

$$P_EM_a.t_t = P_EM_a.ts + shock_P_EM_a.t_t \quad (1)$$

$$\log\left(\frac{epsi_a.t_t}{epsi_a.ts}\right) = rho_eps_a \log\left(\frac{epsi_a.t_{t-1}}{epsi_a.ts}\right) + shock_epsi_a.t_t \quad (2)$$

$$EM_t_t = (1 - rho_EM) EM_t_{t-1} + ZZ_1.a.t_t + ZZ_2.a.t_t + ZZ_3.a.t_t + ZZ_4.a.t_t + ZZ_5.a.t_t + ZZ_6.a.t_t + ZZ_7.a.t_t + ZZ_8.a.t_t + ZZ_9.a.t_t + ZZ_10.a.t_t \quad (3)$$

$$Pen_1.a.t_t = gama0.1.a + EM_t_t gama1.1.a + gama2.1.a EM_t_t^2 \quad (4)$$

$$ZZ_1.a.t_t = (1 + shock_epsi_carb.int.a.t_t) carb.int.1.a Y.1.a.t_t \quad (5)$$

$$Pen_2.a.t_t = gama0.2.a + EM_t_t gama1.2.a + EM_t_t^2 gama2.2.a \quad (6)$$

$$ZZ_2.a.t_t = (1 + shock_epsi_carb.int.a.t_t) carb.int.2.a Y.2.a.t_t \quad (7)$$

$$Pen_3.a.t_t = gama0.3.a + EM_t_t gama1.3.a + EM_t_t^2 gama2.3.a \quad (8)$$

$$ZZ_3.a.t_t = (1 + shock_epsi_carb.int.a.t_t) carb.int.3.a Y.3.a.t_t \quad (9)$$

$$Pen_4.a.t_t = gama0.4.a + EM_t_t gama1.4.a + EM_t_t^2 gama2.4.a \quad (10)$$

$$ZZ_4.a.t_t = (1 + shock_epsi_carb.int.a.t_t) carb.int.4.a Y.4.a.t_t \quad (11)$$

$$Pen_5.a.t_t = gama0.5.a + EM_t_t gama1.5.a + EM_t_t^2 gama2.5.a \quad (12)$$

$$ZZ_5.a.t_t = (1 + shock_epsi_carb.int.a.t_t) carb.int.5.a Y.5.a.t_t \quad (13)$$

$$Pen_6.a.t_t = gama0.6.a + EM_t_t gama1.6.a + EM_t_t^2 gama2.6.a \quad (14)$$

$$ZZ_6.a.t_t = (1 + shock_epsi_carb.int.a.t_t) carb.int.6.a Y.6.a.t_t \quad (15)$$

$$Pen_7.a.t_t = gama0.7.a + EM_t_t gama1.7.a + EM_t_t^2 gama2.7.a \quad (16)$$

$$ZZ_7.a.t_t = (1 + shock_epsi_carb.int.a.t_t) carb.int.7.a Y.7.a.t_t \quad (17)$$

$$Pen_8.a.t_t = gama0.8.a + EM_t_t gama1.8.a + EM_t_t^2 gama2.8.a \quad (18)$$

$$ZZ_8.a.t_t = (1 + shock_epsi_carb.int.a.t_t) carb.int.8.a Y.8.a.t_t \quad (19)$$

$$Pen_9.a.t_t = gama0.9.a + EM_t_t gama1.9.a + EM_t_t^2 gama2.9.a \quad (20)$$

$$ZZ_9.a.t_t = (1 + shock_epsi_carb.int.a.t_t) carb.int.9.a Y.9.a.t_t \quad (21)$$

$$Pen_{10.a.t_t} = gama0_{10.a} + EM_{.t_t} gama1_{10.a} + EM_{.t_t}^2 gama2_{10.a} \quad (22)$$

$$ZZ_{10.a.t_t} = (1 + shock_epsi_carb_int.a.t_t) carb_int_{10.a} Y_{10.a.t_t} \quad (23)$$

$$ZZ_{.a.t_t} = ZZ_{1.a.t_t} + ZZ_{2.a.t_t} + ZZ_{3.a.t_t} + ZZ_{4.a.t_t} + ZZ_{5.a.t_t} + ZZ_{6.a.t_t} + ZZ_{7.a.t_t} + ZZ_{8.a.t_t} + ZZ_{9.a.t_t} + ZZ_{10.a.t_t} \quad (24)$$

$$\log\left(\frac{R_{.a.t_t}}{R_{.a.t_s}}\right) = 0.4096000000000002 \log\left(\frac{R_{.a.t_{t-1}}}{R_{.a.t_s}}\right) + 0.8855999999999997 \log(pi_cpi.a.t_{t-1}) \quad (25)$$

$$K_{.a.t_t} = (1 - delta) K_{.a.t_{t-1}} + I_{.a.t_t} \quad (26)$$

$$lambda_{.a.t_t} = C_{.a.t_t}^{(-sig)} \quad (27)$$

$$1 = \frac{R_{.a.t_t} \frac{beta \ lambda_{.a.t_{t+1}}}{lambda_{.a.t_t}}}{pi_cpi.a.t_{t+1}} \quad (28)$$

$$1 = \frac{\frac{beta \ lambda_{.a.t_{t+1}}}{lambda_{.a.t_t}} (rk_{.a.t_{t+1}} + (1 - delta) PI_{.a.t_{t+1}})}{PI_{.a.t_t}} \quad (29)$$

$$lambda_{.a.t_t} w_{.a.t_t} = kappa N_{.a} N_{.a.t_t}^{lab.a} \quad (30)$$

$$1 = \left(Psi_{con.1.a} P_{1.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.2.a} P_{2.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.3.a} P_{3.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.4.a} P_{4.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.5.a} P_{5.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} \right. \\ \left. + Psi_{con.6.a} P_{6.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.7.a} P_{7.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.8.a} P_{8.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.9.a} P_{9.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.10.a} P_{10.a.t_t}^{\frac{(-sigc.a)}{1-sigc.a}} \right)^{\frac{-(1-sigc.a)}{sigc.a}} \quad (31)$$

$$pi_cpi.a.t_t = \left(Psi_{con.1.a} (pi_ppi.1.a.t_t P_{1.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.2.a} (pi_ppi.2.a.t_t P_{2.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.3.a} (pi_ppi.3.a.t_t P_{3.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} \right. \\ \left. + Psi_{con.4.a} (pi_ppi.4.a.t_t P_{4.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.5.a} (pi_ppi.5.a.t_t P_{5.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.6.a} (pi_ppi.6.a.t_t P_{6.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} \right. \\ \left. + Psi_{con.7.a} (pi_ppi.7.a.t_t P_{7.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.8.a} (pi_ppi.8.a.t_t P_{8.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} + Psi_{con.9.a} (pi_ppi.9.a.t_t P_{9.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} \right. \\ \left. + Psi_{con.10.a} (pi_ppi.10.a.t_t P_{10.a.t_{t-1}})^{\frac{(-sigc.a)}{1-sigc.a}} \right)^{\frac{-(1-sigc.a)}{sigc.a}} \quad (32)$$

$$PI_{.a.t_t} = \left(Psi_{inv.1.a} P_{1.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} + Psi_{inv.2.a} P_{2.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} + Psi_{inv.3.a} P_{3.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} + Psi_{inv.4.a} P_{4.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} + Psi_{inv.5.a} P_{5.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} \right. \\ \left. + Psi_{inv.6.a} P_{6.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} + Psi_{inv.7.a} P_{7.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} + Psi_{inv.8.a} P_{8.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} + Psi_{inv.9.a} P_{9.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} + Psi_{inv.10.a} P_{10.a.t_t}^{\frac{(-sigi.a)}{1-sigi.a}} \right)^{\frac{-(1-sigi.a)}{sigi.a}} \quad (33)$$

$$\begin{aligned}
w.a.t_t = & \left(\omega_{N.1.a} w_{1.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} + \omega_{N.2.a} w_{2.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} + \omega_{N.3.a} w_{3.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} + \omega_{N.4.a} w_{4.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} \right. \\
& + \omega_{N.5.a} w_{5.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} + \omega_{N.6.a} w_{6.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} + \omega_{N.7.a} w_{7.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} + \omega_{N.8.a} w_{8.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} \\
& \left. + \omega_{N.9.a} w_{9.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} + \omega_{N.10.a} w_{10.a.t_t} \frac{(-\psi_{N-a})}{1-\psi_{N-a}} \right) \frac{-(1-\psi_{N-a})}{\psi_{N-a}} \quad (34)
\end{aligned}$$

$$\begin{aligned}
rk.a.t_t = & \left(\omega_{K.1.a} rk_{1.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} + \omega_{K.2.a} rk_{2.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} + \omega_{K.3.a} rk_{3.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} + \omega_{K.4.a} rk_{4.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} \right. \\
& + \omega_{K.5.a} rk_{5.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} + \omega_{K.6.a} rk_{6.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} + \omega_{K.7.a} rk_{7.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} + \omega_{K.8.a} rk_{8.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} \\
& \left. + \omega_{K.9.a} rk_{9.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} + \omega_{K.10.a} rk_{10.a.t_t} \frac{(-\psi_{K-a})}{1-\psi_{K-a}} \right) \frac{-(1-\psi_{K-a})}{\psi_{K-a}} \quad (35)
\end{aligned}$$

$$Y.VA.a.t_t = C.a.t_t + I.a.t_t PI.a.t_t \quad (36)$$

$$C_{1.a.t_t} = C.a.t_t \Psi_{con.1.a} \left(\frac{1}{P_{1.a.t_t}} \right)^{\frac{1}{1-sigc.a}} \quad (37)$$

$$I_{1.a.t_t} = I.a.t_t \Psi_{inv.1.a} \left(\frac{PI.a.t_t}{P_{1.a.t_t}} \right)^{\frac{1}{1-sigi.a}} \quad (38)$$

