Distribution and aggregate demand: Implications of the Bhaduri-Marglin model*

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Abstract

In this paper, we provide a unified presentation of the model of Bhaduri and Marglin (1990) using a recognizable terminology, which allows us to analyse how the incorporation of distributional effects into aggregate demand influences the results of standard macroeconomic models. We identify the "cooperative" situations, under which a distributional change can be accepted by the group in principle negatively affected by that change, in terms of the value taken by the elasticity of aggregate demand. In addition, we find that introducing distributional effects into aggregate demand reinforces the initial effect of a shock under a wage-led regime and partially offsets it under a profit-led regime, but only if the mark-up depends negatively on the level of activity.

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1. Introduction

The study of the distribution of income among its various recipients has been at the centre of the analysis since the early stages of political economy. As famously stated by David Ricardo in the Preface to his *Principles* (first edition published in 1817), "To determine the laws which regulate this distribution [of the product], is the principal problem in Political Economy" (Ricardo, 1821, p. 5). However, following the emergence of the so called "marginal revolution", the last third of the XIX century witnessed a dismissal of the interest in the study of distribution. Specifically, distribution was seen as something independent of social institutions and relations, and was instead explained as a part of the general process of price formation within the market mechanism (Dobb, 1973). This in turn was reflected in the change of the name of the discipline, from "political economy" to the more neutral of "economics". The interest on income distribution has come back to the forefront, though, with the current economic crisis and the recent appearance of the already classic book of Thomas Piketty (Piketty, 2013), whose last objective is placing the study of distribution back at the centre of economic analysis, in the line of classical economists (Piketty, 2015). The role of the rising income inequality in the origin of the crisis has been analysed, from different points of view, in, e.g., Kumhof, Rancière and Winant (2015) or Stockhammer (2015).

On the other hand, standard macroeconomic analyses do not pay much attention to income distribution. In the best of cases, some (mostly European) textbooks model aggregate supply from the existence of a distributive conflict around income distribution, following earlier contributions by, e.g., Rowthorn (1977), Layard and Nickell (1985) or Blanchard (1986). This approach, widely used in the explanation of unemployment in the European economies, was popularised in the book of Layard, Nickell and Jackman (1991). However, the effects of income distribution on aggregate demand have received by far much less attention.

Discussions on the favourable effects on aggregate demand of a wage increase can be traced back to some writings in the 1930s by Michał Kalecki, later collected in Kalecki (1971), or to Steindl (1952). These insights were formally modelled in, e.g., Rowthorn (1982), Taylor (1985) or Blecker (1989). However, the most complete exposition of the impact of income distribution on aggregate demand is due to Bhaduri and Marglin; see Bhaduri and Marglin (1990) and Marglin and Bhaduri (1990).

As their starting point, Bhaduri and Marglin allow for the double role of wages, which represent at the same time both a cost of production and a source of demand, where the latter feature is typically neglected in traditional models. From here, they develop a model with two components: (i) aggregate demand depends on the distribution of income, and (ii) the distribution of income between wages and profits is determined by the price decisions of firms.

There is no doubt that the model of Bhaduri and Marglin represents a very appealing approach to incorporate distribution into a macroeconomic model. However, the terminology used is sometimes particular, and even different between Bhaduri and Marglin (1990) and Marglin and Bhaduri (1990), which makes difficult the comparison of the results with those from other contributions. In addition, the interest of the authors lies in a specific issue, namely, how the relationship between wages and unemployment allows to analyse the role of different political ideologies about the management of the capitalist economy, rather than focusing on the more general aspects of the role of distribution in the working of the whole economy.

In this paper, we provide a presentation of the model of Bhaduri and Marglin intended to be simple, unified and recognizable, and using a standard terminology, which allows for a clear understanding of the role of income distribution on aggregate demand; as well as for a comparison of the performance of the model with the typical macroeconomic models that do not include distribution. Our ultimate aim will be analysing how, and under which conditions, the incorporation of distributional effects into the aggregate demand side influences the results of a standard macroeconomic model. In particular, we develop a complete model of the aggregate demand (representing the short run) where, as well as incorporating the main features of the Bhaduri-Marglin model, the interest rate is made endogenous (through a monetary policy rule) and the open economy is explicitly introduced from the beginning.

The paper is organized as follows. Our version of the Bhaduri-Marglin model is developed in section 2. The effects of changes in the distribution of income are discussed in section 3, together with the conditions under which such distributional changes can be accepted by the group in principle negatively affected by that change. Next, in section 4 we analyse the effects of changes in other exogenous variables, and how these results differ in comparison with the standard macroeconomic model, i.e., without including distribution into the aggregate demand. The main conclusions are summarized in section 5.

2. The model

We will develop along this section the two components of the model, i.e., aggregate demand and distribution, which will be then put together to give the solution of the model.

2.1. Aggregate demand

Goods market

We begin by defining the share of wages in income, ω, as:

$$\omega = \frac{WN}{PY}$$

where WN is the wage bill (being W the average wage and N the employment level of labour), P the price level, and Y the real aggregate output. If we consider just two sources of income, wages and profits, the share of profits in income would be given by $(1 - \omega)$.

We will outline now the different components of aggregate demand. Regarding the consumption function, two main approaches can be distinguished (Nuti, 2004). According to the traditional Keynesian approach, consumption depends on aggregate income, independently of its distribution. In contrast, the Kaleckian approach assumes that consumption differs across income categories; in other words, the recipients of wages and profits (i.e., workers and capitalists) will have different propensities to consume. This will be the approach followed here.

Denoting by c_W and c_Π the marginal propensities to consume out of disposable income of workers and capitalists, respectively, the consumption expenditures of each group will be, respectively, $c_W\ [\omega Y - T^W]$ and $c_\Pi\ [(1 - \omega)Y - T^\Pi]$; where $[\omega Y - T^W]$ and $[(1 - \omega)Y - T^\Pi]$ are the disposable incomes of workers and capitalists, with T^W and T^Π denoting government taxes (net of transfers) levied on each group. Accordingly, the consumption function will be given by:

$$C = [c_W\omega + c_\Pi(1 - \omega)]Y - (c_W T^W + c_\Pi T^\Pi)$$

where C denotes total consumption, and:

$$0 < c_W < 1,\ 0 < c_\Pi < 1, \text{ and } c_W > c_\Pi.$$

Notice that, unlike the traditional Kaleckian assumption $c_W = 1$, we assume here $c_W < 1$, which implies the possibility of savings by workers.

Finally, writing for convenience the first part of the above equation in an implicit manner, our consumption function becomes:

$$C = \bar{C} + C(\omega, Y) - (c_W T^W + c_\Pi T^\Pi) \quad C_\omega > 0, C_Y > 0 \qquad (1)$$

where $\bar{C}$ is the autonomous component of consumption, gathering the effect of any other variable that might affect consumption; and, from now on, F_Z denotes the partial derivative of the function F with respect to the variable Z. In the above equation, $C_\omega = (c_W - c_\Pi)Y$, and $C_Y = c_W\omega + c_\Pi(1 - \omega)$.

Turning now to investment, we assume an investment function such as:

$$I = \bar{I} + I(\omega, Y, r) \qquad I_\omega < 0, I_Y > 0, I_r < 0 \qquad (2)$$

where, in addition to an autonomous component $\bar{I}$, the investment of firms, I, depends positively on the profit share (i.e., negatively on the wage share), reflecting the influence of a higher expected future profitability and the availability of internal funds; positively on current output, as a proxy of the expected level of output; and negatively on the real interest rate r, reflecting financial markets conditions.

