

A Sensitivity Analysis

A.1 Case I

$$\frac{\partial w_g}{\partial \delta} = \frac{\left(-2(\delta^2 - 4)c_g + 2(2(\delta - 4)\delta + 9)c_n + \delta(32 - 7\delta) + 2(\delta^2 - 4)G_s \right)}{(\delta(4\delta - 17) + 16)^2} \geq 0 \quad (\text{A.1})$$

$$\frac{\partial w_g}{\partial c_n} = \frac{2 - \delta}{\delta(4\delta - 17) + 16} > 0 \quad (\text{A.2})$$

$$\frac{\partial w_g}{\partial c_g} = \frac{2(\delta - 2)^2}{\delta(4\delta - 17) + 16} > 0 \quad (\text{A.3})$$

$$\frac{\partial w_g}{\partial G_t} = \frac{2 - \delta}{\delta(4\delta - 17) + 16} > 0 \quad (\text{A.4})$$

$$\frac{\partial w_g}{\partial G_s} = \frac{\delta(2\delta - 9) + 8}{\delta(4\delta - 17) + 16} > 0 \quad (\text{A.5})$$

$$\frac{\partial w_n}{\partial \delta} = \frac{\left((\delta(9\delta - 32) + 32)c_g - 2(\delta^2 - 4)c_n + 4(\delta - 2)(\delta(\delta(2\delta - 13) + 26) - 12) + ((32 - 9\delta)\delta - 32)G_s - 2\delta^2 G_t + 8G_t \right)}{(\delta(4\delta - 17) + 16)^2} \geq 0 \quad (\text{A.6})$$

$$\frac{\partial w_n}{\partial c_n} = \frac{2(\delta - 2)^2}{\delta(4\delta - 17) + 16} > 0 \quad (\text{A.7})$$

$$\frac{\partial w_n}{\partial c_g} = -\frac{(\delta - 2)\delta}{\delta(4\delta - 17) + 16} > 0 \quad (\text{A.8})$$

$$\frac{\partial w_n}{\partial G_t} = \frac{2(\delta - 2)^2}{\delta(4\delta - 17) + 16} > 0 \quad (\text{A.9})$$

$$\frac{\partial w_n}{\partial G_s} = \frac{(\delta - 2)\delta}{\delta(4\delta - 17) + 16} < 0 \quad (\text{A.10})$$

$$\frac{\partial m_{Rg}}{\partial \delta} = \frac{\left(2(\delta(\delta(\delta(7\delta - 64) + 213) - 304) + 160)c_g + 4(\delta - 2)(\delta((\delta - 6)\delta + 12) - 10)c_n + \delta(\delta((264 - 31\delta)\delta - 822) + 1120) - 2(\delta(\delta(\delta(7\delta - 64) + 213) - 304) + 160)G_s + 4\delta(\delta((\delta - 8)\delta + 24) - 34)G_t + 80G_t - 576 \right)}{(\delta - 4)^2(\delta(4\delta - 17) + 16)^2} \geq 0 \quad (\text{A.11})$$

$$\frac{\partial m_{Rg}}{\partial c_n} = -\frac{(\delta - 2)^2}{(\delta - 4)(\delta(4\delta - 17) + 16)} > 0 \quad (\text{A.12})$$

$$\frac{\partial m_{Rg}}{\partial c_g} = -\frac{(\delta - 2)(\delta(2\delta - 9) + 8)}{(\delta - 4)(\delta(4\delta - 17) + 16)} < 0 \quad (\text{A.13})$$

$$\frac{\partial m_{Rg}}{\partial G_t} = -\frac{(\delta - 2)^2}{(\delta - 4)(\delta(4\delta - 17) + 16)} > 0 \quad (\text{A.14})$$

$$\frac{\partial m_{Rg}}{\partial G_s} = -\frac{2(\delta-3)((\delta-7)\delta+8)}{(\delta-4)(\delta(4\delta-17)+16)} < 0 \quad (\text{A.15})$$

$$\frac{\partial m_{Rn}}{\partial \delta} = \frac{\begin{pmatrix} (\delta-2)(\delta(17(\delta-6)\delta+192)-128)c_g \\ +2(\delta(\delta(\delta(7\delta-64)+213)-304)+160)c_n \\ -(\delta-2)(\delta(17(\delta-6)\delta+192)-128)G_s \\ +2\delta(\delta(\delta(7\delta-64)+213)-304)G_t \\ +4(\delta(\delta(\delta(\delta(2\delta-33)+203)-608)+939)-704)+80G_t+192 \end{pmatrix}}{(\delta-4)^2(\delta(4\delta-17)+16)^2} \geq 0 \quad (\text{A.16})$$