$$N_{1.a.t_t} = N.a.t_t \omega_{N.1.a} \left(\frac{w.a.t_t}{w_{1.a.t_t}} \right)^{\frac{1}{1-\psi_{N-a}}} \quad (39)$$

$$K_{1.a.t_t} = K.a.t_t \omega_{K.1.a} \left(\frac{rk.a.t_{t+1}}{rk_{1.a.t_{t+1}}} \right)^{\frac{1}{1-\psi_{K-a}}} \quad (40)$$

$$\begin{aligned}
Y_{1.a.t_t} P_{1.a.t_t} = & P_{1.a.t_t} C_{1.a.t_t} + P_{1.a.t_t} I_{1.a.t_t} + P_{1.a.t_t} H_{1.1.a.t_t} + P_{1.a.t_t} H_{2.1.a.t_t} + P_{1.a.t_t} H_{3.1.a.t_t} + P_{1.a.t_t} H_{4.1.a.t_t} \\
& + P_{1.a.t_t} H_{5.1.a.t_t} + P_{1.a.t_t} H_{6.1.a.t_t} + P_{1.a.t_t} H_{7.1.a.t_t} + P_{1.a.t_t} H_{8.1.a.t_t} + P_{1.a.t_t} H_{9.1.a.t_t} + P_{1.a.t_t} H_{10.1.a.t_t} \quad (41)
\end{aligned}$$

$$Y_{1.a.t_t} = \epsilon_{psi.a.t_t} \epsilon_{psi.1.a.t_t} (1 - Pen_{1.a.t_t}) \left(N_{1.a.t_t}^{\alpha_{N.1.a}} K_{1.a.t_{t-1}}^{1-\alpha_{N.1.a}} \right)^{\alpha_{H.1.a}} H_{1.a.t_t}^{1-\alpha_{H.1.a}} \quad (42)$$

$$EM_{cost.1.a.t_t} = P_{EM.a.t_t} (1 + shock_{\epsilon_{psi_carb.int.a.t_t}}) carb.int_{1.a} \quad (43)$$

$$mc_{tild.1.a.t_t} = EM_{cost.1.a.t_t} + mc_{1.a.t_t} \quad (44)$$

$$P_{1.a.t_t} = mc_{tild.1.a.t_t} \quad (45)$$

$$w_{1.a.t_t} = \frac{Y_{1.a.t_t} mc_{1.a.t_t} \alpha N_{1.a} \alpha H_{1.a}}{N_{1.a.t_t}} \quad (46)$$

$$rk_{1.a.t_t} = \frac{Y_{1.a.t_t} mc_{1.a.t_t} (1 - \alpha N_{1.a}) \alpha H_{1.a}}{K_{1.a.t_t-1}} \quad (47)$$

$$PH_{1.a.t_t} = \frac{Y_{1.a.t_t} (1 - \alpha H_{1.a}) mc_{1.a.t_t}}{H_{1.a.t_t}} \quad (48)$$

$$PH_{1.a.t_t} = \left(Psi_{1.1.a} P_{1.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} + Psi_{1.2.a} P_{2.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} + Psi_{1.3.a} P_{3.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} + Psi_{1.4.a} P_{4.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} + Psi_{1.5.a} P_{5.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} \right. \\ \left. + Psi_{1.6.a} P_{6.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} + Psi_{1.7.a} P_{7.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} + Psi_{1.8.a} P_{8.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} + Psi_{1.9.a} P_{9.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} \right. \\ \left. + Psi_{1.10.a} P_{10.a.t_t}^{\frac{(-sigh_{1.a})}{1-sigh_{1.a}}} \right)^{\frac{(-1-sigh_{1.a})}{sigh_{1.a}}} \quad (49)$$

$$H_{1.1.a.t_t} = H_{1.a.t_t} Psi_{1.1.a} \left(\frac{PH_{1.a.t_t}}{P_{1.a.t_t}} \right)^{\frac{1}{1-sigh_{1.a}}} \quad (50)$$

$$H_{1.2.a.t_t} = H_{1.a.t_t} Psi_{1.2.a} \left(\frac{PH_{1.a.t_t}}{P_{2.a.t_t}} \right)^{\frac{1}{1-sigh_{1.a}}} \quad (51)$$

$$H_{1.3.a.t_t} = H_{1.a.t_t} Psi_{1.3.a} \left(\frac{PH_{1.a.t_t}}{P_{3.a.t_t}} \right)^{\frac{1}{1-sigh_{1.a}}} \quad (52)$$

$$H_{1.4.a.t_t} = H_{1.a.t_t} Psi_{1.4.a} \left(\frac{PH_{1.a.t_t}}{P_{4.a.t_t}} \right)^{\frac{1}{1-sigh_{1.a}}} \quad (53)$$

$$H_{1.5.a.t_t} = H_{1.a.t_t} Psi_{1.5.a} \left(\frac{PH_{1.a.t_t}}{P_{5.a.t_t}} \right)^{\frac{1}{1-sigh_{1.a}}} \quad (54)$$

$$H_{1.6.a.t_t} = H_{1.a.t_t} Psi_{1.6.a} \left(\frac{PH_{1.a.t_t}}{P_{6.a.t_t}} \right)^{\frac{1}{1-sigh_{1.a}}} \quad (55)$$

$$H_{1.7.a.t_t} = H_{1.a.t_t} Psi_{1.7.a} \left(\frac{PH_{1.a.t_t}}{P_{7.a.t_t}} \right)^{\frac{1}{1-sigh_{1.a}}} \quad (56)$$

$$H_{1.8.a.t_t} = H_{1.a.t_t} Psi_{1.8.a} \left(\frac{PH_{1.a.t_t}}{P_{8.a.t_t}} \right)^{\frac{1}{1-sigh_{1.a}}} \quad (57)$$

$$H_{.1.9.a.t_t} = H_{.1.a.t_t} Psi_{.1.9.a} \left(\frac{PH_{.1.a.t_t}}{P_{.9.a.t_t}} \right)^{\frac{1}{1-sigh_{.1.a}}} \quad (58)$$

$$H_{.1.10.a.t_t} = H_{.1.a.t_t} Psi_{.1.10.a} \left(\frac{PH_{.1.a.t_t}}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigh_{.1.a}}} \quad (59)$$

$$\log \left(\frac{epsi_{.1.a.t_t}}{epsi_{.1.a.ts}} \right) = rho_{eps.a} \log \left(\frac{epsi_{.1.a.t_{t-1}}}{epsi_{.1.a.ts}} \right) + shock_{epsi_{.1.a.t_t}} \quad (60)$$

$$C_{.2.a.t_t} = C_{.a.t_t} Psi_{con.2.a} \left(\frac{1}{P_{.2.a.t_t}} \right)^{\frac{1}{1-sigc.a}} \quad (61)$$

$$I_{.2.a.t_t} = I_{.a.t_t} Psi_{inv.2.a} \left(\frac{PI_{.a.t_t}}{P_{.2.a.t_t}} \right)^{\frac{1}{1-sigi.a}} \quad (62)$$

$$N_{.2.a.t_t} = N_{.a.t_t} omega_{N.2.a} \left(\frac{w_{.a.t_t}}{w_{.2.a.t_t}} \right)^{\frac{1}{1-upsilon_{N.a}}} \quad (63)$$

$$K_{.2.a.t_t} = K_{.a.t_t} omega_{K.2.a} \left(\frac{rk_{.a.t_{t+1}}}{rk_{.2.a.t_{t+1}}} \right)^{\frac{1}{1-upsilon_{K.a}}} \quad (64)$$

$$Y_{.2.a.t_t} P_{.2.a.t_t} = P_{.2.a.t_t} C_{.2.a.t_t} + P_{.2.a.t_t} I_{.2.a.t_t} + P_{.2.a.t_t} H_{.1.2.a.t_t} + P_{.2.a.t_t} H_{.2.2.a.t_t} + P_{.2.a.t_t} H_{.3.2.a.t_t} + P_{.2.a.t_t} H_{.4.2.a.t_t} \\ + P_{.2.a.t_t} H_{.5.2.a.t_t} + P_{.2.a.t_t} H_{.6.2.a.t_t} + P_{.2.a.t_t} H_{.7.2.a.t_t} + P_{.2.a.t_t} H_{.8.2.a.t_t} + P_{.2.a.t_t} H_{.9.2.a.t_t} + P_{.2.a.t_t} H_{.10.2.a.t_t} \quad (65)$$

$$Y_{.2.a.t_t} = epsi_{.a.t_t} epsi_{.2.a.t_t} (1 - Pen_{.2.a.t_t}) \left(N_{.2.a.t_t}^{alpha_{N.2.a}} K_{.2.a.t_{t-1}}^{1-alpha_{N.2.a}} \right)^{alpha_{H.2.a}} H_{.2.a.t_t}^{1-alpha_{H.2.a}} \quad (66)$$

$$EM_{cost.2.a.t_t} = P_{EM.a.t_t} (1 + shock_{epsi_{carb.int.a.t_t}}) carb_{int.2.a} \quad (67)$$

$$mc_{tild.2.a.t_t} = EM_{cost.2.a.t_t} + mc_{.2.a.t_t} \quad (68)$$

$$P_{.2.a.t_t} = mc_{tild.2.a.t_t} \quad (69)$$

$$w_{.2.a.t_t} = \frac{Y_{.2.a.t_t} mc_{.2.a.t_t} alpha_{N.2.a} alpha_{H.2.a}}{N_{.2.a.t_t}} \quad (70)$$

$$rk_{.2.a.t_t} = \frac{Y_{.2.a.t_t} mc_{.2.a.t_t} (1 - alpha_{N.2.a}) alpha_{H.2.a}}{K_{.2.a.t_{t-1}}} \quad (71)$$

