1) a) Problema do Consumidor: $\max_{c_t, k_{t+1}, n_t} \sum_{t=0}^{\infty} \beta^t u(c_t, 1-n_t, g_t)$

$$\text{s.t.} \quad \sum_{t=0}^{\infty} q_t \left(c_t + k_{t+1} - (1-\delta)k_t\right) = \sum_{t=0}^{\infty} q_t \left((1-\tau_{nt}) w_t n_t + (1-\tau_{kt}) r_t k_t\right)$$

C.P.O.: $[c_t]$ $\beta^t u_{ct} = \lambda q_t$ (1)

$[n_t]$ $\beta^t u_{lt} = \lambda q_t (1-\tau_{nt}) w_t$ (2)

$[k_{t+1}]$ $\lambda q_t = \lambda q_{t+1} \left[(1-\delta) + (1-\tau_{kt}) r_t\right]$ (3)

C.T.: $\lim_{t \to \infty} \beta^t u_{ct} k_{t+1} = 0$

Normalização: $q_0 = 1$

$\overset{(1)}{\Rightarrow} \lambda = u_{c0} \Rightarrow q_t = \beta^t \left(\frac{u_{ct}}{u_{c0}}\right)$ (4)

$\overset{(4)+(2)}{\Longrightarrow} \dfrac{u_{lt}}{u_{ct}} = (1-\tau_{nt}) w_t$ (5)

$\overset{(4)+(3)}{\Longrightarrow} u_{ct} = \beta u_{ct+1} \left[(1-\delta) + (1-\tau_{kt}) r_t\right]$ (6)

b) Problema da Firma: $\max_{k_t, n_t} F(k_t, n_t) - r_t k_t - w_t n_t$

C.P.O.: $[k_t]$ $F_{kt} = r_t$

$[n_t]$ $F_{nt} = w_t$

c) O equilíbrio é uma sequencia $\{c_t, k_{t+1}, n_t, g_t\}_{t=0}^{\infty}$ tal que:

(i) O problema do consumidor é resolvido, i.e., a utilidade U é maximizada; e

(ii) Há market clearing: $\begin{cases} n_t^s = n_t^d \\ c_t + k_{t+1} - (1-\delta)k_t + g_t = F(k_t, n_t) \end{cases}$

Dados $\{g_t, w_t, r_t\}_{t=0}^{\infty}$ e k_0

d) Da R.O.: $\sum_{t=0}^{\infty} q_t(c_t + k_{t+1} - (1-\delta)k_t) = \sum_{t=0}^{\infty} q_t((1-\tau_{nt})w_t n_t + (1-\tau_{kt}) r_t k_t)$

$$\Rightarrow \sum_{t=0}^{\infty} q_t(c_t - (1-\tau_{nt})w_t n_t) = \sum_{t=0}^{\infty} q_t\left[(1-\tau_{kt})r_t k_t + (1-\delta)k_t - k_{t+1}\right]$$

$$\Rightarrow \sum_{t=0}^{\infty} q_t(c_t - (1-\tau_{nt})w_t n_t) = q_0\left[(1-\tau_{k0})r_0 + (1-\delta)\right]k_0 \left.\begin{array}{l} - q_0 k_1 + q_1\left[(1-\tau_{k1})r_1 + (1-\delta)\right]k_1 \\ - q_1 k_2 + q_2\left[(1-\tau_{k2})r_2 + (1-\delta)\right]k_2 \\ + \dots \end{array}\right\} \text{Equação de Euler} \Rightarrow 0$$

$$+ \cancel{\lim_{t\to\infty} q_t k_{t+1}} \xrightarrow{C.T.} 0$$

$$\Rightarrow \sum_{t=0}^{\infty} \underbrace{q_t}_{(4)}(c_t - \underbrace{(1-\tau_{nt})w_t}_{(5)} n_t) = q_0\left[(1-\tau_{k0})r_0 + (1-\delta)\right]k_0$$