$$\frac{\partial m_{Rn}}{\partial c_n} = \frac{(\delta-2)((9-2\delta)\delta-8)}{(\delta-4)(\delta(4\delta-17)+16)} < 0 \quad (\text{A.17})$$

$$\frac{\partial m_{Rn}}{\partial c_g} = -\frac{(\delta-2)^2\delta}{(\delta-4)(\delta(4\delta-17)+16)} > 0 \quad (\text{A.18})$$

$$\frac{\partial m_{Rn}}{\partial G_t} = \frac{(\delta-2)((9-2\delta)\delta-8)}{(\delta-4)(\delta(4\delta-17)+16)} < 0 \quad (\text{A.19})$$

$$\frac{\partial m_{Rn}}{\partial G_s} = \frac{(\delta-2)^2\delta}{(\delta-4)(\delta(4\delta-17)+16)} < 0 \quad (\text{A.20})$$

$$\frac{\partial D_g}{\partial \delta} = \frac{\begin{pmatrix} (\delta(\delta(\delta(-8(\delta-13)\delta-559)+1588)-2510)+2080)-704)c_g \\ -(\delta-2)(\delta(\delta(8\delta-69)+222)-320)+168)c_n \\ +2(\delta(\delta(6\delta^2-56\delta+201)-336)+224)(\delta-1)^2 \\ +(\delta(\delta(\delta(8\delta-13)\delta+559)-1588)+2510)-2080+704)G_s \\ +\delta(\delta((85-8\delta)\delta-360)+764)-808)G_t+336G_t \end{pmatrix}}{(\delta-4)^2(\delta-1)^2(\delta(4\delta-17)+16)^2} \geq 0 \quad (\text{A.21})$$

$$\frac{\partial D_g}{\partial c_n} = \frac{(\delta-2)^2}{(\delta-4)(\delta-1)(\delta(4\delta-17)+16)} > 0 \quad (\text{A.22})$$

$$\frac{\partial D_g}{\partial c_g} = \frac{(\delta-2)(\delta(2\delta-9)+8)}{(\delta-4)(\delta-1)(\delta(4\delta-17)+16)} < 0 \quad (\text{A.23})$$

$$\frac{\partial D_g}{\partial G_t} = \frac{(\delta-2)^2}{(\delta-4)(\delta-1)(\delta(4\delta-17)+16)} > 0 \quad (\text{A.24})$$

$$\frac{\partial D_g}{\partial G_s} = \frac{(\delta-2)((9-2\delta)\delta-8)}{(\delta-4)(\delta-1)(\delta(4\delta-17)+16)} > 0 \quad (\text{A.25})$$

$$\frac{\partial D_n}{\partial \delta} = \frac{\begin{pmatrix} (-((\delta-2)(\delta(\delta(8\delta-69)+222)-320)+168)\delta^2 c_g) \\ +(\delta(\delta(\delta(4431-2\delta(\delta(8\delta-115)+689)) \\ -8196)+8632)-4736)+1024)c_n \\ +\delta^2(2(\delta(\delta(4(\delta-10)\delta+153)-268)+184)(\delta-1)^2 \\ +(\delta-2)(\delta(\delta(8\delta-69)+222)-320)+168)G_s) \\ +(\delta(\delta(\delta(4431-2\delta(\delta(8\delta-115)+689)) \\ -8196)+8632)-4736)+1024)G_t \end{pmatrix}}{(\delta-4)^2(\delta-1)^2\delta^2(\delta(4\delta-17)+16)^2} \geq 0 \quad (\text{A.26})$$

$$\frac{\partial D_n}{\partial c_n} = \frac{(\delta - 2)(\delta(2\delta - 9) + 8)}{(\delta - 4)(\delta - 1)\delta(\delta(4\delta - 17) + 16)} < 0 \quad (\text{A.27})$$

$$\frac{\partial D_n}{\partial c_g} = \frac{(\delta - 2)^2}{(\delta - 4)(\delta - 1)(\delta(4\delta - 17) + 16)} > 0 \quad (\text{A.28})$$

$$\frac{\partial D_n}{\partial G_t} = \frac{(\delta - 2)(\delta(2\delta - 9) + 8)}{(\delta - 4)(\delta - 1)\delta(\delta(4\delta - 17) + 16)} < 0 \quad (\text{A.29})$$

$$\frac{\partial D_n}{\partial G_s} = -\frac{(\delta - 2)^2}{(\delta - 4)(\delta - 1)(\delta(4\delta - 17) + 16)} < 0 \quad (\text{A.30})$$