$$PH_{.2.a.t_t} = \frac{Y_{.2.a.t_t} (1 - alpha_{H.2.a}) mc_{.2.a.t_t}}{H_{.2.a.t_t}} \quad (72)$$

$$\begin{aligned}
PH_{2.a.t_t} = & \left(Psi_{2.1.a} P_{1.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} + Psi_{2.2.a} P_{2.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} + Psi_{2.3.a} P_{3.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} + Psi_{2.4.a} P_{4.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} + Psi_{2.5.a} P_{5.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} \right. \\
& + Psi_{2.6.a} P_{6.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} + Psi_{2.7.a} P_{7.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} + Psi_{2.8.a} P_{8.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} + Psi_{2.9.a} P_{9.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} \\
& \left. + Psi_{2.10.a} P_{10.a.t_t} \frac{(-sigh_{2.a})}{1-sigh_{2.a}} \right) \frac{(-1-sigh_{2.a})}{sigh_{2.a}} \quad (73)
\end{aligned}$$

$$H_{2.1.a.t_t} = H_{2.a.t_t} Psi_{2.1.a} \left(\frac{PH_{2.a.t_t}}{P_{1.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (74)$$

$$H_{2.2.a.t_t} = H_{2.a.t_t} Psi_{2.2.a} \left(\frac{PH_{2.a.t_t}}{P_{2.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (75)$$

$$H_{2.3.a.t_t} = H_{2.a.t_t} Psi_{2.3.a} \left(\frac{PH_{2.a.t_t}}{P_{3.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (76)$$

$$H_{2.4.a.t_t} = H_{2.a.t_t} Psi_{2.4.a} \left(\frac{PH_{2.a.t_t}}{P_{4.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (77)$$

$$H_{2.5.a.t_t} = H_{2.a.t_t} Psi_{2.5.a} \left(\frac{PH_{2.a.t_t}}{P_{5.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (78)$$

$$H_{2.6.a.t_t} = H_{2.a.t_t} Psi_{2.6.a} \left(\frac{PH_{2.a.t_t}}{P_{6.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (79)$$

$$H_{2.7.a.t_t} = H_{2.a.t_t} Psi_{2.7.a} \left(\frac{PH_{2.a.t_t}}{P_{7.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (80)$$

$$H_{2.8.a.t_t} = H_{2.a.t_t} Psi_{2.8.a} \left(\frac{PH_{2.a.t_t}}{P_{8.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (81)$$

$$H_{2.9.a.t_t} = H_{2.a.t_t} Psi_{2.9.a} \left(\frac{PH_{2.a.t_t}}{P_{9.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (82)$$

$$H_{2.10.a.t_t} = H_{2.a.t_t} Psi_{2.10.a} \left(\frac{PH_{2.a.t_t}}{P_{10.a.t_t}} \right)^{\frac{1}{1-sigh_{2.a}}} \quad (83)$$

$$\log\left(\frac{\text{epsi.2.a.t}_t}{\text{epsi.2.a.ts}}\right) = \text{rho.eps.a} \log\left(\frac{\text{epsi.2.a.t}_{t-1}}{\text{epsi.2.a.ts}}\right) + \text{shock.epsi.2.a.t}_t \quad (84)$$

$$C_{3.a.t} = C_{a.t} \text{Psi.con.3.a} \left(\frac{1}{P_{3.a.t}}\right)^{\frac{1}{1-\text{sigc.a}}} \quad (85)$$

$$I_{3.a.t} = I_{a.t} \text{Psi.inv.3.a} \left(\frac{PI_{a.t}}{P_{3.a.t}}\right)^{\frac{1}{1-\text{sigi.a}}} \quad (86)$$

$$N_{3.a.t} = N_{a.t} \text{omega.N.3.a} \left(\frac{w_{a.t}}{w_{3.a.t}}\right)^{\frac{1}{1-\text{upsi.N.a}}} \quad (87)$$

$$K_{3.a.t} = K_{a.t} \text{omega.K.3.a} \left(\frac{rk_{a.t+1}}{rk_{3.a.t+1}}\right)^{\frac{1}{1-\text{upsi.K.a}}} \quad (88)$$

$$Y_{3.a.t} P_{3.a.t} = P_{3.a.t} C_{3.a.t} + P_{3.a.t} I_{3.a.t} + P_{3.a.t} H_{1.3.a.t} + P_{3.a.t} H_{2.3.a.t} + P_{3.a.t} H_{3.3.a.t} + P_{3.a.t} H_{4.3.a.t} \\ + P_{3.a.t} H_{5.3.a.t} + P_{3.a.t} H_{6.3.a.t} + P_{3.a.t} H_{7.3.a.t} + P_{3.a.t} H_{8.3.a.t} + P_{3.a.t} H_{9.3.a.t} + P_{3.a.t} H_{10.3.a.t} \quad (89)$$

$$Y_{3.a.t} = \text{epsi.a.t} \text{epsi.3.a.t} (1 - \text{Pen.3.a.t}) \left(N_{3.a.t}^{\text{alphaN.3.a}} K_{3.a.t-1}^{1-\text{alphaN.3.a}}\right)^{\text{alphaH.3.a}} H_{3.a.t}^{1-\text{alphaH.3.a}} \quad (90)$$

$$EM_{\text{cost.3.a.t}} = P_{EM.a.t} (1 + \text{shock.epsi.carb.int.a.t}) \text{carb.int.3.a} \quad (91)$$

$$mc_{\text{tild.3.a.t}} = EM_{\text{cost.3.a.t}} + mc_{3.a.t} \quad (92)$$

$$P_{3.a.t} = mc_{\text{tild.3.a.t}} \quad (93)$$

$$w_{3.a.t} = \frac{Y_{3.a.t} mc_{3.a.t} \text{alphaN.3.a} \text{alphaH.3.a}}{N_{3.a.t}} \quad (94)$$

$$rk_{3.a.t} = \frac{Y_{3.a.t} mc_{3.a.t} (1 - \text{alphaN.3.a}) \text{alphaH.3.a}}{K_{3.a.t-1}} \quad (95)$$

$$PH_{3.a.t} = \frac{Y_{3.a.t} (1 - \text{alphaH.3.a}) mc_{3.a.t}}{H_{3.a.t}} \quad (96)$$

$$PH_{3.a.t} = \left(\text{Psi.3.1.a} P_{1.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} + \text{Psi.3.2.a} P_{2.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} + \text{Psi.3.3.a} P_{3.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} + \text{Psi.3.4.a} P_{4.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} + \text{Psi.3.5.a} P_{5.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} \right. \\ \left. + \text{Psi.3.6.a} P_{6.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} + \text{Psi.3.7.a} P_{7.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} + \text{Psi.3.8.a} P_{8.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} + \text{Psi.3.9.a} P_{9.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} \right. \\ \left. + \text{Psi.3.10.a} P_{10.a.t}^{\frac{(-\text{sigH.3.a})}{1-\text{sigH.3.a}}} \right)^{\frac{(-1-\text{sigH.3.a})}{\text{sigH.3.a}}} \quad (97)$$

$$H_{.3.1.a.t_t} = H_{.3.a.t_t} Psi_{.3.1.a} \left(\frac{PH_{.3.a.t_t}}{P_{.1.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (98)$$

$$H_{.3.2.a.t_t} = H_{.3.a.t_t} Psi_{.3.2.a} \left(\frac{PH_{.3.a.t_t}}{P_{.2.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (99)$$

$$H_{.3.3.a.t_t} = H_{.3.a.t_t} Psi_{.3.3.a} \left(\frac{PH_{.3.a.t_t}}{P_{.3.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (100)$$

$$H_{.3.4.a.t_t} = H_{.3.a.t_t} Psi_{.3.4.a} \left(\frac{PH_{.3.a.t_t}}{P_{.4.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (101)$$

$$H_{.3.5.a.t_t} = H_{.3.a.t_t} Psi_{.3.5.a} \left(\frac{PH_{.3.a.t_t}}{P_{.5.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (102)$$

$$H_{.3.6.a.t_t} = H_{.3.a.t_t} Psi_{.3.6.a} \left(\frac{PH_{.3.a.t_t}}{P_{.6.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (103)$$

$$H_{.3.7.a.t_t} = H_{.3.a.t_t} Psi_{.3.7.a} \left(\frac{PH_{.3.a.t_t}}{P_{.7.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (104)$$

$$H_{.3.8.a.t_t} = H_{.3.a.t_t} Psi_{.3.8.a} \left(\frac{PH_{.3.a.t_t}}{P_{.8.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (105)$$

$$H_{.3.9.a.t_t} = H_{.3.a.t_t} Psi_{.3.9.a} \left(\frac{PH_{.3.a.t_t}}{P_{.9.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (106)$$

$$H_{.3.10.a.t_t} = H_{.3.a.t_t} Psi_{.3.10.a} \left(\frac{PH_{.3.a.t_t}}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigh_{.3.a}}} \quad (107)$$

$$\log \left(\frac{epsi_{.3.a.t_t}}{epsi_{.3.a.ts}} \right) = rho_{eps.a} \log \left(\frac{epsi_{.3.a.t_{t-1}}}{epsi_{.3.a.ts}} \right) + shock_{epsi_{.3.a.t_t}} \quad (108)$$

$$C_{.4.a.t_t} = C_{.a.t_t} Psi_{con.4.a} \left(\frac{1}{P_{.4.a.t_t}} \right)^{\frac{1}{1-sigc.a}} \quad (109)$$

$$I_{.4.a.t_t} = I_{.a.t_t} Psi_{inv.4.a} \left(\frac{PI_{.a.t_t}}{P_{.4.a.t_t}} \right)^{\frac{1}{1-sigi.a}} \quad (110)$$

$$N_{4.a.t_t} = N_{.a.t_t} \omega_{N_{4.a}} \left(\frac{w_{.a.t_t}}{w_{4.a.t_t}} \right)^{\frac{1}{1-\psi_{N_{4.a}}}} \quad (111)$$