Since we are dealing with an open economy, we have to include the trade balance as an additional component of aggregate demand. In principle, net exports (i.e., the trade balance) would depend negatively on domestic output, positively on foreign output, and negatively on the real exchange rate (measured as the price of domestic goods relative to foreign goods). If we define the real exchange rate in terms of unit labour costs, and multiply and divide by the ratio of domestic prices to foreign prices, it will equal the real exchange rate in terms of internal prices multiplied by the ratio of domestic to foreign real unit labour costs. On the other hand, real unit labour costs equal the wage share, provided that the level of output measured at factor cost and at market prices do not differ significantly. Therefore, the function for net exports, NX, would be:

$$NX = NX(\omega, \omega^*, Y, Y^*, Q) \qquad NX_\omega < 0, NX_{\omega^*} > 0, NX_Y < 0, NX_{Y^*} > 0, NX_Q < 0$$

where Q is the real exchange rate (in terms of internal prices), and an asterisk denotes foreign variables. The dependence of net exports on the relative (to the rest of the world) wage share can be justified since a higher (lower) relative wage share means a higher (lower) relative unit labour cost, so that relative prices worsen (improve), given the prices of imports, so reducing (increasing) net exports; this effect would be stronger in small open economies. Assuming further that the real exchange rate depends positively on the real interest rate differential with respect to the rest of the world, the function for net exports becomes:

$$NX = NX(\omega, \omega^*, Y, Y^*, r, r^*) \qquad NX_\omega < 0, NX_{\omega^*} > 0, NX_Y < 0, NX_{Y^*} > 0, NX_r < 0, NX_{r^*} > 0 \qquad (3)$$

To conclude, the equilibrium condition in the goods market would be given by:

$$Y = C + I + GOVEXP + NX$$

with $GOVEXP$ denoting the level of government expenditure. Replacing equations (1) to (3) and rearranging, we get:

$$Y = E + C(\omega, Y) + I(\omega, Y, r) + G + NX(\omega, \omega^*, Y, Y^*, r, r^*)$$

$$C_\omega > 0, C_Y > 0, I_\omega < 0, I_Y > 0, I_r < 0, NX_\omega < 0, NX_{\omega^*} > 0, NX_Y < 0, NX_{Y^*} > 0, NX_r < 0, NX_{r^*} > 0 \qquad (4)$$

where $G = GOVEXP - (c_W T^W + c_\Pi T^\Pi)$ is a measure of the public sector deficit, and $E = \bar{C} + \bar{I}$ is a measure of autonomous shocks to private expenditure (i.e., consumption and investment).

Equation (4) is an *IS* function that, unlike the traditional one, has as an additional exogenous variable, namely, the wage share. In order to complete the aggregate demand side of the model, our next step will be making endogenous the real interest rate.

Money market

As regards the money market, the standard practice consists of assuming an exogenous money supply that works as the instrument of monetary policy; and which, together with the demand for money, gives rise to the *LM* function. This framework, however, has revealed problematic since the surge experienced by financial innovation has made highly unstable the traditional demand for money function; in such a case, the intermediate target of monetary policy should be the interest rate rather than money supply (Poole, 1970).

On the other hand, in a post-Keynesian context, the supply of money is endogenous, rather than exogenous, and determined by its demand; monetary policy, in turn, is represented by the rate of interest determined by the central bank (Kaldor, 1982). A now standard way of tackling this issue is assuming that the central bank follows a monetary policy rule of the type proposed by Taylor (1993), in terms of the deviation of current inflation from the central bank's target. A macroeconomic model incorporating a monetary policy rule based on inflation targeting has been developed, at a textbook level, in Bajo-Rubio and Díaz-Roldán (2011, 2016).

Strictly speaking, the central bank sets the nominal interest rate; however, since the interest rate affecting the goods market is the real interest rate, we will present our monetary rule in terms of the latter. Specifically, we assume a rule such as:

$$r = \rho + \alpha(\Delta P - \Delta P^T) \qquad (5)$$

so that the real interest rate r would be adjusted along with deviations of the actual inflation rate ΔP from the target established by the central bank ΔP^T, with α denoting the degree of response; in turn, ρ is a reference value for the real interest rate in the long run, which can include a risk premium[1]. Equation (5) defines the monetary rule followed by the central bank, and will be called the *MR* function[2].

The AD-D *function*

The next step would be replacing the *MR* function, given by equation (5), into the *IS* function, given by equation (4), to get an equation that summarizes the aggregate demand side of the model. However, instead of relating the output level Y and the inflation rate ΔP, as usual in an aggregate demand (*AD*) function, the equation we derive here relates the output level Y and the wage share ω. For that reason, it will be called, on incorporating distributional issues, the *AD-D* function (with the last *D* standing for "distribution").

Since the *IS* function is an implicit one, we will proceed as follows. We will first differentiate equations (4) and (5), and replace the differentiated version of (5) into the differentiated version of (4); and next, as in Sargent (1979), we will find reduced forms for the

[1] The monetary rule could be also made dependent on the evolution of the level of activity, as measured by the level of output Y; see, e.g., Bajo-Rubio and Díaz-Roldán (2011, 2016). However, this would only complicate the multipliers without affecting the results, so we have preferred to assume a simple rule as in (5).

[2] A reaction function of the central bank analogous to equation (5) has been used in a post-Keynesian context in Hein and Stockhammer (2011).

endogenous variable Y as a function of ω and the exogenous variables, and then obtain their multipliers, i.e., partial derivatives of Y with respect to the exogenous variables.

Therefore, the *AD-D* function would be given by:

$$(1 - C_Y - I_Y - NX_Y)\, dY = (C_\omega + I_\omega + NX_\omega)\, d\omega + \alpha(I_r + NX_r)\, d\Delta P + (I_r + NX_r)\, d\rho - \alpha(I_r + NX_r)\, d\Delta P^T + dE + dG + NX_{\omega^*}\, d\omega^* + NX_{Y^*}\, dY^* + NX_{r^*}\, dr^* \quad (6)$$

i.e., a relation between output and the wage share, which depends, in addition to the rate of inflation ΔP, on:

- monetary shocks (given by changes in ρ)
- monetary policy actions (through changes in ΔP^T)
- shocks to private expenditure (given by changes in E)
- fiscal policy (through changes in G)
- external shocks (depending on ω*, Y* and r*)

The slope of this function would be:

$$\frac{d\omega}{dY} = \frac{1 - C_Y - I_Y - NX_Y}{C_\omega + I_\omega + NX_\omega} = \frac{H}{J}$$

where, for simplicity, we have made $1 - C_Y - I_Y - NX_Y = H$, and $C_\omega + I_\omega + NX_\omega = J$.

In the above expression, the numerator H is positive, provided that $(1 - C_Y) > I_Y$, a usual assumption in the Keynesian model for stability reasons; see, e.g., Gandolfo (1997, Chapter 20). The sign of the denominator J, however, is ambiguous, since $C_\omega > 0$, and $I_\omega < 0$, $NX_\omega < 0$, which also makes ambiguous the sign of the slope of the *AD-D* function. As is customary in this literature, we can consider two cases (Stockhammer and Onaran, 2013):

a) when $J > 0$, i.e., if $C_\omega > I_\omega + NX_\omega$ → the aggregate demand is *wage-led*, and the *AD-D* function is increasing in the plane Y-ω
b) when $J < 0$, i.e., if $C_\omega < I_\omega + NX_\omega$ → the aggregate demand is *profit-led*, and the *AD-D* function is decreasing in the plane Y-ω

Of course, whether J is greater or lower than zero is an empirical issue. According to the evidence surveyed in Stockhammer and Onaran (2013), domestic demand is normally wage-led (so that $C_\omega > I_\omega$), whereas total demand would be profit-led only if NX_ω is high enough to offset the former effect, which would be more likely in small open economies.