A.2 Case II

$$\frac{\partial w_g}{\partial \delta} = \frac{\left(\begin{aligned} & (2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \\ & \cdot (4(\gamma - 1)(\delta - 2)(\delta(4\delta - 19) + 18)\eta Cap_{g0} \\ & + 2(\delta - 2)(\delta(4\delta - 19) + 18)c_g \\ & + c_n(-4(\gamma - 1)(\delta - 2)\eta - 3\delta^2 + 14\delta - 14) + 12\gamma\delta^2\eta G_s \\ & - 52\gamma\delta\eta G_s + 52\gamma\eta G_s - 12\delta^2\eta G_s + 8\delta^3 G_s - 57\delta^2 G_s + 52\delta\eta G_s \\ & + 122\delta G_s - 52\eta G_s - 76G_s - 4\gamma\delta\eta G_t \\ & + 2((\gamma - 1)(\delta(9\delta - 34) + 30)\eta + 3(\delta - 2)(\delta - 1)(2\delta - 7) - 7G_t) \\ & + 8\gamma\eta G_t - 3\delta^2 G_t + 4\delta\eta G_t + 14\delta G_t - 8\eta G_t) \\ & - (4(\gamma - 1)(\delta(3\delta - 13) + 13)\eta + 16\delta^3 - 111\delta^2 + 234\delta - 148) \\ & \cdot (4(\gamma - 1)(\delta - 4)(\delta - 2)^2(\delta - 1)\eta Cap_{g0} \\ & + (\delta - 1)(3\delta - 8)(2(\gamma - 1)(\delta - 2)\eta + \delta^2 - 5\delta + 4) \\ & + 2(\delta - 4)(\delta - 2)^2(\delta - 1)c_g \\ & - (\delta - 2)c_n(2(\gamma - 1)(\delta - 2)\eta + \delta^2 - 5\delta + 4) + 4\gamma\delta^3\eta G_s \\ & - 26\gamma\delta^2\eta G_s + 52\gamma\delta\eta G_s - 32\gamma\eta G_s - 4\delta^3\eta G_s + 26\delta^2\eta G_s + 2\delta^4 G_s \\ & - 19\delta^3 G_s + 61\delta^2 G_s - 52\delta\eta G_s - 76\delta G_s + 32\eta G_s + 32G_s \\ & - 2\gamma\delta^2\eta G_t + 8\gamma\delta\eta G_t - 8\gamma\eta G_t + 2\delta^2\eta G_t - \delta^3 G_t + 7\delta^2 G_t \\ & - 8\delta\eta G_t - 14\delta G_t + 8\eta G_t + 8G_t) \end{aligned} \right)}{\left(\begin{aligned} & (2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta \\ & + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \end{aligned} \right)} \quad (\text{A.31})$$

$$\geq 0 \quad (\text{A.31})$$

$$\frac{\partial w_g}{\partial c_n} = -\frac{(\delta - 2)(2(\gamma - 1)(\delta - 2)\eta + \delta^2 - 5\delta + 4)}{2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.32})$$

$$\frac{\partial w_g}{\partial c_g} = \frac{2(\delta - 4)(\delta - 2)^2(\delta - 1)}{2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.33})$$

$$\frac{\partial w_g}{\partial \eta} = \frac{\begin{pmatrix} 4(\gamma-1)(\delta-4)(\delta-2)^2(\delta-1) \\ \cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ - (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta) \\ + ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8) \end{pmatrix}}{\begin{pmatrix} (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta \\ + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \end{pmatrix}} \geq 0 \quad (\text{A.34})$$

$$\frac{\partial w_g}{\partial Cap_{g0}} = \frac{4(\gamma-1)(\delta-4)(\delta-2)^2(\delta-1)\eta}{\begin{pmatrix} 2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta \\ + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64 \end{pmatrix}} < 0 \quad (\text{A.35})$$

$$\frac{\partial w_g}{\partial \gamma} = \frac{\begin{pmatrix} 4(\delta-4)(\delta-2)^2(\delta-1)\eta \\ \cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ - (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta) \\ + ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8) \end{pmatrix}}{\begin{pmatrix} (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta \\ + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \end{pmatrix}} \geq 0 \quad (\text{A.36})$$

$$\frac{\partial w_g}{\partial G_t} = -\frac{2(\gamma-1)(\delta-2)^2\eta + \delta^3 - 7\delta^2 + 14\delta - 8}{\begin{pmatrix} 2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta \\ + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64 \end{pmatrix}} > 0 \quad (\text{A.37})$$

$$\frac{\partial w_g}{\partial G_s} = \frac{(\delta(2\delta-9)+8)(2(\gamma-1)(\delta-2)\eta + \delta^2 - 5\delta + 4)}{\begin{pmatrix} 2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta \\ + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64 \end{pmatrix}} > 0 \quad (\text{A.38})$$