(4)	$q_t = \beta^t\left(\frac{u_{ct}}{u_{c0}}\right)$
(5)	$\frac{u_{\ell t}}{u_{ct}} = (1-\tau_{nt})w_t$

$$\Rightarrow \sum_{t=0}^{\infty} \beta^t \frac{u_{ct}}{u_{c0}}\left(c_t - \left(\frac{u_{\ell t}}{u_{ct}}\right)n_t\right) = \left[(1-\tau_{k0})r_0 + (1-\delta)\right]k_0$$

$$\Rightarrow \sum_{t=0}^{\infty} \beta^t\left[u_{ct}c_t - u_{\ell t}n_t\right] = u_{c0}k_0\left[(1-\tau_{k0})r_0 + (1-\delta)\right]$$

e) Problema de Ramsey: $\max_{c_t, n_t, k_{t+1}, g_t} \sum_{t=0}^{\infty} \beta^t u(c_t, \ell_t, g_t)$

$$\text{s.t.} \begin{cases} c_t + k_{t+1} - (1-\delta)k_t + g_t = F(k_t, n_t) \quad \forall t \\ \sum_{t=0}^{\infty} \beta^t\left[u_{ct}c_t - u_{\ell t}n_t\right] = u_{c0}k_0\left[(1-\delta) + (1-\tau_{k0})r_0\right] \end{cases}$$

$$\Leftrightarrow \max_{c_t, n_t, k_{t+1}, g_t} \sum_{t=0}^{\infty}\left\{\beta^t u(c_t, \ell_t, g_t) - \delta_t\left[c_t + k_{t+1} - (1-\delta)k_t + g_t - F(k_t, n_t)\right]\right\} + \mu \sum_{t=0}^{\infty}\beta^t\left[u_{ct}c_t - u_{\ell t}n_t\right] - \mu u_{c0}k_0\left[(1-\delta) + (1-\tau_{k0})r_0\right]$$

$$\Leftrightarrow \max_{c_t, n_t, k_{t+1}, g_t} \sum_{t=0}^{\infty}\beta^t\left\{\underbrace{\left[u(c_t, \ell_t, g_t) + \mu u_{ct}c_t - \mu u_{\ell t}n_t\right]} - \delta_t\left[c_t + k_{t+1} - (1-\delta)k_t + g_t - F(k_t, n_t)\right]\right\} - \mu u_{c0}k_0\left[(1-\delta) + (1-\tau_{k0})r_0\right]$$

$$\Leftrightarrow \max_{c_t, n_t, k_{t+1}, g_t} \sum_{t=0}^{\infty}\beta^t\left\{W(c_t, \ell_t, g_t) - \delta_t\left[c_t + k_{t+1} - (1-\delta)k_t + g_t - F(k_t, n_t)\right]\right\} - \mu u_{c0}k_0\left[(1-\delta) + (1-\tau_{k0})r_0\right]$$

C.P.O. : $[c_t]\ W_{c_t} = \delta_t$

$[n_t]\ W_{\ell t} = \delta_t F_{n_t}$

$[g_t]\ W_{g_t} = \delta_t$

$[K_{t+1}]\ \delta_t = \beta \delta_{t+1} [(1-\delta) + F_{K_t}$

$$\Rightarrow \begin{cases} F_{n_t} = W_{\ell t}/W_{c_t} \\ W_{g_t} = W_{c_t} \\ W_{c_t} = \beta W_{c_{t+1}} [(1-\delta) + F_{K_{t+1}}] \end{cases}$$

f) $x_t = x_{t+1} = x \ \forall t \quad \forall x = c, n, K, g, \tau_n, \tau_K, w, r$

$$\left.\begin{array}{l} \text{Do problema de Ramsey: } 1 = \beta[(1-\delta) + F_K] \\ \text{Do problema Descentralizado: } 1 = \beta[(1-\delta) + (1-\tau_K) F_K] \end{array}\right\} \Rightarrow \tau_K = 0$$

g) $W(c_t, \ell_t, g_t) = u(c_t, \ell_t, g_t) + \mu\, u_{c_t} c_t - \mu\, u_{\ell t} n_t]$

$$W(c_t, \ell_t, g_t) = \frac{c_t^{1-\gamma} - 1}{1-\gamma} + v(\ell_t, g_t) + \mu\, c_t^{1-\gamma} - \mu\, v_{\ell t} n_t$$

$$\Rightarrow W_{c_t} = c_t^{-\gamma} + \mu(1-\gamma) c_t^{-\gamma} = c_t^{-\gamma}(1 + \mu(1-\gamma))$$