Finally, from equation (6), the effect of the exogenous variables on the position of the *AD-D* function would be:

$$\frac{\partial Y}{\partial \rho} < 0, \frac{\partial Y}{\partial \Delta P} < 0, \frac{\partial Y}{\partial \Delta P^T} > 0, \frac{\partial Y}{\partial E} > 0, \frac{\partial Y}{\partial G} > 0, \frac{\partial Y}{\partial \omega^*} > 0, \frac{\partial Y}{\partial Y^*} > 0, \frac{\partial Y}{\partial r^*} > 0$$

2.2. Distribution

In line with the post-Keynesian tradition, we will assume that firms set prices by adding a mark-up to average variable costs, where the latter are constant over the relevant range of output up to full capacity, and increasing beyond (Eichner and Kregel, 1975). The mark-up, in turn, reflects the degree of monopoly, which depends on several factors such as the concentration in industry, the development of sales promotion (through advertising, selling agents, etc.), the level of fixed over variable costs, or the power of trade unions (see Kalecki, 1954, pp. 17-18).

Hence, assuming for simplicity no fixed costs, and that labour is the only variable factor, our equation for prices, P, will be given by:

$$P = (1 + \mu)\frac{W}{Y/N}$$

where μ denotes the mark-up; and, recalling the definition of the wage share, we have:

$$\omega = \frac{1}{1 + \mu}$$

i.e., an equation for the wage share along the lines of Kalecki (1954) or Asimakopulos (1975).

The relationship between the mark-up and the level of activity is rather controversial. For instance, Marglin and Bhaduri (1990) assumed that the mark-up was increasing in the rate of capacity utilization. However, such an assumption implies that the real wage is countercyclical, which is at odds with the empirical evidence since observed real wages are acyclical or slightly procyclical (see, e.g., Stirati, 2016).

The simplest solution would be assuming that the mark-up is insensitive to the level of activity. In this case, the wage share would be constant and given by the level of the mark-up, which would depend in turn on the factors mentioned above. For convenience, we write our distributional equation as:

$$\omega = \bar{\omega}$$

where $\bar{\omega}$ denotes the given value of the wage share; or, in differentiated form:

$$d\omega = d\bar{\omega} \qquad (7)$$

We will call the distribution function given by equation (7) the *DIST* function, which is a horizontal line in the plane *Y*-ω:

$$\frac{d\omega}{dY} = 0$$

and shifts above (below) when the mark-up decreases (increases).

An alternative approach would be assuming that the mark-up depends negatively on the level of activity. This can be justified in terms of a procyclical elasticity of demand, so that in a boom firms reduce the mark-up in order to gain some new potential customers (Bils, 1989); or if the degree of collusion is countercyclical, so that in a boom firms have an incentive to deviate from the collusive solution by reducing prices, due to the expected potential rise in demand (Rotemberg and Saloner, 1986). This hypothesis, on the other hand, was favoured by Kalecki himself on the grounds that firms would tend to "protect" profits, so that "there is a tendency for the degree of monopoly to rise in the slump, a tendency which is reversed in the boom" (Kalecki, 1954, p. 18). Accordingly, in this case:

$$\mu = \mu(Y) \qquad \mu_Y < 0$$

and the *DIST* function would be given by:

$$\omega = \bar{\omega} + \omega(Y) \qquad \omega_Y > 0$$

where $\bar{\omega}$ denotes now the exogenous component of the wage share; and, in differentiated form:

$$d\omega = d\bar{\omega} + \omega_Y\, dY \qquad (7')$$

with a positive slope:

$$\frac{d\omega}{dY} = \omega_Y > 0$$

since a higher output leads to a lower mark-up, and then to a higher wage share. As before, its position depends on $\bar{\omega}$:

$$\frac{\partial\omega}{\partial\bar{\omega}} > 0$$

2.3. Solution of the model

The functions *AD-D* and *DIST* given by equations (6) and (7) or (7'), make up a model in the line of Bhaduri and Marglin, i.e., a complete aggregate demand model that incorporates the effect of income distribution.

We get the solution of the model by replacing (7) in (6):

$$H\,dY = J\,d\overline{\omega} + \alpha(I_r + NX_r)\,d\Delta P + (I_r + NX_r)\,d\rho - \alpha(I_r + NX_r)\,d\Delta P^T + dE + dG + NX_{\omega^*}\,d\omega^* + NX_{Y^*}\,dY^* + NX_{r^*}\,dr^* \quad (8)$$

or, alternatively, (7') in (6):

$$(H - J\omega_Y)\,dY = J\,d\overline{\omega} + \alpha(I_r + NX_r)\,d\Delta P + (I_r + NX_r)\,d\rho - \alpha(I_r + NX_r)\,d\Delta P^T + dE + dG + NX_{\omega^*}\,d\omega^* + NX_{Y^*}\,dY^* + NX_{r^*}\,dr^* \quad (8')$$

As can be seen, the only difference between equations (8) and (8') is the coefficient on dY that appears in the latter: H versus $(H - J\omega_Y)$. While the sign of the former is unambiguously positive, the sign of the latter is ambiguous, which makes also ambiguous the sign of the effect of changes in exogenous variables when the mark-up depends negatively on output. In principle, three cases are possible:

(i) if $J > 0$ (i.e., the wage-led case), then $(H - J\omega_Y) < 0$ if $H/J < \omega_Y$, so that the slope of the *AD-D* function is lower than the slope of the *DIST* function

(ii) if $J > 0$ (i.e., the wage-led case), then $(H - J\omega_Y) > 0$ if $H/J > \omega_Y$, so that the slope of the *AD-D* function is greater than the slope of the *DIST* function

(iii) if $J < 0$ (i.e., the profit-led case), then $(H - J\omega_Y) > 0$ always

However, it can be shown that case (i) above is unstable. Following the reasoning in next section, if, e.g., $\overline{\omega}$ rises from an equilibrium position, the new equilibrium would correspond to a lower level of output despite the fact that a higher wage share increases output when aggregate demand is wage-led, which would move the economy away from the equilibrium. Accordingly, this case will be omitted thereafter, and the coefficient $(H - J\omega_Y)$ will be taken as positive. This in turn means that the effect of the level of activity on the mark-up, and hence on the wage share, is expected to be relatively small.

In the next section we will analyse the effects of a change in the wage share in each of the different situations analysed.

3. Effects of distributional changes

From the solution of the model, i.e., equations (8) or (8'), the effect on output following a change in the exogenous component of the wage share is given by:

$$\frac{\partial Y}{\partial \overline{\omega}} = \frac{J}{H} \quad (9)$$

if the mark-up is constant; or:

$$\frac{\partial Y}{\partial \overline{\omega}} = \frac{J}{H - J\omega_Y} \quad (9')$$

if the mark-up is countercyclical. As can be seen from equations (9) and (9'), the multiplier is positive in the wage-led case and negative in the profit-led case, independently of the assumption on the mark-up. Also, by looking at equations (9) and (9'), it is apparent that, when the mark-up is countercyclical, the multiplier is greater in the wage-led case and lower (in absolute value) in the profit-led case, compared with the case of constant mark-up. We examine

in turn the effects of an increase in the exogenous component of the wage share, for all the different situations.