$$\frac{\partial w_n}{\partial \delta} = \frac{\begin{pmatrix} (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \\ \cdot (-2(\gamma-1)(\delta(4\delta-21)+28)-8)\eta Cap_{g0} \\ + (\delta((21-4\delta)\delta-28)+8)c_g \\ + 2(\delta-2)c_n(3(\gamma-1)(\delta-2)\eta + 4\delta^2 - 19\delta + 18) + 4\delta^3 G_s \\ - 21\delta^2 G_s + 28\delta G_s - 8G_s + 6\gamma\delta^2\eta G_t \\ + 2((\gamma-1)(\delta(4\delta-21)+28)-8)\eta + 5\delta^4 - 36\delta^3 \\ + 81\delta^2 - 62\delta - 36G_t + 12) - 24\gamma\delta\eta G_t + 24\gamma\eta G_t - 6\delta^2\eta G_t \\ + 8\delta^3 G_t - 54\delta^2 G_t + 24\delta\eta G_t + 112\delta G_t - 24\eta G_t) \\ - (4(\gamma-1)(\delta(3\delta-13)+13)\eta + 16\delta^3 - 111\delta^2 + 234\delta - 148) \\ \cdot (-2(\gamma-1)(\delta-4)(\delta-2)(\delta-1)\delta\eta Cap_{g0} \\ + 2(\delta-4)(\delta-1)\delta((\gamma-1)(\delta-2)\eta + \delta^2 - 4\delta + 3) \\ - (\delta-4)(\delta-2)(\delta-1)\delta c_g \\ + 2(\delta-2)^2 c_n((\gamma-1)(\delta-2)\eta + \delta^2 - 5\delta + 4) + \delta^4 G_s - 7\delta^3 G_s \\ + 14\delta^2 G_s - 8\delta G_s + 2\gamma\delta^3\eta G_t - 12\gamma\delta^2\eta G_t + 24\gamma\delta\eta G_t - 16\gamma\eta G_t \\ - 2\delta^3\eta G_t + 12\delta^2\eta G_t + 2\delta^4 G_t - 18\delta^3 G_t + 56\delta^2 G_t - 24\delta\eta G_t \\ - 72\delta G_t + 16\eta G_t + 32G_t) \end{pmatrix}}{(2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2} \geq 0 \quad (\text{A.39})$$

$$\frac{\partial w_n}{\partial c_n} = \frac{2(\delta-2)^2((\gamma-1)(\delta-2)\eta + \delta^2 - 5\delta + 4)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64}$$

$$> 0 \quad (\text{A.40})$$

$$\frac{\partial w_n}{\partial c_g} = - \frac{(\delta - 4)(\delta - 2)(\delta - 1)\delta}{2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.41})$$

$$\frac{\partial w_n}{\partial \eta} = - \frac{\begin{pmatrix} 2(\gamma - 1)(\delta - 4)(\delta - 2)(\delta - 1)\delta \\ \cdot ((\delta - 4)(\delta - 1)(\delta(4\delta - 17) + 16)Cap_{g0} \\ - (\delta - 2)((\delta(2\delta - 9) + 8)c_g + (\delta - 2)c_n - 3\delta^2 + 11\delta) \\ + ((9 - 2\delta)\delta - 8)G_s + \delta G_t - 2G_t - 8) \end{pmatrix}}{\left((2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \right)} \geq 0 \quad (\text{A.42})$$

$$\frac{\partial w_n}{\partial Cap_{g0}} = - \frac{2(\gamma - 1)(\delta - 4)(\delta - 2)(\delta - 1)\delta\eta}{\left((2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \right)} < 0 \quad (\text{A.43})$$

$$\frac{\partial w_n}{\partial \gamma} = - \frac{\begin{pmatrix} 2(\delta - 4)(\delta - 2)(\delta - 1)\delta\eta \\ \cdot ((\delta - 4)(\delta - 1)(\delta(4\delta - 17) + 16)Cap_{g0} \\ - (\delta - 2)((\delta(2\delta - 9) + 8)c_g + (\delta - 2)c_n - 3\delta^2 + 11\delta) \\ + ((9 - 2\delta)\delta - 8)G_s + \delta G_t - 2G_t - 8) \end{pmatrix}}{\left((2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \right)} \geq 0 \quad (\text{A.44})$$

$$\frac{\partial w_n}{\partial G_t} = \frac{2(\delta - 2)^2 ((\gamma - 1)(\delta - 2)\eta + \delta^2 - 5\delta + 4)}{\left((2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \right)} > 0 \quad (\text{A.45})$$

$$\frac{\partial w_n}{\partial G_s} = \frac{(\delta - 4)(\delta - 2)(\delta - 1)\delta}{\left((2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \right)} < 0 \quad (\text{A.46})$$

