a) Firms are on their labor curve
(given real wages (W_1/P_1) = $MP_L(A_1)$)

b) In the short run, wages are sticky

hh would be on labor supply curve if
real wage = marginal rate of substitution b/w
cons^n & leisure,

$W_t/P_t = \chi N_t^{\phi} / C_t^{-\gamma}$

but this might not be equal to W_1/P_1 in
short run because of sticky wages

So while in long run, on lab ss curve, might not
be the case in short run.

c) In the long run, Euler eq^n, money d^d eq^n,
prices influence hh cons^n demand.
Firms supply o/p that clears cons^n market,
lab. market clears setting wages = MP_L.
which is equal to lab ss. by household.

But in the short run, sticky wages can
complicate lab. market clearing

d)

Euler Eq^n:

$$1 = \beta E_t \left[Q_t \cdot \frac{P_{t+1}}{P_t} \cdot \frac{C_{t+1}^{-\gamma}}{C_t^{-\gamma}} \right]$$

@ SS $t = t+1 = \ldots$

$\therefore \quad 1 = \beta \mathbb{E}[Q]$

$Q = 1/\beta$

Since mkts clear in long run.

$A_t N_t = Y_t = C_t$

again @ SS $t = t+1 = \cdots$

$AN = Y = C$

$A = W/P = \chi . N^{\varphi} / C^{-\gamma}$

$$A = \frac{\chi N^{\varphi}}{(AN)^{-\gamma}}$$

$$A^{1-\gamma} = \chi N^{\varphi+\gamma}$$

$$N = \left(\frac{A^{1-\gamma}}{\chi}\right)^{1/\varphi+\gamma}$$

$$C = A \cdot N = A\left(\frac{A^{1-\gamma}}{\chi}\right)^{1/\varphi+\gamma}$$

$$M/P = \xi^{1/\eta}\left(1 - 1/\beta\right)^{-1/\eta} \cdot A\left(\frac{A^{1-\gamma}}{\chi}\right)^{1/\varphi+\gamma}$$

e) In the long run the real variables are independent of nominal wage or money supply $\Rightarrow$ classical dichotomy holds.

f) in short run.

$$W_1 = W_0$$

$$W_1/P_1 = W_0/P_1 = A_1 \qquad \text{\# stickiness.}$$

$$P_1 = W_0/A_1$$

$$1 = \beta \mathbb{E}_1 \left[Q_1 \cdot W_0/A_1 \cdot \frac{1}{P} \cdot \frac{C^{-\gamma}}{C_1^{-\gamma}} \right]$$

taking out subscript for $t \geq 2$ as it is long run.

$$C_1^{-\gamma} = \beta \cdot Q_1 \cdot \frac{W_0}{A_1} \cdot \frac{C^{-\gamma}}{P}$$

$$C_1 = \left(\beta Q_1 \cdot \frac{W_0}{A_1} \cdot \frac{1}{P} \right)^{-1/\gamma} \cdot C$$

→ note, not independent of wages. (nominal var).

$$M_1/P_1 = M_1 \cdot \frac{A_1}{W_0} = \xi^{1/\eta} \left(1 - \frac{1}{Q_1} \right)^{-1/\eta} \cdot C_1^{\gamma/\eta}$$

$$N_1 = C_1/A_1 = P_1/W_0 \, C_1 \quad \text{– lab dd.}$$

but lab ss to satisfy $Y_1 = C_1$.

g) No. Classical dichotomy doesn't hold as nominal var wage shows up in eqn for all the real var.

h) if you increase money supply given sticky wages, prices may not fully adjust. ($P_1 = W_0/A$)

$\Rightarrow$ real balance of money holding $\uparrow$.

hh prefer consuming today over saving & consuming tomorrow (Euler eqn dynamics)

$\therefore$ as real balance increase consn today increase & hence so does o/p to meet the consn dd.

i) $\uparrow$ productivity $\Rightarrow$ $\uparrow MP_L$ ($P_1 = W_1/A_1$).

price of consn good $\downarrow$

via Euler, consn today is preferred over consn tomorrow at the margine.

real wages $\uparrow$ (W_0/P_1). even if hh hold labor ss constant, increasing dd for consn consn can be met by increasing productivity

j) $1 - \tau_1^N = MRS_1 / MPL_1$

$$= \frac{\chi N_1 \varphi C_1 \gamma}{(1-\alpha)} \cdot \frac{N_1}{Y_1}$$

$$= \frac{\chi \cdot c_1^{\gamma-1} \cdot N_1^{1+\varphi}}{(1-\alpha)} \qquad (y_1 = c_1).$$

$$= \chi \cdot \left(\frac{c_1}{A_1}\right)^{1+\varphi} \cdot c_1^{\gamma-1} \cdot \frac{1}{(1-\alpha)} \qquad (c_1 = A_1 N_1).$$

$$= \chi \cdot \frac{1}{(1-\alpha)} \cdot \left(\frac{1}{A_1}\right)^{1+\varphi} \cdot c_1^{\varphi+\gamma}$$

sub. for c_1. from f.

$$= \chi \cdot \frac{1}{(1-\alpha)} \cdot \left(\frac{1}{A_1}\right)^{1+\varphi} \cdot \left(\left(\frac{P \cdot A_1}{\beta Q_1 W_0}\right)^{1/\gamma} \cdot c\right)^{\varphi+\gamma}$$

$$= \chi \cdot \frac{1}{(1-\alpha)} \cdot \left(\frac{1}{A_1}\right)^{1+\varphi} \cdot \left(\frac{P \cdot A_1}{\beta \cdot Q_1} \cdot \frac{1}{W_0}\right)^{\frac{\varphi}{\gamma}+1} \cdot c^{\varphi+\gamma}$$

$$= \chi \cdot \frac{1}{(1-\alpha)} \cdot A_1^{\varphi/\gamma - \varphi} \cdot \left(\frac{P}{W_0} \cdot \frac{\beta}{Q_1}\right)^{\varphi/\gamma + 1}$$

$A_1^{-1-\varphi+1+\varphi/\gamma}$
$= A_1^{\varphi/\gamma - \varphi}$

procyclical if $\uparrow$ in A_1.

$$\frac{\partial(1-\gamma_1^{N})}{\partial A_1} = \frac{\varphi}{\gamma} - \varphi \cdot (\underbrace{A_1^{\varphi/\gamma - \varphi - 1}}_{\to 0}).$$

procyclical if. $\varphi/\gamma - \varphi > 0$
$\varphi/\gamma > \varphi$.
$1/\gamma > 0$

j) check for moments like:

- response of o/p to a) monetary shocks
  b) productivity shocks.

- response of real wages to monetary shocks