Do Problema de Ramsey: $c_t^{-\gamma}\cancel{(1+\mu(1-\gamma))} = \beta c_{t+1}^{-\gamma}\cancel{(1+\mu(1-\gamma))}[(1-\delta) + F_{K_{t+1}}]$

$$\left.\begin{array}{l} c_t^{-\gamma} = \beta c_{t+1}^{-\gamma} [(1-\delta) + F_{K_{t+1}}] \\ \text{Do Problema Descentralizado: } c_t^{-\gamma} = \beta c_{t+1}^{-\gamma}[(1-\delta) + (1-\tau_{K_{t+1}}) F_{K_{t+1}}] \end{array}\right\} \Rightarrow \tau_{K_{t+1}} = 0 \ \forall \ t \geq 1$$

$$\Rightarrow \tau_{K_t} = 0 \ \forall \ t \geq 2$$

h) $\dfrac{\partial \mathcal{L}}{\partial \tau_{K_0}} = \mu\, u_{c_0} K_0\, r_0 > 0$

$$\begin{array}{cccc} \vee & \vee & \vee & \vee \\ 0 & 0 & 0 & 0 \end{array}$$

RI

Valem em igualdade

Há aumento de bem-estar com $\tau_{K_0} > 0$. Para um governo benevolente é ótimo taxar capital já acumulado (K_0).

2) $Y_t = Y_n + \alpha(\pi_t + \pi_t^e)$

$L = (1/2)\{\lambda(Y_t - Y^*)^2 + (\pi_t - \pi^*)^2\}$

$Y^* > Y_n, \quad \alpha > 0, \ \lambda > 0$

a) Comprometimento <u>com</u> credibilidade:

$$\min_{Y_t, \pi_t} (1/2)\{\lambda(Y_t - Y^*)^2 + (\pi_t - \pi^*)^2\}$$

$$\text{s.t.} \quad Y_t = Y_n + \alpha(\pi_t - \pi_t^e)$$

Por comprometimento $\pi_t = \pi_t^e \ \forall t$ [governo ancora expectativas e <u>não</u> desvia]

Da restrição: $Y_t = Y_n \ \forall t$

Dado o formato da função objetivo, não há nível de π_t que compense a diferença $(Y_n - Y^*)^2$. Logo, $\pi_t = \pi^* \ \forall t$.

$$L^c = (1/2)\lambda(Y_n - Y^*)^2$$

b) Não Comprometimento:

① anúncio de π_t^e — ② expectativas formadas — ③ realização de π_t, Y_t

$$\min_{Y_t, \pi_t} (1/2)\{\lambda(Y_t - Y^*)^2 + (\pi_t - \pi^*)^2\}$$

$$\text{s.t.} \quad Y_t = Y_n + \alpha(\pi_t - \pi_t^e)$$

$$\min_{\pi_t} (1/2)\{\lambda(Y_n - Y^* + \alpha(\pi_t - \pi_t^e))^2 + (\pi_t - \pi^*)^2\}$$

C.P.O.: $[\pi_t]$ $\alpha\lambda(Y_n - Y^* + \alpha(\pi - \pi_t^e)) + (\pi_t - \pi^*) = 0$

$$\pi_t = \frac{\lambda\alpha^2\pi_t^e + \pi^* + \lambda\alpha(Y^* - Y_n)}{1 + \lambda\alpha^2}$$

Público antecipa comportamento ótimo do regulador: $\pi_t^e = \dfrac{\lambda\alpha^2\pi_t^e + \pi^* + \lambda\alpha(Y^* - Y_n)}{1 + \lambda\alpha^2} \Rightarrow \pi_t^e = \pi^* + \lambda\alpha(Y^* - Y_n)$