$$\frac{\partial m_{Rg}}{\partial \delta} = \frac{\begin{pmatrix} 2(-2(\gamma - 1)\eta Cap_{g0}((\gamma - 1)(\delta - 2)^2 \\ \cdot (\delta(2\delta - 9) + 8)^2\eta - (\delta - 1)^2(\delta(\delta(7\delta - 64) + 213) - 304) + 160)) \\ + G_s((\gamma - 1)(\delta - 2)^2(\delta(2\delta - 9) + 8)^2\eta \\ - (\delta - 1)^2(\delta(\delta(7\delta - 64) + 213) - 304) + 160)) \\ + G_t((\gamma - 1)(\delta(3\delta - 8) + 6)(\delta - 2)^2\eta \\ + 2\delta(\delta(\delta((\delta - 10)\delta + 41) - 90) + 112) - 74)) \\ + (\delta - 1)(4(\gamma - 1)(\delta - 2)^3(3(\delta - 6)\delta + 20)\eta \\ - (\delta - 1)(\delta(\delta(31\delta - 264) + 822) - 1120) + 576)) \\ - 2c_g((\gamma - 1)(\delta - 2)^2(\delta(2\delta - 9) + 8)^2\eta \\ - (\delta - 1)^2(\delta(\delta(7\delta - 64) + 213) - 304) + 160)) \\ + 2(\delta - 2)c_n((\gamma - 1)(\delta - 2)(\delta(3\delta - 8) + 6)\eta \\ + 2(\delta((\delta - 6)\delta + 12) - 10)(\delta - 1)^2) + 80G_t \end{pmatrix}}{(2(\gamma - 1)(\delta - 2)(\delta(2\delta - 9) + 8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2} \geq 0 \quad (\text{A.47})$$

$$\frac{\partial m_{Rg}}{\partial c_n} = -\frac{(\delta-2)^2(\delta-1)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64} > 0 \quad (\text{A.48})$$

$$\frac{\partial m_{Rg}}{\partial c_g} = -\frac{(\delta-2)(\delta-1)(\delta(2\delta-9)+8)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64} < 0 \quad (\text{A.49})$$

$$\frac{\partial m_{Rg}}{\partial \eta} = -\frac{\left(\begin{aligned} &2(\gamma-1)(\delta-2)(\delta-1)(\delta(2\delta-9)+8) \\ &\cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ &- (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta) \\ &+ ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8) \end{aligned} \right)}{\left((2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \right)} \geq 0 \quad (\text{A.50})$$

$$\frac{\partial m_{Rg}}{\partial Cap_{g0}} = -\frac{2(\gamma-1)(\delta-2)(\delta-1)(\delta(2\delta-9)+8)\eta}{\left((2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \right)} > 0 \quad (\text{A.51})$$

$$\frac{\partial m_{Rg}}{\partial \gamma} = -\frac{\left(\begin{aligned} &2(\delta-2)(\delta-1)(\delta(2\delta-9)+8)\eta \\ &\cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ &- (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta) \\ &+ ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8) \end{aligned} \right)}{\left((2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \right)} \geq 0 \quad (\text{A.52})$$

$$\frac{\partial m_{Rg}}{\partial G_t} = -\frac{(\delta-2)^2(\delta-1)}{\left((2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \right)} > 0 \quad (\text{A.53})$$

$$\frac{\partial m_{Rg}}{\partial G_s} = \frac{-2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta - 2(\delta-3)(\delta-1)((\delta-7)\delta+8)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64} < 0 \quad (\text{A.54})$$