We begin with the wage-led case, depicted in Figures 1a and 1b. Starting from point 1, in both figures a rise in $\bar{\omega}$ shifts the *DIST* function upwards to point 2, which tends to increase output since demand is wage-led. The mark-up does not change in Figure 1a; however, in Figure 1b the higher output leads to a fall in the mark-up that raises additionally the wage share and the level of output. Following rightwards movements along both *AD-D* and *DIST*, the economy ends at point 3 with higher output and a higher wage share.

[Figures 1a and 1b here]

Turning to the profit-led case depicted in Figures 2a and 2b, the higher $\bar{\omega}$ shifts again the *DIST* function upwards from point 1 to point 2, which now tends to lower output since demand is profit-led. While the mark-up does not change in Figure 2a, in Figure 2b the reduced output leads to a higher mark-up that, by decreasing the wage share, leads to the level of output to partially increase, so the final fall in output is smaller than otherwise. Following leftwards movements along *AD-D* and *DIST*, the economy ends at point 3 with lower output and a higher wage share.

[Figures 2a and 2b here]

Our next step will be deriving the conditions under which an increase in the income share of a group can be "acceptable" for the other group, despite the decrease in the own share in income. These would be the "cooperative" cases already discussed by Bhaduri and Marglin, namely:

- in the wage-led case, when an increase in the wage share that raises the wage bill raises also profits, so it could be accepted by capitalists
- in the profit-led case, when an increase in the profit share (i.e., a decrease in the wage share) that raises profits raises also the wage bill, so it could be accepted by workers

To that end, recall that in our model the wage bill and total profits, in real terms, would be given, respectively, by:

$$\text{wage bill} = \frac{W}{P}N = \omega Y$$

$$\text{profits} = \mu\frac{W}{P}N = (1-\omega)Y$$

so that, from equations (6) and (7) or (7'), the effect on the wage bill and total profits of a change in the exogenous component of the wage share would be:

$$\frac{\partial \text{wage bill}}{\partial \bar{\omega}} = \omega\frac{\partial Y}{\partial \bar{\omega}} + Y\frac{\partial \omega}{\partial \bar{\omega}} = \frac{J\omega + HY}{H}$$

$$\frac{\partial \text{profits}}{\partial \bar{\omega}} = (1-\omega)\frac{\partial Y}{\partial \bar{\omega}} - Y\frac{\partial \omega}{\partial \bar{\omega}} = \frac{J(1-\omega) - HY}{H}$$

if the mark-up is constant; or:

$$\frac{\partial \text{wage bill}}{\partial \bar{\omega}} = \omega\frac{\partial Y}{\partial \bar{\omega}} + Y\frac{\partial \omega}{\partial \bar{\omega}} = \frac{J\omega + HY}{H - J\omega_Y}$$

$$\frac{\partial \text{profits}}{\partial \bar{\omega}} = (1-\omega)\frac{\partial Y}{\partial \bar{\omega}} - Y\frac{\partial \omega}{\partial \bar{\omega}} = \frac{J(1-\omega) - HY}{H - J\omega_Y}$$

if the mark-up is countercyclical.

The denominator is positive in all cases; and J is positive in the wage-led case and negative in the profit-led case. From here, we can derive the conditions under which an exogenous change in distribution can be "acceptable" for the other group, in terms of the elasticity of the *AD-D* function, denoted by $\varepsilon_{AD\text{-}D}$:

$$\varepsilon_{AD\text{-}D} = \frac{d\omega}{dY}\frac{Y}{\omega} = \frac{H}{J}\frac{Y}{\omega}$$

Notice that, since we are interested in the sign of the numerator (which is the same in both cases), these conditions will be independent of the assumption on the behaviour of the mark-up.

Therefore:

a) Under a wage-led regime, an increase in the exogenous component of the wage share leads to higher output and a higher wage share, which raises the wage bill. Capitalists will accept this situation if profits also increase so that $J(1-\omega) > HY$, which happens when:

$$\varepsilon_{AD\text{-}D} < \frac{(1-\omega)}{\omega} \qquad (10)$$

i.e., when the elasticity of the *AD-D* function is lower than the ratio of the profit share to the wage share.

b) Under a profit-led regime, a decrease in the exogenous component of the wage share (or, which is the same, an increase in the profit share) leads to higher output and a lower wage share, which raises total profits. Workers will accept this situation if the wage bill also increases so that $|J\omega| > HY$, which happens when:

$$|\varepsilon_{AD\text{-}D}| < 1 \qquad (11)$$

i.e., when the elasticity of the *AD-D* function (which has now a negative sign), in absolute value, is lower than one.

In general, the "cooperative" situations will require an *AD-D* function relatively flat, so the increase in output can be as high as possible, as already emphasised by Bhaduri and Marglin (1990) and Marglin and Bhaduri (1990).

4. Comparison with standard models

The solution of the model given by equations (8) or (8') would be the equivalent to the *AD* function of an otherwise standard macroeconomic model, i.e., not including distribution into the aggregate demand side of the model. The effect on output of changes in the exogenous variables of the model (other than $\bar{\omega}$, which was examined in the previous section) would be as follows:

$$\frac{\partial Y}{\partial \Delta P} = \frac{\alpha(I_r + NX_r)}{H} < 0,\ \frac{\partial Y}{\partial \rho} = \frac{(I_r + NX_r)}{H} < 0,\ \frac{\partial Y}{\partial \Delta P^T} = -\frac{\alpha(I_r + NX_r)}{H} > 0,\ \frac{\partial Y}{\partial E} = \frac{1}{H} > 0,$$
$$\frac{\partial Y}{\partial G} = \frac{1}{H} > 0, \frac{\partial Y}{\partial \omega^*} = \frac{NX_{\omega^*}}{H} > 0,\ \frac{\partial Y}{\partial Y^*} = \frac{NX_{Y^*}}{H} > 0,\ \frac{\partial Y}{\partial r^*} = \frac{NX_{r^*}}{H} > 0 \qquad (12)$$

if the mark-up is constant; or:

$$\frac{\partial Y}{\partial \Delta P} = \frac{\alpha(I_r + NX_r)}{H - J\omega_Y} < 0,\ \frac{\partial Y}{\partial \rho} = \frac{(I_r + NX_r)}{H - J\omega_Y} < 0,\ \frac{\partial Y}{\partial \Delta P^T} = -\frac{\alpha(I_r + NX_r)}{H - J\omega_Y} > 0,\ \frac{\partial Y}{\partial E} = \frac{1}{H - J\omega_Y} > 0,$$
$$\frac{\partial Y}{\partial G} = \frac{1}{H - J\omega_Y} > 0, \frac{\partial Y}{\partial \omega^*} = \frac{NX_{\omega^*}}{H - J\omega_Y} > 0,\ \frac{\partial Y}{\partial Y^*} = \frac{NX_{Y^*}}{H - J\omega_Y} > 0,\ \frac{\partial Y}{\partial r^*} = \frac{NX_{r^*}}{H - J\omega_Y} > 0 \qquad (12')$$

if the mark-up is countercyclical.

In Figures 3a and 3b, and 4a and 4b, we show the effects in the model of an expansionary demand shock (the case of the contractionary shock would be symmetrical), for the wage-led and profit-led cases, respectively. Such a shock could occur following a decrease in the risk premium, an increase in the inflation target of the central bank (i.e., an expansionary monetary policy), an exogenous increase in consumption or investment, an increase in the government deficit (i.e., an expansionary fiscal policy), or an improvement in the trade balance resulting from an increase in the profit share, output level or real interest rate in the rest of the world (in the latter case, via a depreciation of the real exchange rate).