Por consequência: $\pi_t = \dfrac{\lambda\alpha^2\left[\pi^* + \lambda\alpha(Y^* - Y_n)\right] + \pi^* + \lambda\alpha(Y^* - Y_n)}{1 + \lambda\alpha^2}$

$\Rightarrow \pi_t = \pi^* + \lambda\alpha(Y^* - Y_n) \quad \forall t$ [Expectativas Racionais]

$\Rightarrow Y_t = Y_n \quad \forall t$

Note que não há 'ganho' sobre Y_t, mas há 'perda' sobre π_t.

$L^{NC} = (1/2)\lambda(1 + \lambda\alpha^2)(Y_n - Y^*)^2\}$

$L^{NC} > L^C$

c) Comprometimento para sempre: $W_C = \dfrac{L^C}{1-\beta}$

Desvio: $W^D = 0$

↳ Desejo Y^*, π^*. Vai determinar π_t^e para depois desviar (pois até o momento, era crível)

$Y_t = Y_n + \alpha(\pi_t - \pi_t^e) \Rightarrow \pi_t^e = \pi^* - \dfrac{(Y^* - Y_n)}{\alpha}$.

Uma vez que estes sejam as expectativas, desvia para $\pi_t = \pi^* \Rightarrow Y_t = Y_n + \alpha\left(\pi^* - \pi^* + \dfrac{(Y^* - Y_n)}{\alpha}\right) = Y^*$.

Porém, a partir do próximo período há 'punição eterna' por perda de credibilidade. Logo, $W^R = 0 + \left(\dfrac{\beta}{1-\beta}\right)L^{NC}$.

Para haver equilíbrio com comprometimento: $\dfrac{L^C}{\cancel{1-\beta}} \leq \left(\dfrac{\beta}{\cancel{1-\beta}}\right)L^{NC} \Leftrightarrow \beta \geq \dfrac{L^C}{L^{NC}}$

Como $L^C < L^{NC}$, $\exists\, \sigma \in [L^C/L^{NC}, 1)$ tal que se $\beta \geq \sigma$, comprometimento eterno é equilíbrio.

3) a) $\max_{c_t, a_{t+1}} \sum_{t=0}^{\infty} \beta^t \ln c_t$

$\quad$ s.t. $\quad c_t + a_{t+1} \leq (1-\tau) r_t a_t + \Pi_t$

C.P.O.: $[c_t] \quad \lambda_t = 1/c_t$

$[a_{t+1}] \quad \lambda_t = \beta \lambda_{t+1} (1-\tau) r_{t+1}$

$$\Rightarrow \quad 1/c_t = \beta \mathbb{E}_t \left[(1/c_{t+1})(1-\tau) r_{t+1} \right]$$

C.T.: $\lim_{t \to \infty} \beta^t \lambda_t a_{t+1} = 0$

b) $\max_{a_t, h_t} \Pi_t = A a_t^{\alpha} h_t^{1-\alpha} - r_t a_t$

C.P.O.: $[a_t] \quad A\alpha (h_t/a_t)^{1-\alpha} = r_t$

$\dfrac{\partial \Pi_t}{\partial h_t} \quad A(1-\alpha)(a_t/h_t)^{\alpha} > 0 \quad \forall h_t \quad \Rightarrow h_t^* = h^{max} \quad \forall t$

c) O eq. competitivo é uma sequência de preços e alocações tais que tomando como dados, resolvam o problema dos agentes e há market-clearing.

d) Apesar de haver retornos marginais decrescentes p/ cada insumo de maneira individual, temos retorno constante de escala quando tratando os insumos de maneira combinada $(\partial F / \partial (a_t^{\alpha} h_t^{1-\alpha}) = A > 0)$. Esse é o motor do crescimento. O ponto principal é que estes insumos são acumuláveis. A infraestrutura cresce à medida que o capital cresce. Assim, o modelo escapa da armadilha dos retornos marginais decrescentes (AK).

