

$$\begin{aligned} &> \text{restart;} \\ &> L[0] := \{L[0,N] = 600000, L[0,S] = 400000\}; \\ & \quad L_0 := \{L_{0,N} = 600000, L_{0,S} = 400000\} \end{aligned} \quad (1)$$

$$\begin{aligned} &> \text{eta} := -1/2; \\ & \quad \eta := -\frac{1}{2} \end{aligned} \quad (2)$$

$$\begin{aligned} &> w[0] := \{w[0,N] = 15, w[0,S] = 15\}; \\ & \quad w_0 := \{w_{0,N} = 15, w_{0,S} = 15\} \end{aligned} \quad (3)$$

$$\begin{aligned} &> L[1] := \{L[1,N] = 600000, L[1,S] = 420000\}; \\ & \quad L_1 := \{L_{1,N} = 600000, L_{1,S} = 420000\} \end{aligned} \quad (4)$$

$$\begin{aligned} &> \text{eta}*(w[1,S] - w[0,S])/w[0,S] = (L[1,S]-L[0,S])/L[0,S]; \\ & \quad -\frac{1}{2} \frac{w_{1,S} - w_{0,S}}{w_{0,S}} = \frac{L_{1,S} - L_{0,S}}{L_{0,S}} \end{aligned} \quad (5)$$

$$\begin{aligned} &> \text{eval}(\text{subs}(L[0], L[1], w[0], \%)); \\ & \quad -\frac{1}{30} w_{1,S} + \frac{1}{2} = \frac{1}{20} \end{aligned} \quad (6)$$

$$\begin{aligned} &> \text{solve}(\%, \{w[1,S]\}); \\ & \quad \left\{ w_{1,S} = \frac{27}{2} \right\} \end{aligned} \quad (7)$$

$$\begin{aligned} &> w[1] := \text{`union`}(\%, \{w[1,N]=15\}); \\ & \quad w_1 := \left\{ w_{1,S} = \frac{27}{2}, w_{1,N} = 15 \right\} \end{aligned} \quad (8)$$

$$\begin{aligned} &> \text{evalf}(\%); \\ & \quad \{w_{1,S} = 13.50000000, w_{1,N} = 15.\} \end{aligned} \quad (9)$$

$$\begin{aligned} &> L[2] := \{L[2,N] = L[1,N] + (w[1,N] - w[1,S])*1000, L[2,S] = L[1,S] - (w[1,N] - w[1,S])*1000\}; \\ & \quad L_2 := \{L_{2,N} = L_{1,N} + 1000 w_{1,N} - 1000 w_{1,S}, L_{2,S} = L_{1,S} - 1000 w_{1,N} + 1000 w_{1,S}\} \end{aligned} \quad (10)$$

$$\begin{aligned} &> L[2] := \text{eval}(\text{subs}(L[1], w[1], \%)); \\ & \quad L_2 := \{L_{2,N} = 601500, L_{2,S} = 418500\} \end{aligned} \quad (11)$$

$$\begin{aligned} &> \{\text{eta}*(w[2,S] - w[1,S])/w[1,S] = (L[2,S]-L[1,S])/L[1,S], \\ & \quad \text{eta}*(w[2,N] - w[1,N])/w[1,N] = (L[2,N]-L[1,N])/L[1,N]\}; \\ & \quad \left\{ -\frac{1}{2} \frac{w_{2,S} - w_{1,S}}{w_{1,S}} = \frac{L_{2,S} - L_{1,S}}{L_{1,S}}, -\frac{1}{2} \frac{w_{2,N} - w_{1,N}}{w_{1,N}} = \frac{L_{2,N} - L_{1,N}}{L_{1,N}} \right\} \end{aligned} \quad (12)$$

$$\begin{aligned} &> \text{eval}(\text{subs}(L[1], L[2], w[1], \%)); \\ & \quad \left\{ -\frac{1}{30} w_{2,N} + \frac{1}{2} = \frac{1}{400}, -\frac{1}{27} w_{2,S} + \frac{1}{2} = -\frac{1}{280} \right\} \end{aligned} \quad (13)$$

$$\begin{aligned} &> w[2] := \text{solve}(\%, \{w[2,S], w[2,N]\}); \\ & \quad w_2 := \left\{ w_{2,S} = \frac{3807}{280}, w_{2,N} = \frac{597}{40} \right\} \end{aligned} \quad (14)$$

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> evalf(%);
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$$\{w_{2,S} = 13.59642857, w_{2,N} = 14.92500000\} \quad (15)$$

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> Ratio := {w[2, N]/w[2, S]= subs(w[2],w[2, N]/w[2, S]),w[2, S]/w[2,N]= subs(w[2],w[2,S]/w[2,N])};
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$$Ratio := \left\{ \frac{w_{2,N}}{w_{2,S}} = \frac{1393}{1269}, \frac{w_{2,S}}{w_{2,N}} = \frac{1269}{1393} \right\} \quad (16)$$

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> evalf(%);
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$$\left\{ \frac{w_{2,N}}{w_{2,S}} = 1.097714736, \frac{w_{2,S}}{w_{2,N}} = 0.9109834889 \right\} \quad (17)$$

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