

Appendix 1

Rewriting the economic growth rate to solve the $g_C = \frac{\beta(1-P\eta-\mu)/P\eta-\rho}{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]}$ and partial differentiate with different independent variables, X , results in the following:

$$\partial g_C / \partial X$$

$$\frac{\partial g_C}{\partial \varepsilon_\phi} = [\beta(1-P\eta-\mu)/P\eta-\rho] \cdot -\{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]\}^{-2} \cdot (\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma) < 0$$

$$\frac{\partial g_C}{\partial \sigma} = [\beta(1-P\eta-\mu)/P\eta-\rho] \cdot -\{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]\}^{-2} \cdot (1+2\varepsilon_\phi\delta\sigma\omega-2\varepsilon_\phi\delta\sigma\gamma - \varepsilon_\phi\delta\omega + \varepsilon_\phi\delta\gamma) < 0$$

$$\frac{\partial g_C}{\partial \rho} = \frac{-1}{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]} < 0$$

$$\frac{\partial g_C}{\partial \beta} = \frac{(1-P\eta-\mu)/P\eta}{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]} > 0$$

$$\frac{\partial g_C}{\partial P} = \frac{-\beta(1-\mu)/P^2\eta}{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]} < 0$$

$$\frac{\partial g_C}{\partial \eta} = \frac{-\beta(1-\mu)/P\eta^2}{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]} < 0$$

$$\frac{\partial g_C}{\partial \mu} = \frac{-\beta/P}{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]} < 0$$

$$\frac{\partial g_C}{\partial \omega} = [\beta(1-P\eta-\mu)/P\eta-\rho] \cdot -\{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]\}^{-2} \cdot (\delta\sigma-\delta)\varepsilon_\phi < 0$$

$$\frac{\partial g_C}{\partial \gamma} = [\beta(1-P\eta-\mu)/P\eta-\rho] \cdot -\{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]\}^{-2} \cdot (\delta\sigma-\delta)\varepsilon_\phi > 0$$

$$\frac{\partial g_C}{\partial \delta} = [\beta(1-P\eta-\mu)/P\eta-\rho] \cdot -\{\sigma[1+(\delta\sigma-\delta)\varepsilon_\phi(\omega-\gamma)]\}^{-2} \cdot (\sigma-1)\varepsilon_\phi(\omega-\gamma) < 0$$

Appendix 2

Year	Energy intensity (LOE/NT\$1,000)	Annual gains (%)
1995	9.61	-0.37
1996	9.47	
1997	9.33	
1998	9.47	
1999	9.30	
2000	9.43	
2001	10.08	-0.021
2002	9.97	
2003	9.95	
2004	9.73	
2005	9.42	
2006	9.10	
2007	8.96	-2.67
2008	8.64	
2009	8.60	
2010	8.25	
2011	7.84	
2012	7.66	-2.23
2013	7.67	
2014	7.43	
2015	7.37	