$$\frac{\partial m_{Rn}}{\partial \delta} = \frac{\left(\begin{aligned} &(\delta-2)(\delta-1)(2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4 \\ &-37\delta^3+117\delta^2-148\delta+64) \\ &\cdot (-4(\gamma-1)(\delta-1)\eta Cap_{g0}+4(\gamma-1)(\delta-1)\eta-2(\delta-1)c_g \\ &+c_n(-2\gamma\eta-4\delta+2\eta+9)+6\delta^2-16\delta+2\delta G_s-2G_s-2\gamma\eta G_t \\ &-4\delta G_t+2\eta G_t+9G_t+6)+(\delta-2) \\ &\cdot (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64) \\ &\cdot (-2(\gamma-1)(\delta-2)\delta\eta Cap_{g0} \\ &+2\delta((\gamma-1)(\delta-2)\eta+(\delta-3)(\delta-1))-(\delta-2)\delta c_g \\ &+c_n(-2(\gamma-1)(\delta-2)\eta-2\delta^2+9\delta-8)+\delta^2 G_s-2\delta G_s \\ &-2\gamma\delta\eta G_t+4\gamma\eta G_t-2\delta^2 G_t+2\delta\eta G_t+9\delta G_t-4\eta G_t-8G_t) \\ &+(\delta-1) \\ &\cdot (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64) \\ &\cdot (-2(\gamma-1)(\delta-2)\delta\eta Cap_{g0}+2\delta((\gamma-1)(\delta-2)\eta+(\delta-3)(\delta-1)) \\ &-(\delta-2)\delta c_g+c_n(-2(\gamma-1)(\delta-2)\eta-2\delta^2+9\delta-8)+\delta^2 G_s \\ &-2\delta G_s-2\gamma\delta\eta G_t+4\gamma\eta G_t-2\delta^2 G_t+2\delta\eta G_t+9\delta G_t-4\eta G_t-8G_t) \\ &-(\delta-2)(\delta-1) \\ &\cdot (4(\gamma-1)(\delta(3\delta-13)+13)\eta+16\delta^3-111\delta^2+234\delta-148) \\ &\cdot (-2(\gamma-1)(\delta-2)\delta\eta Cap_{g0}+2\delta((\gamma-1)(\delta-2)\eta+(\delta-3)(\delta-1)) \\ &-(\delta-2)\delta c_g+c_n(-2(\gamma-1)(\delta-2)\eta-2\delta^2+9\delta-8)+\delta^2 G_s \\ &-2\delta G_s-2\gamma\delta\eta G_t+4\gamma\eta G_t-2\delta^2 G_t+2\delta\eta G_t+9\delta G_t-4\eta G_t-8G_t) \end{aligned} \right)}{(2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64)^2} \geq 0 \quad (\text{A.55})$$

$$\frac{\partial m_{Rn}}{\partial c_n} = \frac{(\delta-2)(\delta-1)(-2(\gamma-1)(\delta-2)\eta-2\delta^2+9\delta-8)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64} < 0 \quad (\text{A.56})$$

$$\frac{\partial m_{Rn}}{\partial c_g} = -\frac{(\delta-2)^2(\delta-1)\delta}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64} > 0 \quad (\text{A.57})$$

$$\frac{\partial m_{Rn}}{\partial \eta} = -\frac{\left(\begin{aligned} &2(\gamma-1)(\delta-2)^2(\delta-1)\delta \\ &\cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ &- (\delta-2)((\delta(2\delta-9)+8)c_g+(\delta-2)c_n-3\delta^2 \\ &+11\delta \\ &+((9-2\delta)\delta-8)G_s+\delta G_t-2G_t-8)) \end{aligned} \right)}{\left((2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64)^2 \right)} \geq 0 \quad (\text{A.58})$$

$$\frac{\partial m_{Rn}}{\partial Cap_{g0}} = -\frac{2(\gamma-1)(\delta-2)^2(\delta-1)\delta\eta}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta+4\delta^4-37\delta^3+117\delta^2-148\delta+64} < 0 \quad (\text{A.59})$$

$$\frac{\partial m_{Rn}}{\partial \gamma} = - \frac{\left(\begin{aligned} &2(\delta-2)^2(\delta-1)\delta\eta \\ &\cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ &- (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta \\ &+ ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8)) \end{aligned} \right)}{\left((2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \right)} \geq 0 \quad (\text{A.60})$$

$$\frac{\partial m_{Rn}}{\partial G_t} = - \frac{(\delta-2)(\delta-1)(2(\gamma-1)(\delta-2)\eta + 2\delta^2 - 9\delta + 8)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} < 0 \quad (\text{A.61})$$

$$\frac{\partial m_{Rn}}{\partial G_s} = \frac{(\delta-2)^2(\delta-1)\delta}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} < 0 \quad (\text{A.62})$$

$$\frac{\partial Cap_g}{\partial \delta} = - \frac{\left(\begin{aligned} &(2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \\ &\cdot (\delta(\delta(16\delta-111)+234)Cap_{g0} - 148Cap_{g0} \\ &- 2((\delta(3\delta-13)+13)c_g + \delta(c_n + (13-3\delta)G_s + G_t)) + 4c_n \\ &+ \delta(9\delta-34) + 26G_s + 4G_t + 30) \\ &+ (4(\gamma-1)(\delta(3\delta-13)+13)\eta + 16\delta^3 - 111\delta^2 + 234\delta - 148) \\ &\cdot ((\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta \\ &+ ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8) \\ &- (\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0}) \end{aligned} \right)}{(2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2} \geq 0 \quad (\text{A.63})$$

$$\frac{\partial Cap_g}{\partial c_n} = \frac{(\delta-2)^2}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.64})$$

$$\frac{\partial Cap_g}{\partial c_g} = \frac{(\delta-2)(\delta(2\delta-9)+8)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} < 0 \quad (\text{A.65})$$