$$K_{4.a.t_t} = K_{.a.t_t} \omega_{K_{4.a}} \left(\frac{rk_{.a.t_t+1}}{rk_{4.a.t_t+1}} \right)^{\frac{1}{1-\psi_{K_{4.a}}}} \quad (112)$$

$$Y_{4.a.t_t} P_{4.a.t_t} = P_{4.a.t_t} C_{4.a.t_t} + P_{4.a.t_t} I_{4.a.t_t} + P_{4.a.t_t} H_{1.4.a.t_t} + P_{4.a.t_t} H_{2.4.a.t_t} + P_{4.a.t_t} H_{3.4.a.t_t} + P_{4.a.t_t} H_{4.4.a.t_t} \\ + P_{4.a.t_t} H_{5.4.a.t_t} + P_{4.a.t_t} H_{6.4.a.t_t} + P_{4.a.t_t} H_{7.4.a.t_t} + P_{4.a.t_t} H_{8.4.a.t_t} + P_{4.a.t_t} H_{9.4.a.t_t} + P_{4.a.t_t} H_{10.4.a.t_t} \quad (113)$$

$$Y_{4.a.t_t} = \overline{\text{epsi}_{.a.t_t} \text{epsi}_{4.a.t_t}} (1 - \text{Pen}_{4.a.t_t}) \left(N_{4.a.t_t}^{\alpha_{N_{4.a}}} K_{4.a.t_t-1}^{1-\alpha_{N_{4.a}}} \right)^{\alpha_{H_{4.a}}} H_{4.a.t_t}^{1-\alpha_{H_{4.a}}} \quad (114)$$

$$EM_{\text{cost}_{4.a.t_t}} = P_{EM_{.a.t_t}} (1 + \text{shock}_{\text{epsi}_{\text{carb.int}_{.a.t_t}}}) \text{carb.int}_{4.a} \quad (115)$$

$$mc_{\text{tild}_{4.a.t_t}} = EM_{\text{cost}_{4.a.t_t}} + mc_{4.a.t_t} \quad (116)$$

$$P_{4.a.t_t} = mc_{\text{tild}_{4.a.t_t}} \quad (117)$$

$$w_{4.a.t_t} = \frac{Y_{4.a.t_t} mc_{4.a.t_t} \alpha_{N_{4.a}} \alpha_{H_{4.a}}}{N_{4.a.t_t}} \quad (118)$$

$$rk_{4.a.t_t} = \frac{Y_{4.a.t_t} mc_{4.a.t_t} (1 - \alpha_{N_{4.a}}) \alpha_{H_{4.a}}}{K_{4.a.t_t-1}} \quad (119)$$

$$PH_{4.a.t_t} = \frac{Y_{4.a.t_t} (1 - \alpha_{H_{4.a}}) mc_{4.a.t_t}}{H_{4.a.t_t}} \quad (120)$$

$$PH_{4.a.t_t} = \left(\text{Psi}_{4.1.a} P_{1.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} + \text{Psi}_{4.2.a} P_{2.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} + \text{Psi}_{4.3.a} P_{3.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} + \text{Psi}_{4.4.a} P_{4.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} + \text{Psi}_{4.5.a} P_{5.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} \right. \\ \left. + \text{Psi}_{4.6.a} P_{6.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} + \text{Psi}_{4.7.a} P_{7.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} + \text{Psi}_{4.8.a} P_{8.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} + \text{Psi}_{4.9.a} P_{9.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} \right. \\ \left. + \text{Psi}_{4.10.a} P_{10.a.t_t}^{\frac{(-\text{sig}_{4.a})}{1-\text{sig}_{4.a}}} \right)^{\frac{-(1-\text{sig}_{4.a})}{\text{sig}_{4.a}}} \quad (121)$$

$$H_{4.1.a.t_t} = H_{4.a.t_t} \text{Psi}_{4.1.a} \left(\frac{PH_{4.a.t_t}}{P_{1.a.t_t}} \right)^{\frac{1}{1-\text{sig}_{4.a}}} \quad (122)$$

$$H_{4.2.a.t_t} = H_{4.a.t_t} \text{Psi}_{4.2.a} \left(\frac{PH_{4.a.t_t}}{P_{2.a.t_t}} \right)^{\frac{1}{1-\text{sig}_{4.a}}} \quad (123)$$

$$H_{4.3.a.t_t} = H_{4.a.t_t} Psi_{4.3.a} \left(\frac{PH_{4.a.t_t}}{P_{3.a.t_t}} \right)^{\frac{1}{1-sigh_{4.a}}} \quad (124)$$

$$H_{4.4.a.t_t} = H_{4.a.t_t} Psi_{4.4.a} \left(\frac{PH_{4.a.t_t}}{P_{4.a.t_t}} \right)^{\frac{1}{1-sigh_{4.a}}} \quad (125)$$

$$H_{4.5.a.t_t} = H_{4.a.t_t} Psi_{4.5.a} \left(\frac{PH_{4.a.t_t}}{P_{5.a.t_t}} \right)^{\frac{1}{1-sigh_{4.a}}} \quad (126)$$

$$H_{4.6.a.t_t} = H_{4.a.t_t} Psi_{4.6.a} \left(\frac{PH_{4.a.t_t}}{P_{6.a.t_t}} \right)^{\frac{1}{1-sigh_{4.a}}} \quad (127)$$

$$H_{4.7.a.t_t} = H_{4.a.t_t} Psi_{4.7.a} \left(\frac{PH_{4.a.t_t}}{P_{7.a.t_t}} \right)^{\frac{1}{1-sigh_{4.a}}} \quad (128)$$

$$H_{4.8.a.t_t} = H_{4.a.t_t} Psi_{4.8.a} \left(\frac{PH_{4.a.t_t}}{P_{8.a.t_t}} \right)^{\frac{1}{1-sigh_{4.a}}} \quad (129)$$

$$H_{4.9.a.t_t} = H_{4.a.t_t} Psi_{4.9.a} \left(\frac{PH_{4.a.t_t}}{P_{9.a.t_t}} \right)^{\frac{1}{1-sigh_{4.a}}} \quad (130)$$

$$H_{4.10.a.t_t} = H_{4.a.t_t} Psi_{4.10.a} \left(\frac{PH_{4.a.t_t}}{P_{10.a.t_t}} \right)^{\frac{1}{1-sigh_{4.a}}} \quad (131)$$

$$\log \left(\frac{epsi_{4.a.t_t}}{epsi_{4.a.ts}} \right) = rho_{eps.a} \log \left(\frac{epsi_{4.a.t_{t-1}}}{epsi_{4.a.ts}} \right) + shock_{epsi_{4.a.t_t}} \quad (132)$$

$$C_{5.a.t_t} = C_{a.t_t} Psi_{con.5.a} \left(\frac{1}{P_{5.a.t_t}} \right)^{\frac{1}{1-sigc.a}} \quad (133)$$

$$I_{5.a.t_t} = I_{a.t_t} Psi_{inv.5.a} \left(\frac{PI_{a.t_t}}{P_{5.a.t_t}} \right)^{\frac{1}{1-sigi.a}} \quad (134)$$

$$N_{5.a.t_t} = N_{a.t_t} omega_{N.5.a} \left(\frac{w_{a.t_t}}{w_{5.a.t_t}} \right)^{\frac{1}{1-upsi_{N.a}}} \quad (135)$$

$$K_{5.a.t_t} = K_{a.t_t} omega_{K.5.a} \left(\frac{rk_{a.t_{t+1}}}{rk_{5.a.t_{t+1}}} \right)^{\frac{1}{1-upsi_{K.a}}} \quad (136)$$

$$Y_{.5.a.t_t} P_{.5.a.t_t} = P_{.5.a.t_t} C_{.5.a.t_t} + P_{.5.a.t_t} I_{.5.a.t_t} + P_{.5.a.t_t} H_{.1.5.a.t_t} + P_{.5.a.t_t} H_{.2.5.a.t_t} + P_{.5.a.t_t} H_{.3.5.a.t_t} + P_{.5.a.t_t} H_{.4.5.a.t_t} \\ + P_{.5.a.t_t} H_{.5.5.a.t_t} + P_{.5.a.t_t} H_{.6.5.a.t_t} + P_{.5.a.t_t} H_{.7.5.a.t_t} + P_{.5.a.t_t} H_{.8.5.a.t_t} + P_{.5.a.t_t} H_{.9.5.a.t_t} + P_{.5.a.t_t} H_{.10.5.a.t_t} \quad (137)$$

$$Y_{.5.a.t_t} = \overline{epsi_{.a.t_t} epsi_{.5.a.t_t} (1 - Pen_{.5.a.t_t})} \left(N_{.5.a.t_t}^{\alpha N_{.5.a}} K_{.5.a.t_{-1}}^{1-\alpha N_{.5.a}} \right)^{\alpha H_{.5.a}} H_{.5.a.t_t}^{1-\alpha H_{.5.a}} \quad (138)$$

$$EM_{.cost.5.a.t_t} = P_{.EM.a.t_t} (1 + shock_{.epsi_{.carb.int.a.t_t}}) carb_{.int.5.a} \quad (139)$$

$$mc_{.tild.5.a.t_t} = EM_{.cost.5.a.t_t} + mc_{.5.a.t_t} \quad (140)$$

$$P_{.5.a.t_t} = mc_{.tild.5.a.t_t} \quad (141)$$

$$w_{.5.a.t_t} = \frac{Y_{.5.a.t_t} mc_{.5.a.t_t} \alpha N_{.5.a} \alpha H_{.5.a}}{N_{.5.a.t_t}} \quad (142)$$

$$rk_{.5.a.t_t} = \frac{Y_{.5.a.t_t} mc_{.5.a.t_t} (1 - \alpha N_{.5.a}) \alpha H_{.5.a}}{K_{.5.a.t_{-1}}} \quad (143)$$