[Figures 3a and 3b here]
[Figures 4a and 4b here]

All these shocks raise aggregate demand and the output level, so that in all the figures the *AD-D* function shifts rightwards and the economy moves from point 1 to point 2. If the mark-up is constant, nothing else happens, and the economy stays at point 2, for both the wage-led case (Figure 3a) and the profit-led case (Figure 4a). Some more interesting results appear when the mark-up is countercyclical. Now, the higher output leads to a fall in the mark-up, and then to a higher wage share, which raises output even more in the wage-led case (Figure 3b) and reduces output something in the profit-led case (Figure 4b), with the economy moving to point 3 in both figures.

Notice that the above results for a countercyclical mark-up follow easily from comparing the multipliers in (12) and (12'). That is, the multipliers of changes in exogenous variables are greater in the wage-led case (because $H - J\omega_Y < H$) and lower in the profit-led case (since now $H - J\omega_Y > H$).

So, how do the results from this model change in comparison with a model that does not include distribution into the aggregate demand side? Looking at the solution of the model given by equation (8) or (8'), we can see two differences in the model of this paper:

a) There appears a new exogenous variable, $\bar{\omega}$, of which the multiplier (9) or (9') is positive in the wage-led case and negative in the profit-led case. In addition, if the wage share is included into the trade balance, the model also includes the effect of ω^*, with a positive multiplier shown in (12) or (12').
b) If the mark-up depends on the level of activity, the effect on output of the rest of exogenous variables, given by the multipliers in (12'), now incorporates the term $J = C_\omega + I_\omega + NX_\omega$. Accordingly, if a countercyclical mark-up is assumed, the multipliers in (12') will be greater in the wage-led case and lower in the profit-led case, compared to the standard model. In other words, the initial effect of the shock will be reinforced under a wage-led regime, and partially offset under a profit-led regime. Recall that this result did not appear when a constant mark-up was assumed instead.

5. Conclusions

The model of Bhaduri and Marglin represents an outstanding contribution that highlights the role of income distribution as a factor influencing aggregate demand. The model originates in

the recognition of the double role of wages, which are at the same time a cost of production and a source of demand, something typically neglected by traditional models.

In this paper, we have provided a unified presentation of the Bhaduri-Marglin model, using a recognizable terminology, which allowed to clearly understand the role of income distribution on aggregate demand, as well as comparing the performance of the model with the standard macroeconomic models that do not include distribution.

Our version of the Bhaduri-Marglin model is made up of (i) an aggregate demand function that incorporates the share of wages in income, where the interest rate is made endogenous (through a monetary policy rule) and the open economy is explicitly introduced from the beginning; and (ii) a distribution function that relates the wage share to the mark-up, where the latter is assumed alternatively to be constant, and depending negatively on the level of activity. These two equations lead to the *AD-D* and *DIST* functions, which make up a complete aggregate demand model that incorporates the effect of income distribution. From here, we get the two well-known cases of wage-led and profit-led aggregate demand, depending on whether a change in the wage share affects aggregate demand with either the same or the opposite sign, respectively.

Next, we have identified the "cooperative" situations, under which a distributional change can be accepted by the group in principle negatively affected by that change. Specifically, under a wage-led regime capitalists would accept an increase in the wage share if profits also increase, which would happen when the elasticity of the *AD-D* function is lower than the ratio of the profit share to the wage share. In turn, under a profit-led regime workers would accept a decrease in the wage share if the wage bill also increases, which would happen when the elasticity of the *AD-D* function, in absolute value, is lower than one.

Finally, we analysed the effects of changes in the rest of exogenous variables, comparing the results with those of the standard macroeconomic model. We found that the introduction of distributional effects into the aggregate demand reinforced the initial effect of a shock under a wage-led regime and partially offset the initial effect of the shock under a profit-led regime, but only if the mark-up depended negatively on the level of activity.

Notice that the model in this paper is an aggregate demand one, so the analysis is just valid for the short run; in particular, the inflation rate in (8) or (8') is taken as exogenous. It would be possible to endogeneize the inflation rate, e.g., through the introduction of an aggregate supply function based on a distributive conflict around income distribution, as in Bajo-Rubio and Díaz-Roldán (2011). As it can be shown, the gradual adjustment of prices would tend to eventually offset in the medium run the effects of any aggregate demand shock on output.

To conclude, recall that in this kind of models, it is crucial to know whether aggregate demand is either wage-led or profit-led, which in the end turns to be an empirical issue and will be dependent on the particular features of the different countries. For instance, in a recent paper Onaran and Galanis (2014) estimate the effects of a change in the wage share on growth at global level in the G20 countries. While domestic private demand was found to be wage-led in all countries, the results for total demand differed across countries, although the global economy was wage-led. Some new results along these lines have been presented in Onaran and Obst (2016); in particular, most European economies were wage-led. On the other hand, an

interesting point has been recently raised by Blecker (2016), so that aggregate demand would be more likely to be profit-led in the short run and wage-led in the long run. This is justified on the grounds that the effect of labour costs on investment and net exports should be more important in the short run, unlike the effect of the wage share on consumption, which should be more important in the long run; see Blecker (2016). These results, coupled with the recent trends in income distribution, would suggest the implementation of pro-labour redistributive policies at a global level, and in particular within the European Union.

References

Asimakopulos, A. (1975): "A Kaleckian theory of income distribution", *Canadian Journal of Economics* 8, 313-333.

Bajo-Rubio, O. and Díaz-Roldán, C. (2011): *Teoría y política macroeconómica*, Antoni Bosch editor, Barcelona.

Bajo-Rubio, O. and Díaz-Roldán, C. (2016): "Open economy Keynesian macroeconomics without the LM curve", *Journal of Economics and Economic Education Research* 17, 1-16.

Bhaduri, A. and Marglin, S. (1990): "Unemployment and the real wage: The economic basis for contesting political ideologies", *Cambridge Journal of Economics* 14, 375-393.

Bils, M. (1989): "Pricing in a customer market", *Quarterly Journal of Economics* 104, 699-718.

Blanchard, O. (1986): "The wage price spiral", *Quarterly Journal of Economics* 101, 543-565.

Blecker, R. (1989): "International competition, income distribution and economic growth", *Cambridge Journal of Economics* 13, 395-412.

Blecker, R. (2016): "Wage-led versus profit-led demand regimes: The long and the short of it", *Review of Keynesian Economics* 4, 373-390.

Dobb, M. (1973): *Theories of Value and Distribution since Adam Smith: Ideology and Economic Theory*, Cambridge University Press, Cambridge.

Eichner, A. S. and Kregel, J. A. (1975): "An Essay on Post-Keynesian Theory: A New Paradigm in Economics", *Journal of Economic Literature* 13, 1293-1314.

Gandolfo, G. (1997): *Economic Dynamics*, Springer, Berlin.

Hein, E. and Stockhammer, E. (2011): "A post-Keynesian macroeconomic model of inflation, distribution and employment", in Hein, E. and Stockhammer, E. (eds.): *A Modern Guide to Keynesian Macroeconomics and Economic Policies*, Edward Elgar, Cheltenham, 112-136.

Kaldor, N. (1982): *The Scourge of Monetarism*, Oxford University Press, Oxford.

Kalecki, M. (1954): *Theory of Economic Dynamics: An Essay on Cyclical and Long-Run Changes in Capitalist Economy*, George Allen and Unwin, London.

Kalecki, M. (1971): *Selected Essays on the Dynamics of the Capitalist Economy 1933-1970*, Cambridge University Press, Cambridge.