$$\frac{\partial Cap_g}{\partial \eta} = \frac{\left(\begin{aligned} &2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8) \\ &\cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ &- (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta \\ &+ ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8)) \end{aligned} \right)}{\left((2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \right)} \geq 0 \quad (\text{A.66})$$

$$\frac{\partial Cap_g}{\partial Cap_{g0}} = - \frac{(\delta-4)(\delta-1)(\delta(4\delta-17)+16)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} < 0 \quad (\text{A.67})$$

$$\frac{\partial Cap_g}{\partial \gamma} = \frac{\begin{pmatrix} 2(\delta-2)(\delta(2\delta-9)+8)\eta \\ \cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ - (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta) \\ + ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8) \end{pmatrix}}{\begin{pmatrix} (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta \\ + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \end{pmatrix}} \geq 0 \quad (\text{A.68})$$

$$\frac{\partial Cap_g}{\partial G_t} = \frac{(\delta-2)^2}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.69})$$

$$\frac{\partial Cap_g}{\partial G_s} = \frac{(\delta-2)((9-2\delta)\delta-8)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.70})$$

$$\frac{\partial D_g}{\partial \delta} = \frac{\begin{pmatrix} (\delta-2)(2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \\ \cdot (2(\gamma-1)(\delta(2\delta-9)+8)\eta Cap_{g0} + (4\delta-9)c_g + c_n - 6\delta \\ + (9-4\delta)G_s + G_t + 11) \\ + (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64) \\ \cdot (2(\gamma-1)(\delta(2\delta-9)+8)\eta Cap_{g0} + (\delta(2\delta-9)+8)c_g \\ + (\delta-2)c_n - 3\delta^2 + 11\delta - 2\delta^2 G_s + 9\delta G_s - 8G_s + \delta G_t - 2G_t - 8) \\ - (\delta-2)(4(\gamma-1)(\delta(3\delta-13)+13)\eta + 16\delta^3 - 111\delta^2 + 234\delta - 148) \\ (2(\gamma-1)(\delta(2\delta-9)+8)\eta Cap_{g0} + (\delta(2\delta-9)+8)c_g + (\delta-2)c_n \\ - 3\delta^2 + 11\delta - 2\delta^2 G_s + 9\delta G_s - 8G_s + \delta G_t - 2G_t - 8) \end{pmatrix}}{(2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2} \geq 0 \quad (\text{A.71})$$

$$\frac{\partial D_g}{\partial c_n} = \frac{(\delta-2)^2}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.72})$$

$$\frac{\partial D_g}{\partial c_g} = \frac{(\delta-2)(\delta(2\delta-9)+8)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} < 0 \quad (\text{A.73})$$

$$\frac{\partial D_g}{\partial \eta} = \frac{\begin{pmatrix} 2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8) \\ \cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ - (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta) \\ + ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8) \end{pmatrix}}{(2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2} \geq 0 \quad (\text{A.74})$$

$$\frac{\partial D_g}{\partial Cap_{g0}} = \frac{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.75})$$

$$\frac{\partial D_g}{\partial \gamma} = \frac{\begin{pmatrix} 2(\delta-2)(\delta(2\delta-9)+8)\eta \\ \cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ - (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta \\ + ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8)) \end{pmatrix}}{\begin{pmatrix} (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta \\ + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \end{pmatrix}} \geq 0 \quad (\text{A.76})$$

$$\frac{\partial D_g}{\partial G_t} = \frac{(\delta-2)^2}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.77})$$

$$\frac{\partial D_g}{\partial G_s} = \frac{(\delta-2)((9-2\delta)\delta-8)}{2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64} > 0 \quad (\text{A.78})$$