$$PH_{.5.a.t_t} = \frac{Y_{.5.a.t_t} (1 - \alpha H_{.5.a}) mc_{.5.a.t_t}}{H_{.5.a.t_t}} \quad (144)$$

$$PH_{.5.a.t_t} = \left(Psi_{.5.1.a} P_{.1.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} + Psi_{.5.2.a} P_{.2.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} + Psi_{.5.3.a} P_{.3.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} + Psi_{.5.4.a} P_{.4.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} + Psi_{.5.5.a} P_{.5.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} \right. \\ \left. + Psi_{.5.6.a} P_{.6.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} + Psi_{.5.7.a} P_{.7.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} + Psi_{.5.8.a} P_{.8.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} + Psi_{.5.9.a} P_{.9.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} \right. \\ \left. + Psi_{.5.10.a} P_{.10.a.t_t}^{\frac{(-sigh_{.5.a})}{1-sigh_{.5.a}}} \right)^{\frac{-(1-sigh_{.5.a})}{sigh_{.5.a}}} \quad (145)$$

$$H_{.5.1.a.t_t} = H_{.5.a.t_t} Psi_{.5.1.a} \left(\frac{PH_{.5.a.t_t}}{P_{.1.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (146)$$

$$H_{.5.2.a.t_t} = H_{.5.a.t_t} Psi_{.5.2.a} \left(\frac{PH_{.5.a.t_t}}{P_{.2.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (147)$$

$$H_{.5.3.a.t_t} = H_{.5.a.t_t} Psi_{.5.3.a} \left(\frac{PH_{.5.a.t_t}}{P_{.3.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (148)$$

$$H_{.5.4.a.t_t} = H_{.5.a.t_t} Psi_{.5.4.a} \left(\frac{PH_{.5.a.t_t}}{P_{.4.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (149)$$

$$H_{.5.5.a.t_t} = H_{.5.a.t_t} Psi_{.5.5.a} \left(\frac{PH_{.5.a.t_t}}{P_{.5.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (150)$$

$$H_{.5.6.a.t_t} = H_{.5.a.t_t} Psi_{.5.6.a} \left(\frac{PH_{.5.a.t_t}}{P_{.6.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (151)$$

$$H_{.5.7.a.t_t} = H_{.5.a.t_t} Psi_{.5.7.a} \left(\frac{PH_{.5.a.t_t}}{P_{.7.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (152)$$

$$H_{.5.8.a.t_t} = H_{.5.a.t_t} Psi_{.5.8.a} \left(\frac{PH_{.5.a.t_t}}{P_{.8.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (153)$$

$$H_{.5.9.a.t_t} = H_{.5.a.t_t} Psi_{.5.9.a} \left(\frac{PH_{.5.a.t_t}}{P_{.9.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (154)$$

$$H_{.5.10.a.t_t} = H_{.5.a.t_t} Psi_{.5.10.a} \left(\frac{PH_{.5.a.t_t}}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigh_{.5.a}}} \quad (155)$$

$$\log \left(\frac{epsi_{.5.a.t_t}}{epsi_{.5.a.ts}} \right) = rho_{eps.a} \log \left(\frac{epsi_{.5.a.t_{t-1}}}{epsi_{.5.a.ts}} \right) + shock_{epsi_{.5.a.t_t}} \quad (156)$$

$$C_{.6.a.t_t} = C_{.a.t_t} Psi_{con.6.a} \left(\frac{1}{P_{.6.a.t_t}} \right)^{\frac{1}{1-sigc.a}} \quad (157)$$

$$I_{.6.a.t_t} = I_{.a.t_t} Psi_{inv.6.a} \left(\frac{PI_{.a.t_t}}{P_{.6.a.t_t}} \right)^{\frac{1}{1-sigi.a}} \quad (158)$$

$$N_{.6.a.t_t} = N_{.a.t_t} omega_{N.6.a} \left(\frac{w_{.a.t_t}}{w_{.6.a.t_t}} \right)^{\frac{1}{1-upsilon_{N.a}}} \quad (159)$$

$$K_{.6.a.t_t} = K_{.a.t_t} omega_{K.6.a} \left(\frac{rk_{.a.t_t+1}}{rk_{.6.a.t_t+1}} \right)^{\frac{1}{1-upsilon_{K.a}}} \quad (160)$$

$$Y_{.6.a.t_t} P_{.6.a.t_t} = P_{.6.a.t_t} C_{.6.a.t_t} + P_{.6.a.t_t} I_{.6.a.t_t} + P_{.6.a.t_t} H_{.1.6.a.t_t} + P_{.6.a.t_t} H_{.2.6.a.t_t} + P_{.6.a.t_t} H_{.3.6.a.t_t} + P_{.6.a.t_t} H_{.4.6.a.t_t} \\ + P_{.6.a.t_t} H_{.5.6.a.t_t} + P_{.6.a.t_t} H_{.6.6.a.t_t} + P_{.6.a.t_t} H_{.7.6.a.t_t} + P_{.6.a.t_t} H_{.8.6.a.t_t} + P_{.6.a.t_t} H_{.9.6.a.t_t} + P_{.6.a.t_t} H_{.10.6.a.t_t} \quad (161)$$

$$Y_{.6.a.t_t} = epsi_{.a.t_t} epsi_{.6.a.t_t} (1 - Pen_{.6.a.t_t}) \left(N_{.6.a.t_t}^{alpha_{N.6.a}} K_{.6.a.t_t-1}^{1-alpha_{N.6.a}} \right)^{alpha_{H.6.a}} H_{.6.a.t_t}^{1-alpha_{H.6.a}} \quad (162)$$

$$EM_cost_6_a_t_t = P_EM_a_t_t (1 + shock_epsi_carb_int_a_t_t) carb_int_6_a \quad (163)$$

$$mc_tild_6_a_t_t = EM_cost_6_a_t_t + mc_6_a_t_t \quad (164)$$

$$P_6_a_t_t = mc_tild_6_a_t_t \quad (165)$$

$$w_6_a_t_t = \frac{Y_6_a_t_t mc_6_a_t_t alphaN_6_a alphaH_6_a}{N_6_a_t_t} \quad (166)$$

$$rk_6_a_t_t = \frac{Y_6_a_t_t mc_6_a_t_t (1 - alphaN_6_a) alphaH_6_a}{K_6_a_t_{t-1}} \quad (167)$$

$$PH_6_a_t_t = \frac{Y_6_a_t_t (1 - alphaH_6_a) mc_6_a_t_t}{H_6_a_t_t} \quad (168)$$

$$PH_6_a_t_t = \left(Psi_6_1_a P_1_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} + Psi_6_2_a P_2_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} + Psi_6_3_a P_3_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} + Psi_6_4_a P_4_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} + Psi_6_5_a P_5_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} \right. \\ \left. + Psi_6_6_a P_6_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} + Psi_6_7_a P_7_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} + Psi_6_8_a P_8_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} + Psi_6_9_a P_9_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} \right. \\ \left. + Psi_6_10_a P_10_a_t_t \frac{(-sigh_6_a)}{1-sigh_6_a} \right) \frac{(-1-sigh_6_a)}{sigh_6_a} \quad (169)$$

$$H_6_1_a_t_t = H_6_a_t_t Psi_6_1_a \left(\frac{PH_6_a_t_t}{P_1_a_t_t} \right)^{\frac{1}{1-sigh_6_a}} \quad (170)$$

$$H_6_2_a_t_t = H_6_a_t_t Psi_6_2_a \left(\frac{PH_6_a_t_t}{P_2_a_t_t} \right)^{\frac{1}{1-sigh_6_a}} \quad (171)$$

$$H_6_3_a_t_t = H_6_a_t_t Psi_6_3_a \left(\frac{PH_6_a_t_t}{P_3_a_t_t} \right)^{\frac{1}{1-sigh_6_a}} \quad (172)$$

$$H_6_4_a_t_t = H_6_a_t_t Psi_6_4_a \left(\frac{PH_6_a_t_t}{P_4_a_t_t} \right)^{\frac{1}{1-sigh_6_a}} \quad (173)$$

$$H_6_5_a_t_t = H_6_a_t_t Psi_6_5_a \left(\frac{PH_6_a_t_t}{P_5_a_t_t} \right)^{\frac{1}{1-sigh_6_a}} \quad (174)$$

$$H_6_6_a_t_t = H_6_a_t_t Psi_6_6_a \left(\frac{PH_6_a_t_t}{P_6_a_t_t} \right)^{\frac{1}{1-sigh_6_a}} \quad (175)$$

$$H_{.6.7.a.t_t} = H_{.6.a.t_t} Psi_{.6.7.a} \left(\frac{PH_{.6.a.t_t}}{P_{.7.a.t_t}} \right)^{\frac{1}{1-sigh_{.6.a}}} \quad (176)$$

$$H_{.6.8.a.t_t} = H_{.6.a.t_t} Psi_{.6.8.a} \left(\frac{PH_{.6.a.t_t}}{P_{.8.a.t_t}} \right)^{\frac{1}{1-sigh_{.6.a}}} \quad (177)$$

$$H_{.6.9.a.t_t} = H_{.6.a.t_t} Psi_{.6.9.a} \left(\frac{PH_{.6.a.t_t}}{P_{.9.a.t_t}} \right)^{\frac{1}{1-sigh_{.6.a}}} \quad (178)$$

$$H_{.6.10.a.t_t} = H_{.6.a.t_t} Psi_{.6.10.a} \left(\frac{PH_{.6.a.t_t}}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigh_{.6.a}}} \quad (179)$$

$$\log \left(\frac{epsi_{.6.a.t_t}}{epsi_{.6.a.ts}} \right) = rho_{eps.a} \log \left(\frac{epsi_{.6.a.t_{t-1}}}{epsi_{.6.a.ts}} \right) + shock_{epsi_{.6.a.t_t}} \quad (180)$$