e) Equação de Euler: $\quad 1+g = \beta(1-\tau) r_{t+1} \quad \Rightarrow r_{t+1} = (1+g)/[\beta(1-\tau)] \quad \forall t$

Regra de h: $\quad h_{t+1} = \tau r_t a_t \quad \Rightarrow (h_{t+1}/a_{t+1}) = \tau r_t/(1+g)$

$$\Rightarrow (h_{t+1}/a_{t+1}) = \frac{\tau}{\beta(1-\tau)} \quad \forall t \quad \Rightarrow (a/h) = \beta/\tau - \beta$$

Demanda de a: $\quad r_t = A\alpha (h_t/a_t)^{1-\alpha}$

$$\Rightarrow \frac{(1+g)}{\beta(1-\tau)} = A\alpha \left(\frac{\tau}{\beta(1-\tau)} \right)^{1-\alpha} \Rightarrow g = A\alpha\beta^{\alpha} \tau^{1-\alpha} (1-\tau)^{\alpha} - 1$$

f) $\partial g/\partial \tau = A\alpha\beta^{\alpha} \left[(1-\alpha) \left(\frac{1-\tau}{\tau} \right)^{\alpha} + \alpha \left(\frac{\tau}{1-\tau} \right)^{1-\alpha} \right] = A\alpha\beta^{\alpha} \left[\frac{(1-\alpha)(1-\tau) + \alpha\tau}{\tau^{\alpha} (1-\tau)^{1-\alpha}} \right]$

$\dfrac{\partial (a/h)}{\partial \tau} = -\beta/\tau^2 < 0$

g) $\max_{c_t, a_{t+1}, h_{t+1}} \sum_{t=0}^{\infty} \beta^t \ln c_t$

s.t. $c_t + a_{t+1} + h_{t+1} = A a_t^{\alpha} h_t^{1-\alpha}$

C.P.O.: $[c_t]$ $\lambda_t = 1/c_t$

$[a_{t+1}]$ $\lambda_t = \beta \lambda_{t+1} A \alpha \left(h_{t+1}/a_{t+1}\right)^{1-\alpha}$

$[h_{t+1}]$ $\lambda_t = \beta \lambda_{t+1} A (1-\alpha) \left(a_{t+1}/h_{t+1}\right)^{\alpha}$

C.T.: $\begin{cases} \lim_{t\to\infty} \beta^t \lambda_t a_{t+1} = 0 \\ \lim_{t\to\infty} \beta^t \lambda_t h_{t+1} = 0 \end{cases}$

h) Combinando Euler: $h_{t+1}/a_{t+1} = \frac{(1-\alpha)}{\alpha}$ $\Rightarrow$ $g = \beta A \alpha^{\alpha} (1-\alpha) - 1$

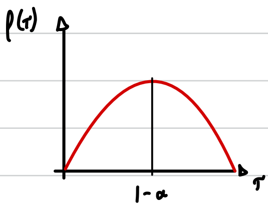
i) Descentralizado: $1+g = A \alpha \beta^{\alpha} (1-\tau)^{\alpha} \tau^{1-\alpha}$

Eficiente: $1+g = A \beta \alpha^{\alpha} (1-\alpha)^{1-\alpha}$

$$(1-\tau)^{\alpha} \tau^{1-\alpha} = \left(\frac{\beta(1-\alpha)}{\alpha}\right)^{1-\alpha}$$

$f(\tau) = (1-\tau)^{\alpha} \tau^{1-\alpha}$

$f'(\tau) = -\alpha \left(\frac{\tau}{1-\tau}\right)^{1-\alpha} + (1-\alpha)\left(\frac{\tau}{1-\tau}\right)^{-\alpha} = 0 \iff \tau^* = 1-\alpha$



$f(\tau^*) = \alpha^{\alpha} (1-\alpha)^{1-\alpha}$

$f(\tau^d) = (\beta^{\alpha}/\alpha)\, \alpha^{\alpha} (1-\alpha)^{1-\alpha}$

Se $\beta = e^{\left(\frac{\ln \alpha}{\alpha}\right)}$, τ^d otimiza crescimento.

