

$$(1) (a) \quad C = W \cdot (1) + \pi - T$$

$$\Rightarrow \boxed{C = W + \pi - T}$$

(b) Aside from "wasting consumption" which we can eliminate as an option since $U_C > 0$, the HH doesn't have a choice other than to consume all its income i.e.

$$\boxed{C^* = W + \pi - T}$$

$$(c) \quad \boxed{G = T}$$

$$(d) \quad \boxed{\pi = Y - W \cdot N^p}$$

$$(e) \quad \max_{N^p} Z \cdot F(K, N^p) - W \cdot N^p$$

$$\text{FOC: } \boxed{Z F_N = W}$$

(f) A CE for this economy is:

A set of endogenous quantities

C, Y, ℓ, N, T, π and endogenous price

w given exogenous variables G, z, K

Such that:

1. The repr. consumer solves the Consumer's Problem
2. The repr. firm solves the Firm's Problem
3. The government satisfies its

Budget constraint

4. The labour market clears
5. The goods market clears

$$(g) \quad 1 = N^D \quad \text{labour mkt}$$

$$Y = C + G \quad \text{goods mkt}$$

$$(h) \quad C = w + \pi - T \quad (BC)$$

then in eq^m,

$$\pi = Y - w \cdot (1) = Y - w$$

$$G = T$$

$\Rightarrow$ sub into BC

$$C = W + (Y - W) - G \\ = Y - G$$

$$\Rightarrow \boxed{C = Y - G}$$

(i) $C = Z \cdot F(K, N) - G$

$$dC = F \cdot dZ + Z \cdot F_K \cdot dK + Z \cdot F_N \cdot dN - dG$$

(j) want $\left. \frac{dC}{dG} \right|_{dZ=0, dK=0} = \frac{\partial C}{\partial G}$ if implicit
fn
theorem
holds

set $dZ=0, dK=0$. Also, since

$$N=1, dN=0$$

$$\Rightarrow \boxed{dC = -dG}$$

ie $\Delta C = -\Delta G$

(k) from $C = Y - G,$

$dc = dy - dG$
since $dc = -dG$ from above,

$$\boxed{dy = 0}$$

(L) No, in this model economy,
consumption is "completely crowded-
out" by government spending.

In the Williamson ch.5 model, labour

supply was endogenous, and in response
to the ΔG , due to the normality of
leisure, $e \downarrow$ and $\therefore N \uparrow$. This

$\uparrow N$ meant that $y \uparrow$, since

$y = z \cdot F(K, N)$. As a result, since

$y \uparrow$, there is "more output" to

divide up between $C+G$, and so

C can $\downarrow$ less than $G \uparrow$. S.

In this model economy however, labour

supply is not endogenous, and $\therefore$ there

is no $\uparrow$ in N in response to the

$\uparrow G$. $\therefore Y$ doesn't change, and

C must $\downarrow$ to offset any $\uparrow$ in G

so that the resource constraint of

the economy $C+G=Y$ still holds.