Kumhof, M., Rancière, R. and Winant, P. (2015): "Inequality, leverage, and crises", *American Economic Review* 105, 1217-1245.

Layard, R. and Nickell, S. (1985): "The causes of British unemployment", *National Institute Economic Review* 111, 62-85.

Layard, R., Nickell, S. and Jackman, R. (1991): *Unemployment: Macroeconomic performance and the labour market*, Oxford University Press, Oxford.

Marglin, S. and Bhaduri, A. (1990): "Profit squeeze and Keynesian theory", in Marglin, S. and Schor, J. (eds.): *The Golden Age of Capitalism: Reinterpreting the Postwar Experience*, Clarendon Press, Oxford, 153-186.

Nuti, D. M. (2004): "Kalecki and Keynes revisited: Two original approaches to demand-determined income – and much more besides", in Sadowski, Z. L. and Szeworski, A. (eds.): *Kalecki's Economics Today*, Routledge, London.

Onaran, Ö. and Galanis, G. (2014): "Income distribution and growth: A global model", *Environment and Planning A* 46, 2489-2513.

Onaran, Ö. and Obst, T. (2016): "Wage-led growth in the EU15 member-states: The effects of income distribution on growth, investment, trade balance and inflation", *Cambridge Journal of Economics*, 40, 1517-1551.

Piketty, T. (2013): *Le capital au XXI^{e} siècle*, Éditions du Seuil, Paris.

Piketty, T. (2015): "Putting distribution back at the center of economics: Reflections on *Capital in the Twenty-First Century*", *Journal of Economic Perspectives* 29, 67-88.

Poole, W. (1970): "Optimal choice of monetary policy instruments in a simple stochastic macro model", *Quarterly Journal of Economics* 84, 197-216.

Ricardo, D. (1821): *On the Principles of Political Economy and Taxation* (3rd edition), John Murray, London.

Rotemberg, J. and Saloner, G. (1986): "A supergame-theoretic model of price wars during booms", *American Economic Review* 76, 390-407.

Rowthorn, R. E. (1977): "Conflict, inflation and money", *Cambridge Journal of Economics* 1, 215-239.

Rowthorn, R. E. (1982): "Demand, real wages and economic growth", *Studi Economici* 18, 3-53.

Sargent, T. J. (1979): *Macroeconomic Theory*, Academic Press, New York.

Steindl, J. (1952): *Maturity and Stagnation in American Capitalism*, Monthly Review Press, New York.

Stirati, A. (2016): "Real wages in the business cycle and the theory of income distribution: An unresolved conflict between theory and facts in mainstream macroeconomics", *Cambridge Journal of Economics* 40, 639-661.

Stockhammer, E. (2015): "Rising inequality as a cause of the present crisis", *Cambridge Journal of Economics* 39, 935-958.

Stockhammer, E. and Onaran, Ö. (2013): "Wage-led growth: Theory, evidence, policy", *Review of Keynesian Economics* 1, 61-78.

Taylor, J. B. (1993): "Discretion versus policy rules in practice", *Carnegie-Rochester Conference Series on Public Policy* 39, 195-214.

Taylor, L. (1985): "A stagnationist model of economic growth", *Cambridge Journal of Economics* 9, 383-403.

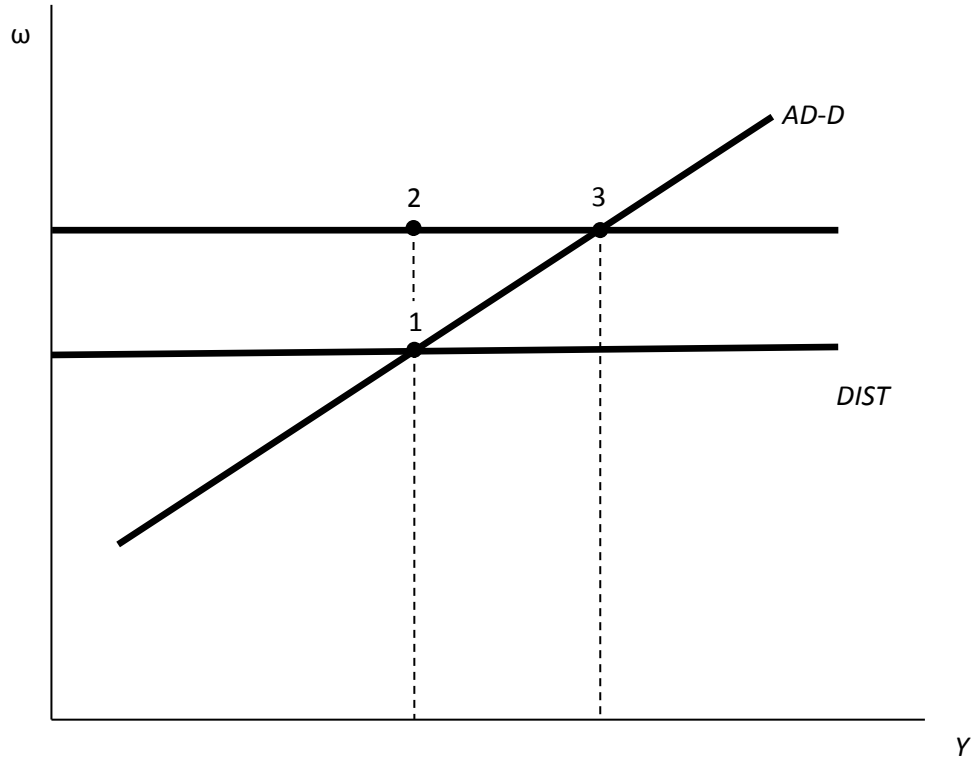

Figure 1a
An increase in the wage share: wage-led case with constant mark-up

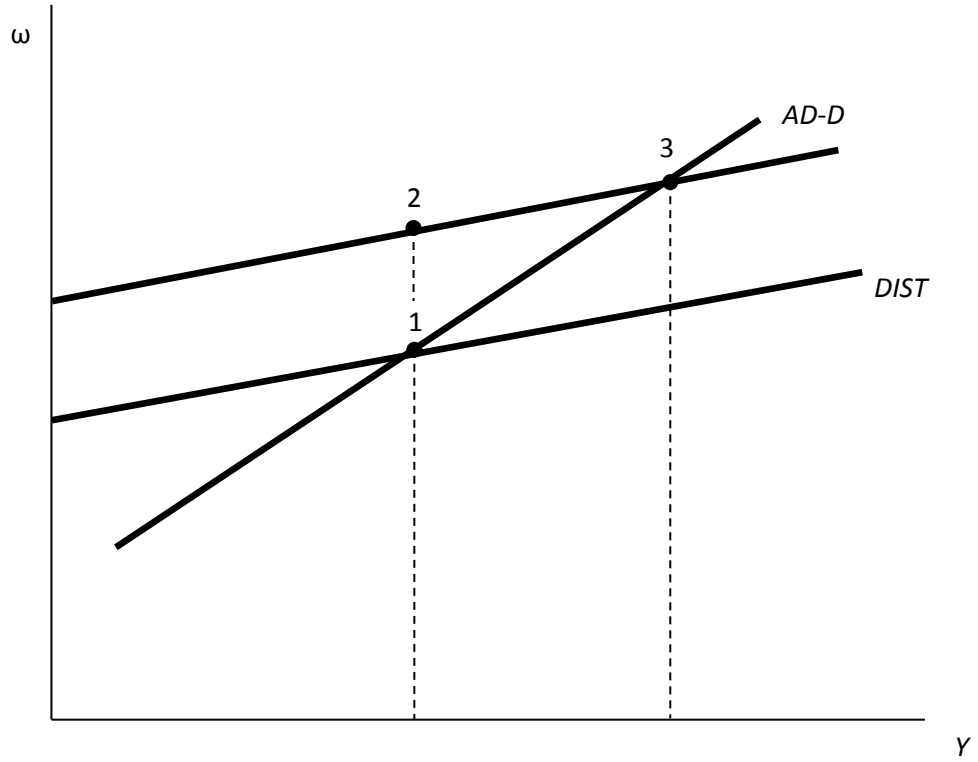

Figure 1b
An increase in the wage share: wage-led case with countercyclical mark-up