C.C., τ^d não otimiza crescimento.

4) $g = \dfrac{\lambda L \alpha - \rho}{\gamma + \alpha}$

a) $\dfrac{\partial g}{\partial \lambda} = \dfrac{L\alpha}{\gamma+\alpha} > 0$ $\quad \uparrow \lambda \equiv$ aumento da eficiência de pesquisa $\Rightarrow \uparrow$ progresso técnico $\Rightarrow g$

$\dfrac{\partial g}{\partial L} = \dfrac{\lambda\alpha}{\gamma+\alpha} > 0$ $\quad \uparrow L \Rightarrow \uparrow L_A \Rightarrow \uparrow$ progresso técnico $\Rightarrow \uparrow g$

$\dfrac{\partial g}{\partial \gamma} = -\dfrac{g}{\gamma+\alpha} < 0$ $\quad \uparrow \gamma \Rightarrow \begin{cases} \uparrow \text{aversão ao risco} \\ \uparrow \text{desejo por estabilidade} \end{cases} \Rightarrow \downarrow K_A \Rightarrow \downarrow g$

$\dfrac{\partial g}{\partial \rho} = -\dfrac{1}{\gamma+\alpha} < 0$ $\quad \uparrow$ impaciência $\Rightarrow \downarrow$ pesquisa $\Rightarrow \downarrow g$

b) $\max \int_0^\infty e^{-\rho t}\left(\dfrac{c_t^{1-\gamma}-1}{1-\gamma}\right) dt$

$$\text{s.t.} \begin{cases} \dot{K}_t = (L_{Y,t})^\alpha \int_0^{A_t} x_t(i)^{1-\alpha}\, di - C_t \\ \dot{A}_t = \lambda A_t L_{A,t} \\ L_{A,t} + L_{Y,t} = L \end{cases}$$

$x_t(i) = \bar{x}_t \quad \forall i \quad \Rightarrow \dot{K}_t = (L_{Yt})^\alpha A_t\, x_t^{1-\alpha} - C_t$

$\Rightarrow \dot{K}_t = (L_{Yt})^\alpha A_t (K_t/A_t)^{1-\alpha} - C_t$

$\Rightarrow \dot{K}_t = (A_t L_{Yt})^\alpha K_t^{1-\alpha} - C_t$ $\rightarrow$ nova versão da restrição.

Hamiltoniano:

$$H = e^{-\rho t}\left(\frac{C_t^{1-\gamma}-1}{1-\gamma}\right) + \mu_t\left[(A_t L_{Yt})^\alpha K_t^{1-\alpha} - C_t\right] + \delta_t\left[\lambda A_t (L - L_{Yt})\right]$$

$H_c = e^{-\rho t} C_t^{-\gamma} - \mu_t = 0 \quad \Rightarrow \mu_t = e^{-\rho t} C_t^{-\gamma}$ $\quad$ (0)

$\ln \hookrightarrow \ln(\mu_t) = -\rho t - \gamma \ln(c_t)$

$\partial/\partial t \hookrightarrow$ $\dot{\mu}_t/\mu_t = -\rho - \gamma(\dot{c}_t/c_t)$ $\quad$ (1)

$H_K = -\dot{\mu}_t \Rightarrow -\dfrac{\dot{\mu}_t}{\mu_t} = (1-\alpha)\left(\dfrac{A_t L_{Yt}}{K_t}\right)^\alpha$ $\quad$ (2)

$H_{L_Y} = 0 \Rightarrow \alpha \mu_t A_t^{1-\alpha}(K_t/L_{Yt})^{1-\alpha} = \delta_t \lambda A_t$ $\quad$ (3)