$$(m) \quad z \cdot F_N(K, N) = w$$

$$F_N \cdot dz + z \cdot F_{NK} dK + z \cdot F_{NN} \cdot dN = dw \quad (*)$$

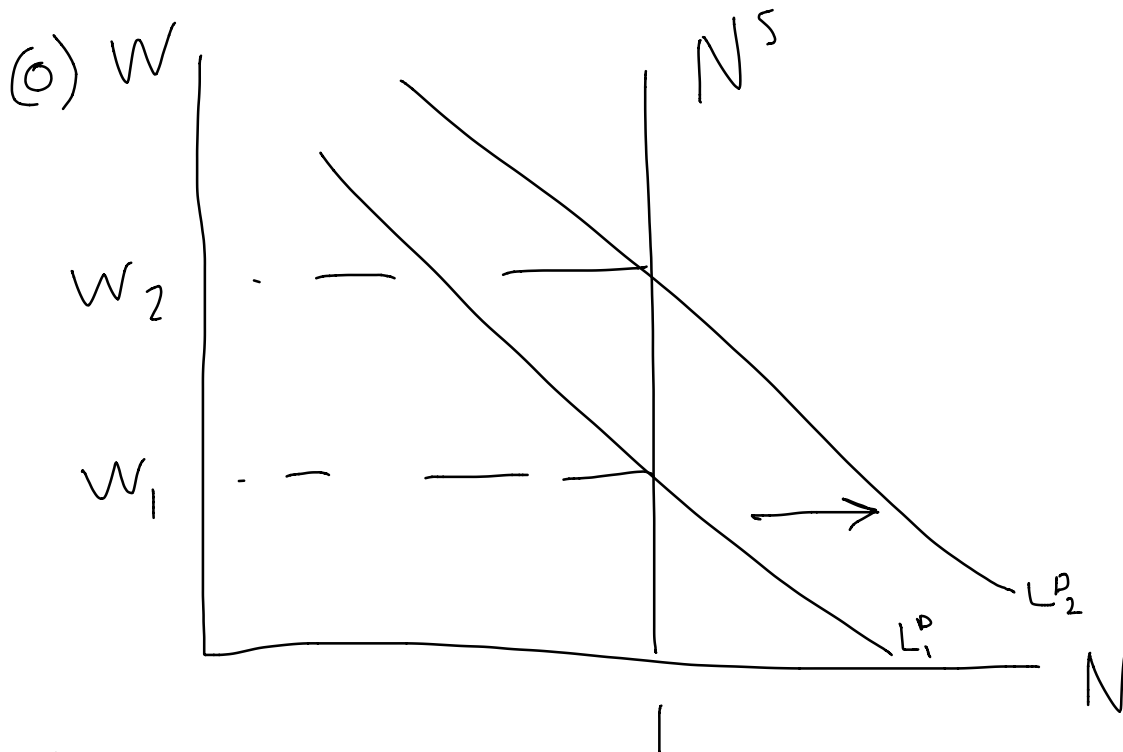
$$\frac{\partial N^0}{\partial w} \text{ implies } dK=0, dz=0$$

$$\Rightarrow \left. \frac{dN}{dw} \right|_{dK=0, dz=0} = \frac{\partial N}{\partial w} = \frac{1}{z \cdot F_{NN}} < 0 \quad \text{Since } F_{NN} < 0$$

(N) from (*), set $dW=0, dK=0$

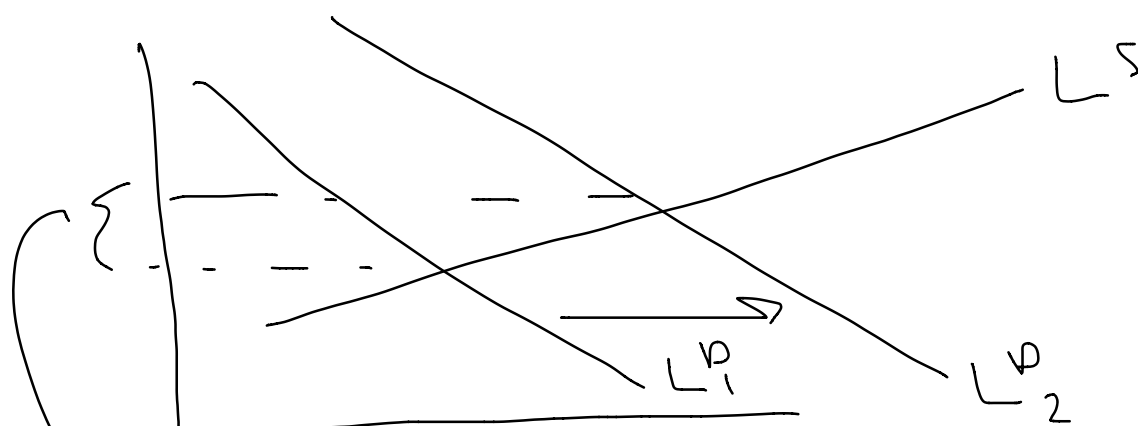
$$\frac{\partial N}{\partial z} = -\frac{F_N}{z \cdot F_{NN}} > 0 \text{ since } F_{NN} < 0$$

$\Rightarrow \uparrow$ TFP shifts lbr. dmd curve right



(P) From above, $\uparrow z$
shifts lbr. dmd curve to right, }
 $w \uparrow$'s. Since L^S is vertical, $\uparrow$ in
 w is large compared to an alternate

Scenario where N^S
has low slope ie



→ Δw less here
compared to vertical L^S

As such, the model with vertical L^S
would yield a w that moves a lot
as γ Δ 's with ΔZ , implying it
would be strongly
procyclical.