$$C_{.7.a.t_t} = C_{.a.t_t} Psi_{con.7.a} \left(\frac{1}{P_{.7.a.t_t}} \right)^{\frac{1}{1-sigc.a}} \quad (181)$$

$$I_{.7.a.t_t} = I_{.a.t_t} Psi_{inv.7.a} \left(\frac{PI_{.a.t_t}}{P_{.7.a.t_t}} \right)^{\frac{1}{1-sigi.a}} \quad (182)$$

$$N_{.7.a.t_t} = N_{.a.t_t} omega_{N.7.a} \left(\frac{w_{.a.t_t}}{w_{.7.a.t_t}} \right)^{\frac{1}{1-upsi_{N.a}}} \quad (183)$$

$$K_{.7.a.t_t} = K_{.a.t_t} omega_{K.7.a} \left(\frac{rk_{.a.t_t+1}}{rk_{.7.a.t_t+1}} \right)^{\frac{1}{1-upsi_{K.a}}} \quad (184)$$

$$Y_{.7.a.t_t} P_{.7.a.t_t} = P_{.7.a.t_t} C_{.7.a.t_t} + P_{.7.a.t_t} I_{.7.a.t_t} + P_{.7.a.t_t} H_{.1.7.a.t_t} + P_{.7.a.t_t} H_{.2.7.a.t_t} + P_{.7.a.t_t} H_{.3.7.a.t_t} + P_{.7.a.t_t} H_{.4.7.a.t_t} \\ + P_{.7.a.t_t} H_{.5.7.a.t_t} + P_{.7.a.t_t} H_{.6.7.a.t_t} + P_{.7.a.t_t} H_{.7.7.a.t_t} + P_{.7.a.t_t} H_{.8.7.a.t_t} + P_{.7.a.t_t} H_{.9.7.a.t_t} + P_{.7.a.t_t} H_{.10.7.a.t_t} \quad (185)$$

$$Y_{.7.a.t_t} = epsi_{.a.t_t} epsi_{.7.a.t_t} (1 - Pen_{.7.a.t_t}) \left(N_{.7.a.t_t}^{alpha_{N.7.a}} K_{.7.a.t_t-1}^{1-alpha_{N.7.a}} \right)^{alpha_{H.7.a}} H_{.7.a.t_t}^{1-alpha_{H.7.a}} \quad (186)$$

$$EM_{cost.7.a.t_t} = P_{EM.a.t_t} (1 + shock_{epsi_{carb.int.a.t_t}}) carb_{int.7.a} \quad (187)$$

$$mc_{tild.7.a.t_t} = EM_{cost.7.a.t_t} + mc_{.7.a.t_t} \quad (188)$$

$$P_{.7.a.t_t} = mc_{tild.7.a.t_t} \quad (189)$$

$$w_{.7.a.t_t} = \frac{Y_{.7.a.t_t} mc_{.7.a.t_t} \alpha N_{.7.a} \alpha H_{.7.a}}{N_{.7.a.t_t}} \quad (190)$$

$$rk_{.7.a.t_t} = \frac{Y_{.7.a.t_t} mc_{.7.a.t_t} (1 - \alpha N_{.7.a}) \alpha H_{.7.a}}{K_{.7.a.t_t-1}} \quad (191)$$

$$PH_{.7.a.t_t} = \frac{Y_{.7.a.t_t} (1 - \alpha H_{.7.a}) mc_{.7.a.t_t}}{H_{.7.a.t_t}} \quad (192)$$

$$PH_{.7.a.t_t} = \left(Psi_{.7.1.a} P_{.1.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} + Psi_{.7.2.a} P_{.2.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} + Psi_{.7.3.a} P_{.3.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} + Psi_{.7.4.a} P_{.4.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} + Psi_{.7.5.a} P_{.5.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} \right. \\ \left. + Psi_{.7.6.a} P_{.6.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} + Psi_{.7.7.a} P_{.7.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} + Psi_{.7.8.a} P_{.8.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} + Psi_{.7.9.a} P_{.9.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} \right. \\ \left. + Psi_{.7.10.a} P_{.10.a.t_t}^{\frac{(-sigh_{.7.a})}{1-sigh_{.7.a}}} \right)^{\frac{(-1-sigh_{.7.a})}{sigh_{.7.a}}} \quad (193)$$

$$H_{.7.1.a.t_t} = H_{.7.a.t_t} Psi_{.7.1.a} \left(\frac{PH_{.7.a.t_t}}{P_{.1.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (194)$$

$$H_{.7.2.a.t_t} = H_{.7.a.t_t} Psi_{.7.2.a} \left(\frac{PH_{.7.a.t_t}}{P_{.2.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (195)$$

$$H_{.7.3.a.t_t} = H_{.7.a.t_t} Psi_{.7.3.a} \left(\frac{PH_{.7.a.t_t}}{P_{.3.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (196)$$

$$H_{.7.4.a.t_t} = H_{.7.a.t_t} Psi_{.7.4.a} \left(\frac{PH_{.7.a.t_t}}{P_{.4.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (197)$$

$$H_{.7.5.a.t_t} = H_{.7.a.t_t} Psi_{.7.5.a} \left(\frac{PH_{.7.a.t_t}}{P_{.5.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (198)$$

$$H_{.7.6.a.t_t} = H_{.7.a.t_t} Psi_{.7.6.a} \left(\frac{PH_{.7.a.t_t}}{P_{.6.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (199)$$

$$H_{.7.7.a.t_t} = H_{.7.a.t_t} Psi_{.7.7.a} \left(\frac{PH_{.7.a.t_t}}{P_{.7.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (200)$$

$$H_{.7.8.a.t_t} = H_{.7.a.t_t} Psi_{.7.8.a} \left(\frac{PH_{.7.a.t_t}}{P_{.8.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (201)$$

$$H_{.7.9.a.t_t} = H_{.7.a.t_t} Psi_{.7.9.a} \left(\frac{PH_{.7.a.t_t}}{P_{.9.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (202)$$

$$H_{.7.10.a.t_t} = H_{.7.a.t_t} Psi_{.7.10.a} \left(\frac{PH_{.7.a.t_t}}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigh_{.7.a}}} \quad (203)$$

$$\log \left(\frac{epsi_{.7.a.t_t}}{epsi_{.7.a.ts}} \right) = rho_{eps.a} \log \left(\frac{epsi_{.7.a.t_{t-1}}}{epsi_{.7.a.ts}} \right) + shock_{epsi_{.7.a.t_t}} \quad (204)$$

$$C_{.8.a.t_t} = C_{.a.t_t} Psi_{con.8.a} \left(\frac{1}{P_{.8.a.t_t}} \right)^{\frac{1}{1-sigc.a}} \quad (205)$$

$$I_{.8.a.t_t} = I_{.a.t_t} Psi_{inv.8.a} \left(\frac{PI_{.a.t_t}}{P_{.8.a.t_t}} \right)^{\frac{1}{1-sigi.a}} \quad (206)$$

$$N_{.8.a.t_t} = N_{.a.t_t} omega_{N.8.a} \left(\frac{w_{.a.t_t}}{w_{.8.a.t_t}} \right)^{\frac{1}{1-upsi_{N.a}}} \quad (207)$$

$$K_{.8.a.t_t} = K_{.a.t_t} omega_{K.8.a} \left(\frac{rk_{.a.t_{t+1}}}{rk_{.8.a.t_{t+1}}} \right)^{\frac{1}{1-upsi_{K.a}}} \quad (208)$$

$$Y_{.8.a.t_t} P_{.8.a.t_t} = P_{.8.a.t_t} C_{.8.a.t_t} + P_{.8.a.t_t} I_{.8.a.t_t} + P_{.8.a.t_t} H_{.1.8.a.t_t} + P_{.8.a.t_t} H_{.2.8.a.t_t} + P_{.8.a.t_t} H_{.3.8.a.t_t} + P_{.8.a.t_t} H_{.4.8.a.t_t} \\ + P_{.8.a.t_t} H_{.5.8.a.t_t} + P_{.8.a.t_t} H_{.6.8.a.t_t} + P_{.8.a.t_t} H_{.7.8.a.t_t} + P_{.8.a.t_t} H_{.8.8.a.t_t} + P_{.8.a.t_t} H_{.9.8.a.t_t} + P_{.8.a.t_t} H_{.10.8.a.t_t} \quad (209)$$

$$Y_{.8.a.t_t} = epsi_{.a.t_t} epsi_{.8.a.t_t} (1 - Pen_{.8.a.t_t}) \left(N_{.8.a.t_t}^{\alpha_{N.8.a}} K_{.8.a.t_{t-1}}^{1-\alpha_{N.8.a}} \right)^{\alpha_{H.8.a}} H_{.8.a.t_t}^{1-\alpha_{H.8.a}} \quad (210)$$

$$EM_{cost.8.a.t_t} = P_{EM.a.t_t} (1 + shock_{epsi_{carb.int.a.t_t}}) carb_{int.8.a} \quad (211)$$

$$mc_{tild.8.a.t_t} = EM_{cost.8.a.t_t} + mc_{.8.a.t_t} \quad (212)$$

$$P_{.8.a.t_t} = mc_{tild.8.a.t_t} \quad (213)$$

$$w_{.8.a.t_t} = \frac{Y_{.8.a.t_t} mc_{.8.a.t_t} \alpha_{N.8.a} \alpha_{H.8.a}}{N_{.8.a.t_t}} \quad (214)$$

$$rk_{.8.a.t_t} = \frac{Y_{.8.a.t_t} mc_{.8.a.t_t} (1 - \alpha_{N.8.a}) \alpha_{H.8.a}}{K_{.8.a.t_{t-1}}} \quad (215)$$

$$PH_{.8.a.t_t} = \frac{Y_{.8.a.t_t} (1 - \alpha_{H.8.a}) mc_{.8.a.t_t}}{H_{.8.a.t_t}} \quad (216)$$