$$\frac{\partial D_n}{\partial \delta} = \frac{\begin{pmatrix} -((\delta-2)(2(\gamma-1)(\delta-2)\delta(\delta(2\delta-9)+8)\eta \\ + (\delta-4)(\delta-1)\delta(\delta(4\delta-17)+16)) \\ \cdot (-4(\gamma-1)(\delta-1)\eta Cap_{g0} + 4(\gamma-1)(\delta-1)\eta - 2(\delta-1)c_g \\ + c_n(-2\gamma\eta - 4\delta + 2\eta + 9) + 6\delta^2 - 16\delta + 2\delta G_s \\ - 2G_s - 2\gamma\eta G_t - 4\delta G_t + 2\eta G_t + 9G_t + 6)) \\ - (2(\gamma-1)(\delta-2)\delta(\delta(2\delta-9)+8)\eta \\ + (\delta-4)(\delta-1)\delta(\delta(4\delta-17)+16)) \\ \cdot (-2(\gamma-1)(\delta-2)\delta\eta Cap_{g0} \\ + 2\delta((\gamma-1)(\delta-2)\eta + (\delta-3)(\delta-1)) - (\delta-2)\delta c_g \\ + c_n(-2(\gamma-1)(\delta-2)\eta - 2\delta^2 + 9\delta - 8) + \delta^2 G_s - 2\delta G_s \\ - 2\gamma\delta\eta G_t + 4\gamma\eta G_t - 2\delta^2 G_t + 2\delta\eta G_t + 9\delta G_t - 4\eta G_t - 8G_t) \\ + (\delta-2)(2(\gamma-1)(\delta(\delta(8\delta-39)+52) - 16)\eta + 20\delta^4 - 148\delta^3 \\ + 351\delta^2 - 296\delta + 64) (-2(\gamma-1)(\delta-2)\delta\eta Cap_{g0} \\ + 2\delta((\gamma-1)(\delta-2)\eta + (\delta-3)(\delta-1)) - (\delta-2)\delta c_g \\ + c_n(-2(\gamma-1)(\delta-2)\eta - 2\delta^2 + 9\delta - 8) + \delta^2 G_s - 2\delta G_s \\ - 2\gamma\delta\eta G_t + 4\gamma\eta G_t - 2\delta^2 G_t + 2\delta\eta G_t + 9\delta G_t - 4\eta G_t - 8G_t) \end{pmatrix}}{\begin{pmatrix} (2(\gamma-1)(\delta-2)\delta(\delta(2\delta-9)+8)\eta \\ + (\delta-4)(\delta-1)\delta(\delta(4\delta-17)+16))^2 \end{pmatrix}} \geq 0 \quad (\text{A.79})$$

$$\frac{\partial D_n}{\partial c_n} = -\frac{(\delta-2)(-2(\gamma-1)(\delta-2)\eta - 2\delta^2 + 9\delta - 8)}{2(\gamma-1)(\delta-2)\delta(\delta(2\delta-9)+8)\eta + (\delta-4)(\delta-1)\delta(\delta(4\delta-17)+16)} < 0 \quad (\text{A.80})$$

$$\frac{\partial D_n}{\partial c_g} = \frac{(\delta-2)^2\delta}{2(\gamma-1)(\delta-2)\delta(\delta(2\delta-9)+8)\eta + (\delta-4)(\delta-1)\delta(\delta(4\delta-17)+16)} > 0 \quad (\text{A.81})$$

$$\frac{\partial D_n}{\partial \eta} = \frac{\begin{pmatrix} 2(\gamma-1)(\delta-2)^2 \\ \cdot ((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ - (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta) \\ + ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8) \end{pmatrix}}{\begin{pmatrix} (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta \\ + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \end{pmatrix}} \geq 0 \quad (\text{A.82})$$

$$\frac{\partial D_n}{\partial Cap_{g0}} = \frac{2(\gamma-1)(\delta-2)^2\delta\eta}{2(\gamma-1)(\delta-2)\delta(\delta(2\delta-9)+8)\eta + (\delta-4)(\delta-1)\delta(\delta(4\delta-17)+16)} < 0 \quad (\text{A.83})$$

$$\frac{\partial D_n}{\partial \gamma} = \frac{\begin{pmatrix} 2(\delta-2)^2\eta((\delta-4)(\delta-1)(\delta(4\delta-17)+16)Cap_{g0} \\ - (\delta-2)((\delta(2\delta-9)+8)c_g + (\delta-2)c_n - 3\delta^2 + 11\delta) \\ + ((9-2\delta)\delta-8)G_s + \delta G_t - 2G_t - 8) \end{pmatrix}}{\begin{pmatrix} (2(\gamma-1)(\delta-2)(\delta(2\delta-9)+8)\eta \\ + 4\delta^4 - 37\delta^3 + 117\delta^2 - 148\delta + 64)^2 \end{pmatrix}} \geq 0 \quad (\text{A.84})$$

$$\frac{\partial D_n}{\partial G_t} = \frac{2(\gamma-1)(\delta-2)^2\eta + 2\delta^3 - 13\delta^2 + 26\delta - 16}{2(\gamma-1)(\delta-2)\delta(\delta(2\delta-9)+8)\eta + (\delta-4)(\delta-1)\delta(\delta(4\delta-17)+16)} < 0 \quad (\text{A.85})$$

$$\frac{\partial D_n}{\partial G_s} = -\frac{(\delta-2)^2\delta}{2(\gamma-1)(\delta-2)\delta(\delta(2\delta-9)+8)\eta + (\delta-4)(\delta-1)\delta(\delta(4\delta-17)+16)} < 0 \quad (\text{A.86})$$