(q) while we could calculate a more
detailed theoretical corr. coefficient, for
this question it is enough to say that
0.12 is moderately procyclical, yet

Our argument above
claimed w would likely be strongly
procyclical. So no, the result is not
consistent.

(2)

$$(a) \quad c = w(h-e) + r \cdot K^s + \pi - T \quad \text{where} \\ K^s \leq K_0$$

$$(b) \quad \max_{c, e, K^s} U(c, e)$$

$$\text{s.t. } c \leq w(h-e) + rK^s + \pi - T$$

Since $U_c > 0$, must have that
 $K^s = K_0$

and $\therefore$ BC holds
with equality

FOC:

$$U_e = U_c \cdot w$$

$$c = w(h-e) + rK_0 + \pi - T$$

$$(c) \quad G = T$$

$$(D) \max_{N^D, K^D} \pi = Y - w \cdot N^D - r K^D$$

$$\text{where } Y = Z \cdot F(K^D, N^D)$$

FOC:

$$Z \cdot F_N = w$$

$$Z \cdot F_K = r$$

$$\begin{aligned} (e) \pi &= Y - w \cdot N^D - r \cdot K^D \\ &= Y - Z \cdot F_N \cdot N - Z \cdot F_K \cdot K \\ &= Y - Z \cdot (F_N \cdot N + F_K \cdot K) \end{aligned}$$

Since $F(\cdot)$ CRS, from Euler's Theorem

$$F = F_N \cdot N + F_K \cdot K$$

$$\text{So } \pi = Y - \underbrace{Z \{ F(\cdot) \}}_Y$$

$$= 0$$

$$\boxed{\pi = 0}$$

Zero
Economic
profits

(f) Set of endog. variables C, Y, e, N, K, T, π
 } exog. variables G, Z, K_0 } endog.
 prices w and r such that

(1) Consumer solves Consumer's Problem

(2) Firm solves firm's problem

(3) Govt satisfies its BC

(4) Labour mkt clears

(5) Goods mkt clears

(6) Capital services mkt clears

(G) $N^S = N^D$ lbr

$Y = C + G$ goods

$K_0 = K$ capital
 services

(H) $C = w(h - e) + rK_0 + \pi - T$

$$= WN + rK + Y - WN - rK - G$$

$$= Y - G$$

$$\Rightarrow \boxed{C = Y - G}$$

$$(I) \quad C = Z \cdot F(K, h - e) - G$$

(J) From HH problem,

$$\frac{U_e}{U_c} = MRS_{e,c} = \underbrace{W = MPN}_{\text{from firm's problem}}$$

From PPF, Slope $\equiv MRT_{e,c}$

$$-MRT = \underbrace{\frac{dC}{de} = -Z \cdot F_N}_{\text{from PPF above}} = -MPN$$

$$\therefore MRS_{e,c} = MRT_{e,c} = MPN$$

Same conditions as
Social optimum, so

Yes, CE here is
optimal

(k) No. let $S_N = \frac{WN}{Y}$

and $S_K = \frac{rK}{Y}$

$$S_N + S_K = \frac{rK + WN}{Y} = \frac{ZF_K \cdot K + Z \cdot F_N \cdot N}{Y} = \frac{Y}{Y} = 1$$

⇒ Payments to labour and capital exhaust income → no fractional of output left over.

(l) No. There, like here, payments to labour & capital exhaust output → the only difference is who owns capital.

In Williamson, the firm owns K so the firm in effect collects the payments to capital by retaining the excess of its revenues over

labour, i.e.

$$\pi = Y - WN$$

$$= Y - z F_N \cdot N$$

which by Euler's Theorem,

$$= Y - z[F - F_K \cdot K]$$

$$= Y - Y + z \cdot F_K \cdot K$$

$$= MP_K \cdot K$$

$\equiv$ Payments to capital.

i.e. when the firm owns K , it collects the marginal product of capital per unit of K (Note though this ultimately flows to HH through π)

In contrast, when the HH owns K , it collects the payments to capital.