$$\begin{aligned}
PH_{.8.a.t_t} = & \left(Psi_{.8.1.a} P_{.1.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} + Psi_{.8.2.a} P_{.2.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} + Psi_{.8.3.a} P_{.3.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} + Psi_{.8.4.a} P_{.4.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} + Psi_{.8.5.a} P_{.5.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} \right. \\
& + Psi_{.8.6.a} P_{.6.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} + Psi_{.8.7.a} P_{.7.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} + Psi_{.8.8.a} P_{.8.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} + Psi_{.8.9.a} P_{.9.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} \\
& \left. + Psi_{.8.10.a} P_{.10.a.t_t} \frac{(-sigh_{.8.a})}{1-sigh_{.8.a}} \right) \frac{(-1-sigh_{.8.a})}{sigh_{.8.a}} \quad (217)
\end{aligned}$$

$$H_{.8.1.a.t_t} = H_{.8.a.t_t} Psi_{.8.1.a} \left(\frac{PH_{.8.a.t_t}}{P_{.1.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (218)$$

$$H_{.8.2.a.t_t} = H_{.8.a.t_t} Psi_{.8.2.a} \left(\frac{PH_{.8.a.t_t}}{P_{.2.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (219)$$

$$H_{.8.3.a.t_t} = H_{.8.a.t_t} Psi_{.8.3.a} \left(\frac{PH_{.8.a.t_t}}{P_{.3.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (220)$$

$$H_{.8.4.a.t_t} = H_{.8.a.t_t} Psi_{.8.4.a} \left(\frac{PH_{.8.a.t_t}}{P_{.4.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (221)$$

$$H_{.8.5.a.t_t} = H_{.8.a.t_t} Psi_{.8.5.a} \left(\frac{PH_{.8.a.t_t}}{P_{.5.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (222)$$

$$H_{.8.6.a.t_t} = H_{.8.a.t_t} Psi_{.8.6.a} \left(\frac{PH_{.8.a.t_t}}{P_{.6.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (223)$$

$$H_{.8.7.a.t_t} = H_{.8.a.t_t} Psi_{.8.7.a} \left(\frac{PH_{.8.a.t_t}}{P_{.7.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (224)$$

$$H_{.8.8.a.t_t} = H_{.8.a.t_t} Psi_{.8.8.a} \left(\frac{PH_{.8.a.t_t}}{P_{.8.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (225)$$

$$H_{.8.9.a.t_t} = H_{.8.a.t_t} Psi_{.8.9.a} \left(\frac{PH_{.8.a.t_t}}{P_{.9.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (226)$$

$$H_{.8.10.a.t_t} = H_{.8.a.t_t} Psi_{.8.10.a} \left(\frac{PH_{.8.a.t_t}}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigh_{.8.a}}} \quad (227)$$

$$\log\left(\frac{\text{epsi}_8.a.t_t}{\text{epsi}_8.a.ts}\right) = \text{rho}_\text{epsi}_a \log\left(\frac{\text{epsi}_8.a.t_{t-1}}{\text{epsi}_8.a.ts}\right) + \text{shock}_\text{epsi}_8.a.t_t \quad (228)$$

$$C_9.a.t_t = C_a.t_t \text{Psi}_\text{con}_9.a \left(\frac{1}{P_9.a.t_t}\right)^{\frac{1}{1-\text{sigc}_a}} \quad (229)$$

$$I_9.a.t_t = I_a.t_t \text{Psi}_\text{inv}_9.a \left(\frac{PI_a.t_t}{P_9.a.t_t}\right)^{\frac{1}{1-\text{sigi}_a}} \quad (230)$$

$$N_9.a.t_t = N_a.t_t \text{omega}_N_9.a \left(\frac{w_a.t_t}{w_9.a.t_t}\right)^{\frac{1}{1-\text{upsi}_N_a}} \quad (231)$$

$$K_9.a.t_t = K_a.t_t \text{omega}_K_9.a \left(\frac{rk_a.t_{t+1}}{rk_9.a.t_{t+1}}\right)^{\frac{1}{1-\text{upsi}_K_a}} \quad (232)$$

$$Y_9.a.t_t P_9.a.t_t = P_9.a.t_t C_9.a.t_t + P_9.a.t_t I_9.a.t_t + P_9.a.t_t H_1.9.a.t_t + P_9.a.t_t H_2.9.a.t_t + P_9.a.t_t H_3.9.a.t_t + P_9.a.t_t H_4.9.a.t_t \\ + P_9.a.t_t H_5.9.a.t_t + P_9.a.t_t H_6.9.a.t_t + P_9.a.t_t H_7.9.a.t_t + P_9.a.t_t H_8.9.a.t_t + P_9.a.t_t H_9.9.a.t_t + P_9.a.t_t H_{10.9.a.t_t} \quad (233)$$

$$Y_9.a.t_t = \text{epsi}_a.t_t \text{epsi}_9.a.t_t (1 - \text{Pen}_9.a.t_t) \left(N_9.a.t_t^{\text{alpha}N_9.a} K_9.a.t_{t-1}^{1-\text{alpha}N_9.a}\right)^{\text{alpha}H_9.a} H_9.a.t_t^{1-\text{alpha}H_9.a} \quad (234)$$

$$EM_\text{cost}_9.a.t_t = P_\text{EM}_a.t_t (1 + \text{shock}_\text{epsi}_\text{carb.int}_a.t_t) \text{carb.int}_9.a \quad (235)$$

$$mc_\text{tild}_9.a.t_t = EM_\text{cost}_9.a.t_t + mc_9.a.t_t \quad (236)$$

$$P_9.a.t_t = mc_\text{tild}_9.a.t_t \quad (237)$$

$$w_9.a.t_t = \frac{Y_9.a.t_t mc_9.a.t_t \text{alpha}N_9.a \text{alpha}H_9.a}{N_9.a.t_t} \quad (238)$$

$$rk_9.a.t_t = \frac{Y_9.a.t_t mc_9.a.t_t (1 - \text{alpha}N_9.a) \text{alpha}H_9.a}{K_9.a.t_{t-1}} \quad (239)$$

$$PH_9.a.t_t = \frac{Y_9.a.t_t (1 - \text{alpha}H_9.a) mc_9.a.t_t}{H_9.a.t_t} \quad (240)$$

$$PH_9.a.t_t = \left(\text{Psi}_9.1.a P_1.a.t_t^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} + \text{Psi}_9.2.a P_2.a.t_t^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} + \text{Psi}_9.3.a P_3.a.t_t^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} + \text{Psi}_9.4.a P_4.a.t_t^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} + \text{Psi}_9.5.a P_5.a.t_t^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} \right. \\ \left. + \text{Psi}_9.6.a P_6.a.t_t^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} + \text{Psi}_9.7.a P_7.a.t_t^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} + \text{Psi}_9.8.a P_8.a.t_t^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} + \text{Psi}_9.9.a P_9.a.t_t^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} \right. \\ \left. + \text{Psi}_9.10.a P_{10.a.t_t}^{\frac{(-\text{sig}h_9.a)}{1-\text{sig}h_9.a}} \right)^{\frac{-(1-\text{sig}h_9.a)}{\text{sig}h_9.a}} \quad (241)$$

$$H_{.9.1.a.t_t} = H_{.9.a.t_t} Psi_{.9.1.a} \left(\frac{PH_{.9.a.t_t}}{P_{.1.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (242)$$

$$H_{.9.2.a.t_t} = H_{.9.a.t_t} Psi_{.9.2.a} \left(\frac{PH_{.9.a.t_t}}{P_{.2.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (243)$$

$$H_{.9.3.a.t_t} = H_{.9.a.t_t} Psi_{.9.3.a} \left(\frac{PH_{.9.a.t_t}}{P_{.3.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (244)$$

$$H_{.9.4.a.t_t} = H_{.9.a.t_t} Psi_{.9.4.a} \left(\frac{PH_{.9.a.t_t}}{P_{.4.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (245)$$

$$H_{.9.5.a.t_t} = H_{.9.a.t_t} Psi_{.9.5.a} \left(\frac{PH_{.9.a.t_t}}{P_{.5.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (246)$$

$$H_{.9.6.a.t_t} = H_{.9.a.t_t} Psi_{.9.6.a} \left(\frac{PH_{.9.a.t_t}}{P_{.6.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (247)$$

$$H_{.9.7.a.t_t} = H_{.9.a.t_t} Psi_{.9.7.a} \left(\frac{PH_{.9.a.t_t}}{P_{.7.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (248)$$

$$H_{.9.8.a.t_t} = H_{.9.a.t_t} Psi_{.9.8.a} \left(\frac{PH_{.9.a.t_t}}{P_{.8.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (249)$$

$$H_{.9.9.a.t_t} = H_{.9.a.t_t} Psi_{.9.9.a} \left(\frac{PH_{.9.a.t_t}}{P_{.9.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (250)$$

$$H_{.9.10.a.t_t} = H_{.9.a.t_t} Psi_{.9.10.a} \left(\frac{PH_{.9.a.t_t}}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigh_{.9.a}}} \quad (251)$$

$$\log \left(\frac{epsi_{.9.a.t_t}}{epsi_{.9.a.ts}} \right) = rho_{eps.a} \log \left(\frac{epsi_{.9.a.t_{t-1}}}{epsi_{.9.a.ts}} \right) + shock_{epsi_{.9.a.t_t}} \quad (252)$$

$$C_{.10.a.t_t} = C_{.a.t_t} Psi_{con.10.a} \left(\frac{1}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigc.a}} \quad (253)$$

$$I_{.10.a.t_t} = I_{.a.t_t} Psi_{inv.10.a} \left(\frac{PI_{.a.t_t}}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigt.a}} \quad (254)$$

