CONCLUDING OBSERVATIONS

Our aim in this paper has been to demonstrate the logical inconsistency which arises in the  $AD/AS$  framework in all out-of-equilibrium positions, as the same economic agent, the firm, is assumed to be governed by two different rules —maximization of profits along  $AS$  and satisfaction of aggregate demand (without profit maximization) along  $AD$  (section 1). When this logical inconsistency is removed by subjecting firms to either of the rules, but not both, two distinct models with very different policy implications are obtained. In the neo-classical model, real wage is the exogenous variable determining profit-maximizing supply of output along  $AS$  from which aggregate demand  $DAD$  is derived. In this model aggregate demand has no independent existence and the model is not “Keynesian” in any sense. In the contrasting model of Kalecki and Keynes, aggregate demand is assigned the dominant role in determining output, with (Keynes) or without (Kalecki) precise profit maximization (section 2). The  $AD/AS$  model interpreted in terms of a disequilibrium theory is seen to correspond precisely to the case of derived demand or derived supply. In the former case, the persistence of the disequilibrium situation in so far as price has to persist below its equilibrium level despite excess demand seems implausible. In the latter case, the disequilibrium theory can be reduced to the case of aggregate demand

playing the governing role without profit maximization, as in Kalecki's model (section 3).

Our argument suggests that the conventional *AD/AS* framework is not only logically faulty but *economically* misleading as well. Perhaps the most awkward assumption of the *AD/AS* framework is that variations in the price level in a modern industrial economy can take place without significant repercussions on nominal wages (equations [3] to [5]). This assumption is not merely unrealistic, but also misleading in a theoretical sense -because it misrepresents the role assigned to the “price mechanism” in the Keynesian model. The relative movements between prices and money wages are assigned the specific role of restoring profit-maximizing equilibrium in the Keynesian model through endogenous movement of the real wage, while output continues to be determined by the level of demand (section 2). This message is not merely lost in the conventional *AD/AS* framework. It also misleads by pretending that the price level simply equates demand with supply even in the macroeconomic context.

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