$H_A = -\dot{\delta}_t \Rightarrow \alpha \mu_t L_{Yt}^\alpha (K_t/A_t)^{1-\alpha} + \delta_t \lambda (L - L_{Yt}) = -\dot{\delta}_t$ $\quad$ (4)

$$\text{C.T.s:} \begin{cases} \lim_{t\to\infty} \mu_t K_t = 0 & (5) \\ \lim_{t\to\infty} \delta_t A_t = 0 & (6) \end{cases}$$

c) $(1) + (2) \Rightarrow \dfrac{\dot{C}_t}{C_t} = \left(\dfrac{1-\alpha}{\gamma}\right)\left(\dfrac{A_t L_{Yt}}{K_t}\right) - \dfrac{\rho}{\gamma}$ (7)

$(3) \Rightarrow \dfrac{\mu_{vt}}{\delta_t} = \left(\dfrac{\lambda}{\alpha}\right)\left(\dfrac{A_t L_{Yt}}{K_t}\right)^{1-\alpha}$ (8)

$(8) \text{ em } (4) \Rightarrow -\dfrac{\dot{\delta}_t}{\delta_t} = \cancel{\alpha}\cancel{\left(\dfrac{A_t L_{Yt}}{K_t}\right)^{1-\alpha}}\left(\dfrac{\lambda}{\cancel{\alpha}}\right)\cancel{L_{Yt}^{\alpha}}\cancel{\left(\dfrac{K_t}{A_t}\right)^{1-\alpha}} + \lambda(L - L_{Yt})$

$\Rightarrow -\dfrac{\dot{\delta}_t}{\delta_t} = \lambda L \Rightarrow \delta_t = e^{-\lambda L t}$ (9)

$(9) \text{ em } (8) \Rightarrow \mu_{vt} = \left(\dfrac{\lambda}{\alpha}\right)\left(\dfrac{A_t L_{Yt}}{K_t}\right)^{1-\alpha} e^{-\lambda L t}$

$(0) \Rightarrow \mu_t = e^{-\rho t} C_t^{-\gamma}$

$\Big\} \left(\dfrac{\lambda}{\alpha}\right)\left(\dfrac{A_t L_{Yt}}{K_t}\right)^{1-\alpha} = e^{-(\rho - \lambda L)t} C_t^{-\gamma} \Rightarrow$

$\overset{\log}{\Rightarrow} \ln(\lambda/\alpha) + (1-\alpha)\left[\ln A_t + \ln L_{Yt} - \ln K_t\right] = -(\rho - \lambda L)t - \gamma \ln C_t$

$\dfrac{\partial}{\partial t} \hookrightarrow (1-\alpha)\left[\dfrac{\dot{A}_t}{A_t} + \dfrac{\dot{L}_{Yt}}{L_{Yt}} - \dfrac{\dot{K}_t}{K_t}\right] = -(\rho - \lambda L) - \gamma \dfrac{\dot{C}_t}{C_t}$

$L_{Yt} = L_Y \ \forall t \Rightarrow \dot{L}_{Yt} = 0 \ \forall t \Rightarrow (1-\alpha)\left[g^* + 0 - g^*\right] = -(\rho - \lambda L) - \gamma g^* \Rightarrow \boxed{g^* = \dfrac{\lambda L - \rho}{\gamma}}$

d) $g = \dfrac{\lambda L \alpha - \rho}{\gamma + \alpha} = \dfrac{\lambda L - \rho/\alpha}{1 + \gamma/\alpha}$

$g^* = \dfrac{\lambda L - \rho}{\gamma}$

$g^* - g = \big((\gamma+\alpha)(\lambda L - \rho) - \gamma(\lambda L \alpha - \rho)\big)/\big(\gamma(\gamma+\alpha)\big)$

$= \big(\lambda L \gamma - \cancel{\rho\gamma} + \lambda L \alpha - \alpha\rho - \lambda L \alpha\gamma + \cancel{\gamma\rho}\big)/\big(\gamma(\gamma+\alpha)\big)$

$= \big(\lambda L \gamma(1-\alpha) + \alpha(\lambda L - \rho)\big)/\big(\gamma(\gamma+\alpha)\big) > 0$

$\Rightarrow g^* > g$

Isso ocorre pois g está associado à economia descentralizada sem concorrência perfeita no mercado do bem intermediário. (Poder de mercado).

5) Acemoglu p. 465, seção 14.1.4