(a) Yes. This time firms are on their labor curve, i.e.

$$\frac{W_1}{P_1} = A_1 \tag{1}$$

(b) No. Since

$$\frac{W_1}{P_1} = A_1 \neq \frac{\chi N_1^{\varphi}}{C_1^{-\gamma}} \tag{2}$$

Hence household are not on labor supply curve.

(c) The households will supply as many workers as needed to produce the output supply Y_1 under wage level W_0.

(d) To simplify notations, we denote Y, C, P, M as long-run equilibrium. As usual, we can solve that in the long-term

$$\begin{aligned} C = Y &= \left[\frac{1}{\chi} A^{1+\varphi}\right]^{\frac{1}{\varphi+\gamma}} \\ \frac{M}{P} &= \zeta^{1/\nu} (1-\beta)^{-1/\nu} Y^{\gamma/\nu} \end{aligned} \tag{3}$$

(e) Classical dichotomy still holds since any change in M will lead to proportional change in P and thus it will leave C and Y unchanging.

(f) We have

$$\begin{aligned} C_1 = Y_1 &= \left[\frac{1}{\beta Q_1} \frac{P}{P_1}\right]^{\frac{1}{\gamma}} Y \\ \frac{M_1}{P_1} &= \zeta^{\frac{1}{\nu}} \left(1 - \frac{1}{Q_1}\right)^{-\frac{1}{\nu}} Y_1^{\frac{\gamma}{\nu}} \end{aligned} \tag{4}$$

(g) No. The second equation can be written as

$$\frac{M_1 A_1}{W_1} = \zeta^{\frac{1}{\nu}} \left(1 - \frac{1}{Q_1}\right)^{-\frac{1}{\nu}} Y_1^{\frac{\gamma}{\nu}} \tag{5}$$

For a given level of Y_1, we can manipulate Q_1 by changing M_1. Hence the classical dichotomy does not hold in the short run.

(h) From the last equation, we can see that when M_1 is increasing, Q_1 is decreasing. Hence, there will be an increase in consumption today (C_1), as well as in output. Intuitively, when we increase the money supply, today's consumption will be higher since the inflation rate is higher.

(i) When the productivity is increasing, the nominal interest rate Q_1 also falls. Therefore, both the consumption and output today are increasing.

(j) The labor wedge is defined as

$$1 - \tau_1^N \equiv \frac{\text{MRS}_1}{\text{MPL}_1} = \frac{\chi N_1^{\varphi} C_1^{\gamma}}{A_1} = \chi A_1^{\gamma-1} N_1^{\gamma+\varphi} \tag{6}$$

In the recession, N_1 is low and hence the labor wedge is higher. Hence it is countercyclical.

(k) We need a proxy for productivity. The labor share of income is good data to achieve this under our model. Then we compare this with the real wage W_1/P_1. Thus, we can determine whether the price or wage is sticky.