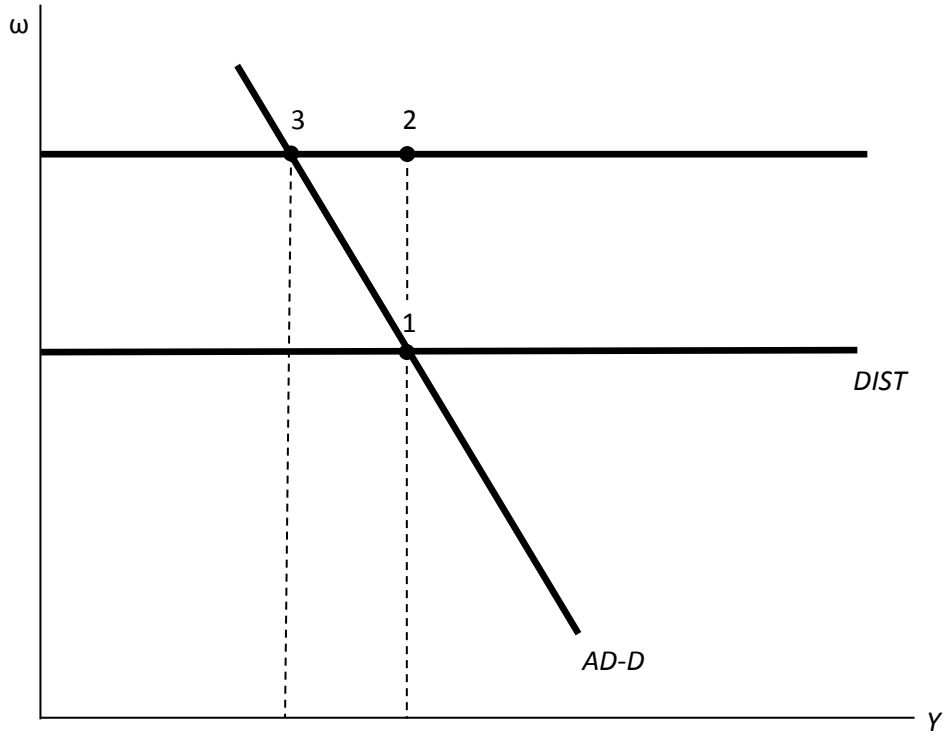

Figure 2a
An increase in the wage share: profit-led case with constant mark-up

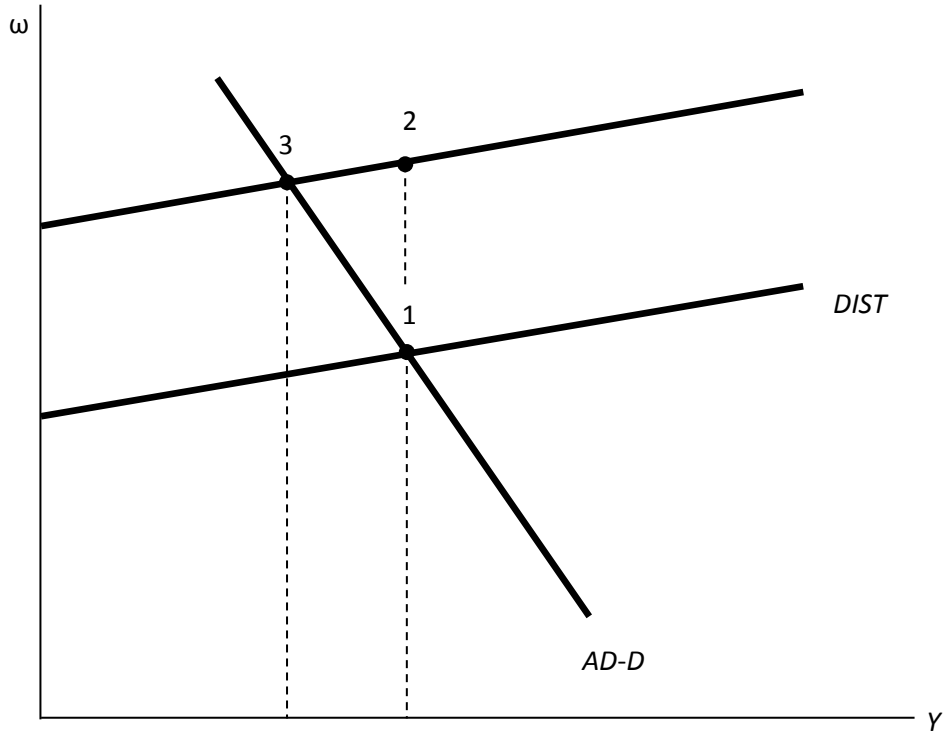

Figure 2b
An increase in the wage share: profit-led case with countercyclical mark-up