$$N_{10.a.t_t} = N_{.a.t_t} \omega_{N_{10.a}} \left(\frac{w_{.a.t_t}}{w_{10.a.t_t}} \right)^{\frac{1}{1-\psi_{N.a}}} \quad (255)$$

$$K_{10.a.t_t} = K_{.a.t_t} \omega_{K_{10.a}} \left(\frac{rk_{.a.t_t+1}}{rk_{10.a.t_t+1}} \right)^{\frac{1}{1-\psi_{K.a}}} \quad (256)$$

$$Y_{10.a.t_t} P_{10.a.t_t} = P_{10.a.t_t} C_{10.a.t_t} + P_{10.a.t_t} I_{10.a.t_t} + P_{10.a.t_t} H_{1.10.a.t_t} + P_{10.a.t_t} H_{2.10.a.t_t} + P_{10.a.t_t} H_{3.10.a.t_t} + P_{10.a.t_t} H_{4.10.a.t_t} \\ + P_{10.a.t_t} H_{5.10.a.t_t} + P_{10.a.t_t} H_{6.10.a.t_t} + P_{10.a.t_t} H_{7.10.a.t_t} + P_{10.a.t_t} H_{8.10.a.t_t} + P_{10.a.t_t} H_{9.10.a.t_t} + P_{10.a.t_t} H_{10.10.a.t_t} \quad (257)$$

$$Y_{10.a.t_t} = \text{epsi}_{.a.t_t} \text{epsi}_{10.a.t_t} (1 - \text{Pen}_{10.a.t_t}) \left(N_{10.a.t_t}^{\alpha_{N_{10.a}}} K_{10.a.t_t-1}^{1-\alpha_{N_{10.a}}} \right)^{\alpha_{H_{10.a}}} H_{10.a.t_t}^{1-\alpha_{H_{10.a}}} \quad (258)$$

$$EM_{cost_{10.a.t_t}} = P_{EM_{.a.t_t}} (1 + \text{shock}_{\text{epsi}_{carb.int_{.a.t_t}}}) \text{carb.int}_{10.a} \quad (259)$$

$$mc_{tild_{10.a.t_t}} = EM_{cost_{10.a.t_t}} + mc_{10.a.t_t} \quad (260)$$

$$P_{10.a.t_t} = mc_{tild_{10.a.t_t}} \quad (261)$$

$$w_{10.a.t_t} = \frac{Y_{10.a.t_t} mc_{10.a.t_t} \alpha_{N_{10.a}} \alpha_{H_{10.a}}}{N_{10.a.t_t}} \quad (262)$$

$$rk_{10.a.t_t} = \frac{Y_{10.a.t_t} mc_{10.a.t_t} (1 - \alpha_{N_{10.a}}) \alpha_{H_{10.a}}}{K_{10.a.t_t-1}} \quad (263)$$

$$PH_{10.a.t_t} = \frac{Y_{10.a.t_t} (1 - \alpha_{H_{10.a}}) mc_{10.a.t_t}}{H_{10.a.t_t}} \quad (264)$$

$$PH_{10.a.t_t} = \left(\text{Psi}_{10.1.a} P_{1.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} + \text{Psi}_{10.2.a} P_{2.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} + \text{Psi}_{10.3.a} P_{3.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} + \text{Psi}_{10.4.a} P_{4.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} + \text{Psi}_{10.5.a} P_{5.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} \right. \\ \left. + \text{Psi}_{10.6.a} P_{6.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} + \text{Psi}_{10.7.a} P_{7.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} + \text{Psi}_{10.8.a} P_{8.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} + \text{Psi}_{10.9.a} P_{9.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} \right. \\ \left. + \text{Psi}_{10.10.a} P_{10.a.t_t}^{\frac{(-\text{sig}h_{10.a})}{1-\text{sig}h_{10.a}}} \right)^{\frac{-(1-\text{sig}h_{10.a})}{\text{sig}h_{10.a}}} \quad (265)$$

$$H_{10.1.a.t_t} = H_{10.a.t_t} \text{Psi}_{10.1.a} \left(\frac{PH_{10.a.t_t}}{P_{1.a.t_t}} \right)^{\frac{1}{1-\text{sig}h_{10.a}}} \quad (266)$$

$$H_{10.2.a.t_t} = H_{10.a.t_t} \text{Psi}_{10.2.a} \left(\frac{PH_{10.a.t_t}}{P_{2.a.t_t}} \right)^{\frac{1}{1-\text{sig}h_{10.a}}} \quad (267)$$

$$H_{.10.3.a.t_t} = H_{.10.a.t_t} Psi_{.10.3.a} \left(\frac{PH_{.10.a.t_t}}{P_{.3.a.t_t}} \right)^{\frac{1}{1-sigh_{.10.a}}} \quad (268)$$

$$H_{.10.4.a.t_t} = H_{.10.a.t_t} Psi_{.10.4.a} \left(\frac{PH_{.10.a.t_t}}{P_{.4.a.t_t}} \right)^{\frac{1}{1-sigh_{.10.a}}} \quad (269)$$

$$H_{.10.5.a.t_t} = H_{.10.a.t_t} Psi_{.10.5.a} \left(\frac{PH_{.10.a.t_t}}{P_{.5.a.t_t}} \right)^{\frac{1}{1-sigh_{.10.a}}} \quad (270)$$

$$H_{.10.6.a.t_t} = H_{.10.a.t_t} Psi_{.10.6.a} \left(\frac{PH_{.10.a.t_t}}{P_{.6.a.t_t}} \right)^{\frac{1}{1-sigh_{.10.a}}} \quad (271)$$

$$H_{.10.7.a.t_t} = H_{.10.a.t_t} Psi_{.10.7.a} \left(\frac{PH_{.10.a.t_t}}{P_{.7.a.t_t}} \right)^{\frac{1}{1-sigh_{.10.a}}} \quad (272)$$

$$H_{.10.8.a.t_t} = H_{.10.a.t_t} Psi_{.10.8.a} \left(\frac{PH_{.10.a.t_t}}{P_{.8.a.t_t}} \right)^{\frac{1}{1-sigh_{.10.a}}} \quad (273)$$

$$H_{.10.9.a.t_t} = H_{.10.a.t_t} Psi_{.10.9.a} \left(\frac{PH_{.10.a.t_t}}{P_{.9.a.t_t}} \right)^{\frac{1}{1-sigh_{.10.a}}} \quad (274)$$

$$H_{.10.10.a.t_t} = H_{.10.a.t_t} Psi_{.10.10.a} \left(\frac{PH_{.10.a.t_t}}{P_{.10.a.t_t}} \right)^{\frac{1}{1-sigh_{.10.a}}} \quad (275)$$

$$\log \left(\frac{epsi_{.10.a.t_t}}{epsi_{.10.a.ts}} \right) = rho_{eps.a} \log \left(\frac{epsi_{.10.a.t_{t-1}}}{epsi_{.10.a.ts}} \right) + shock_{epsi_{.10.a.t_t}} \quad (276)$$

$$\frac{pi_{ppi_{.1.a.t_t}}}{pi_{ppi_{.2.a.t_t}}} = \frac{P_{.1.a.t_t}}{P_{.2.a.t_t}} \frac{P_{.2.a.t_{t-1}}}{P_{.1.a.t_{t-1}}} \quad (277)$$

$$\frac{pi_{ppi_{.1.a.t_t}}}{pi_{ppi_{.3.a.t_t}}} = \frac{P_{.1.a.t_t}}{P_{.3.a.t_t}} \frac{P_{.3.a.t_{t-1}}}{P_{.1.a.t_{t-1}}} \quad (278)$$

$$\frac{pi_{ppi_{.1.a.t_t}}}{pi_{ppi_{.4.a.t_t}}} = \frac{P_{.1.a.t_t}}{P_{.4.a.t_t}} \frac{P_{.4.a.t_{t-1}}}{P_{.1.a.t_{t-1}}} \quad (279)$$

$$\frac{pi_{ppi_{.1.a.t_t}}}{pi_{ppi_{.5.a.t_t}}} = \frac{P_{.1.a.t_t}}{P_{.5.a.t_t}} \frac{P_{.5.a.t_{t-1}}}{P_{.1.a.t_{t-1}}} \quad (280)$$

$$\frac{pi_ppi_1.a.t_t}{pi_ppi_6.a.t_t} = \frac{P_1.a.t_t}{P_6.a.t_t} \frac{P_6.a.t_{t-1}}{P_1.a.t_{t-1}} \quad (281)$$

$$\frac{pi_ppi_1.a.t_t}{pi_ppi_7.a.t_t} = \frac{P_1.a.t_t}{P_7.a.t_t} \frac{P_7.a.t_{t-1}}{P_1.a.t_{t-1}} \quad (282)$$

$$\frac{pi_ppi_1.a.t_t}{pi_ppi_8.a.t_t} = \frac{P_1.a.t_t}{P_8.a.t_t} \frac{P_8.a.t_{t-1}}{P_1.a.t_{t-1}} \quad (283)$$

$$\frac{pi_ppi_1.a.t_t}{pi_ppi_9.a.t_t} = \frac{P_1.a.t_t}{P_9.a.t_t} \frac{P_9.a.t_{t-1}}{P_1.a.t_{t-1}} \quad (284)$$

$$\frac{pi_ppi_1.a.t_t}{pi_ppi_10.a.t_t} = \frac{P_1.a.t_t}{P_10.a.t_t} \frac{P_10.a.t_{t-1}}{P_1.a.t_{t-1}} \quad (285)$$

$$Y_{.a.t_t} = Y_{.10.a.t_t} + Y_{.9.a.t_t} + Y_{.8.a.t_t} + Y_{.7.a.t_t} + Y_{.6.a.t_t} + Y_{.5.a.t_t} + Y_{.4.a.t_t} + Y_{.3.a.t_t} + Y_{.1.a.t_t} + Y_{.2.a.t_t} \quad (286)$$