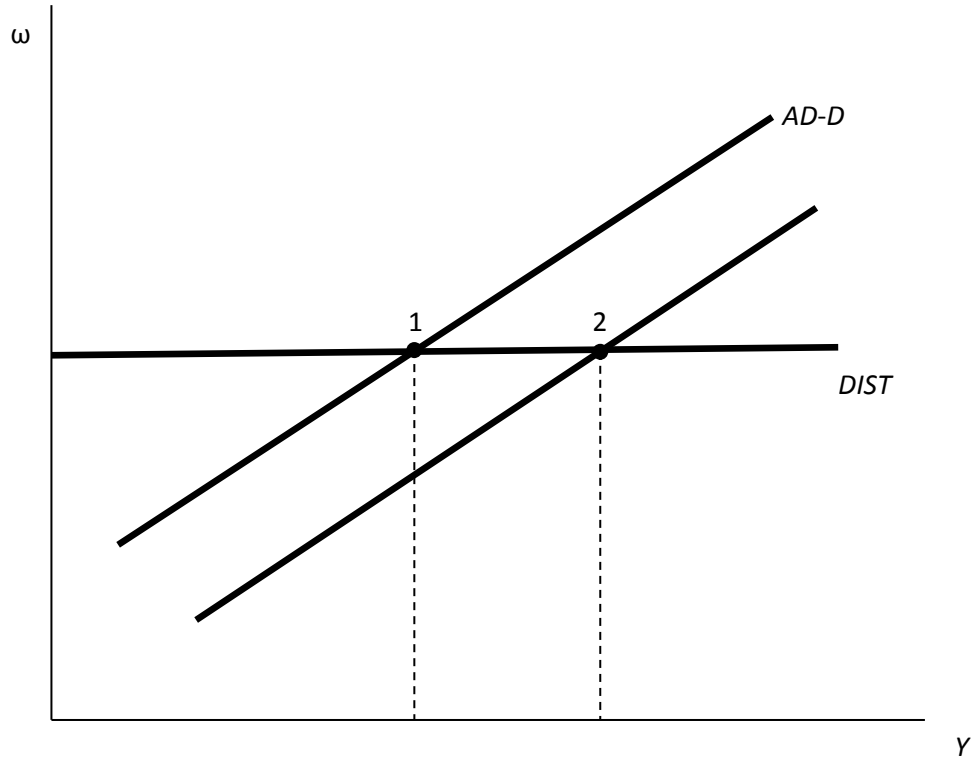

Figure 3a
An expansionary demand shock: wage-led case with constant mark-up

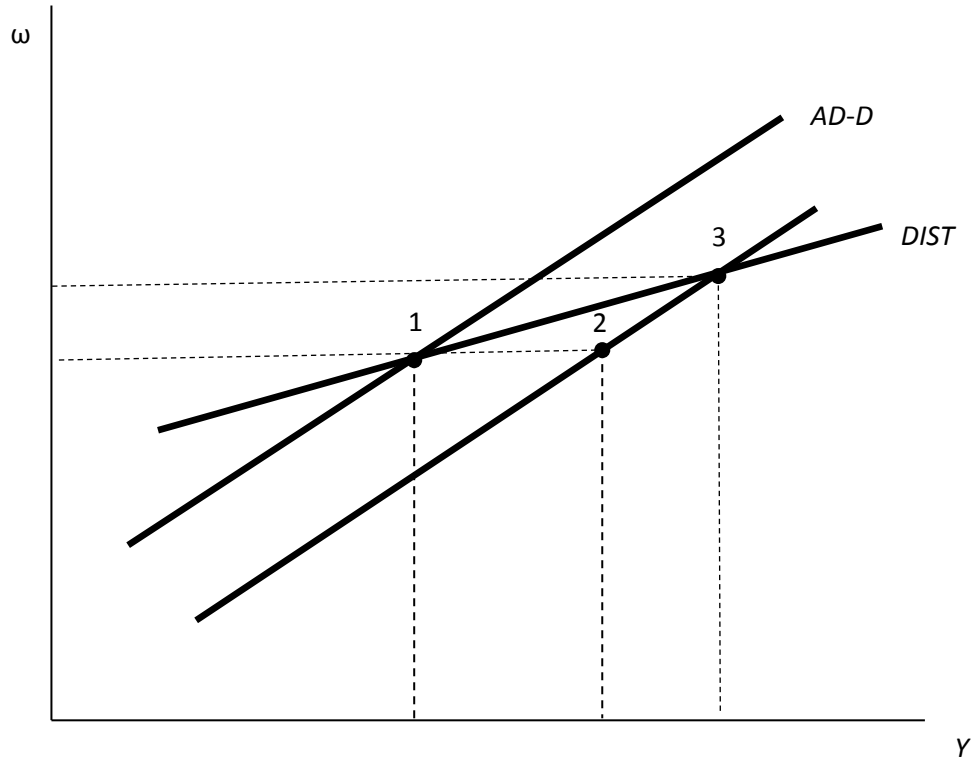

Figure 3b
An expansionary demand shock: wage-led case with countercyclical mark-up

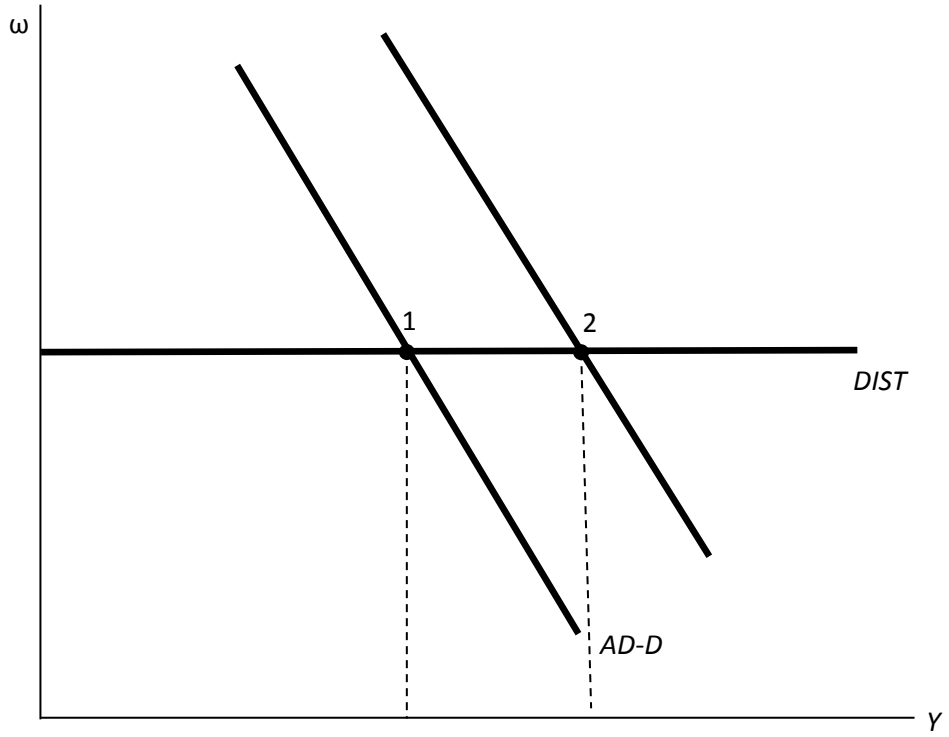

Figure 4a
An expansionary demand shock: profit-led case with constant mark-up

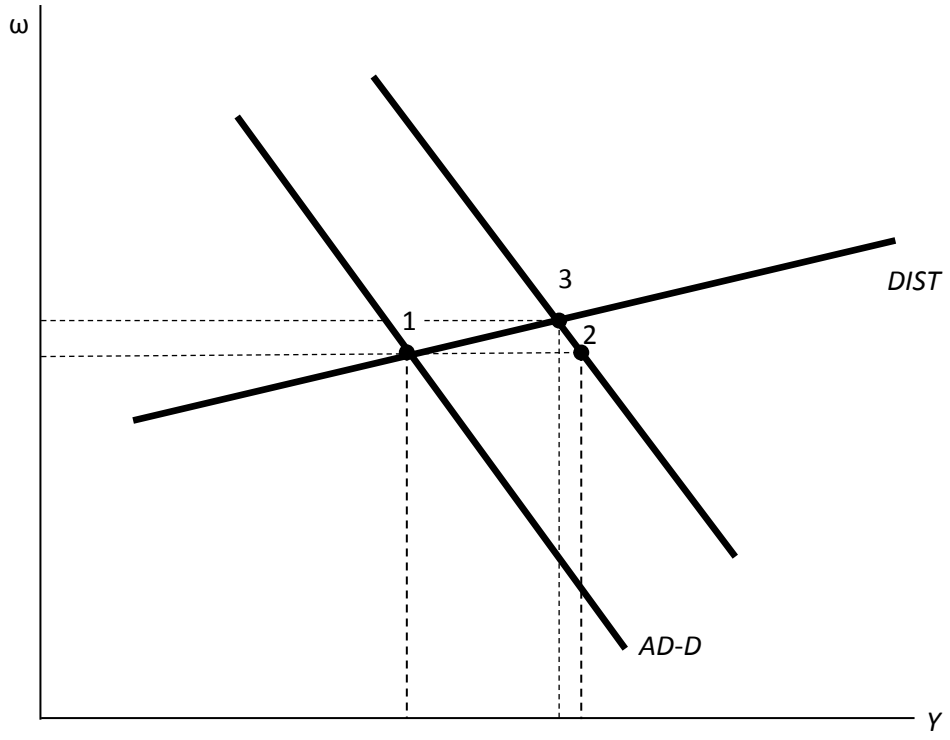

Figure 4b
An expansionary demand shock: profit-led case with countercyclical mark-up