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APPENDIX 1: Theoretical framework for Chapter 2

The representative migrant therefore solves the problem

$$\text{Max } U_t = \sum_{t=1}^{T} \beta^t \left(\gamma_t LnA_t + \theta_t LnC_t^m + \phi_t LnC_t^h\right) \quad (1)$$

Subject to the following constraints

$$P_t^m C_t^m + R_t^m + F_t^m - F_{t-1}^m = Y_t^m + i_t^m F_{t-1}^m \quad (2)$$

$$F_t^h = F_{t-1}^h(1+i_t^h) + e_t R_t^m - P_t^h(A_t - A_{t-1}) - e_t r_t^m \quad (3)$$

$$A_t > 0 \quad (4)$$

$$P_t^h C_t^h = P_t^h Y_t^h + e_t r_t^m \quad (5)$$

Let $\lambda_{1,t}$, $\lambda_{2,t}$ and $\lambda_{3,t}$ be the Lagrangian multipliers for constraints (2), (3) and (5). The Lagrangian for optimizing equation (1) is given by

$$L = \sum_{t=1}^{T} \beta^t \left[(\gamma_t LnA_t + \theta_t LnC_t^m + \phi_t LnC_t^h) + \lambda_{1,t}(Y_t^m + i_t^m F_{t-1}^m - P_t^m C_t^m - R_t^m - F_t^m + F_{t-1}^m) + \lambda_{2,t}(-F_t^h + F_{t-1}^h(1+i_t^h) + e_t R_t^m - P_t^h(A_t - A_{t-1}) - e_t r_t^m) + \lambda_{3,t}(P_t^h Y_t^h + e_t r_t^m - P_t^h C_t^h)\right] \quad (6)$$

From first order conditions

$$\frac{\partial L}{\partial A_t} = \frac{\gamma_t}{A_t} - \beta^t[\lambda_{2,t}P_t^h - \beta\lambda_{2,t+1}P_{t+1}^h] = 0 \quad (7)$$

$$\frac{\partial L}{\partial C_t^m} = [\frac{\theta_t}{C_t^m} - \lambda_{1,t}P_t^m] = 0 \quad (8)$$

$$\frac{\partial L}{\partial C_t^h} = [\frac{\phi_t}{C_t^h} - \lambda_{3,t}P_t^h] = 0 \quad (9)$$

$$\frac{\partial L}{\partial \lambda_{1,t}} = Y_t^m + i_t^m F_{t-1}^m - P_t^m C_t^m - R_t^m - F_t^m + F_{t-1}^m = 0 \quad (10)$$

$$\frac{\partial L}{\partial \lambda_{2,t}} = -F_t^h + F_{t-1}^h(1+i_t^h) + e_t R_t^m + P_t^h(A_t - A_{t-1}) - e_t r_t^m = 0 \quad (11)$$

$$\frac{\partial L}{\partial \lambda_{3,t}} = P_t^h Y_t^h + e_t r_t^m - P_t^h C_t^h = 0 \quad (12)$$

$$\frac{\partial L}{\partial R_t^m} = [-\lambda_{1,t} + e_t\lambda_{2,t}] = 0 \quad (13)$$

$$\frac{\partial L}{\partial r_t^m} = [-\lambda_{2,t}e_t + \lambda_{3,t}e_t] = 0 \quad (14)$$

From equations (8), (13) and (14) $\lambda_{1,t} = e_t\lambda_{2,t} = e_t\lambda_{3,t} = \frac{\theta_t}{P_t^m C_t^m}$. (15)

Into equation (9) $\frac{\phi_t}{C_t^h} = \lambda_{3,t}P_t^h = \frac{\theta_t P_t^h}{e_t P_t^m C_t^m}$

$$\Rightarrow \quad \theta_t C_t^h P_t^h = e_t P_t^m C_t^m \phi_t \quad (16)$$

From equation (10)

$$R_t^m = Y_t^m + F_{t-1}^m(1 + i_t^m) - F_t^m - P_t^m C_t^m \quad (17)$$

Equation (16) into (17) $R_t^m = Y_t^m + F_{t-1}^m(1 + i_t^m) - F_t^m - \frac{\theta_t}{e_t \phi_t} P_t^h C_t^h$ (18)

From equation (18) $\frac{\partial R_t^m}{\partial C_t^h} = -\frac{\theta_t}{e_t \phi_t} P_t^h$ (19)

Equation (12) into (18) $R_t^m = Y_t^m + F_{t-1}^m(1 + i_t^m) - F_t^m - \frac{\theta_t}{e_t \phi_t}(P_t^h Y_t^h + e_t r_t^m)$ (20)

From (20) $r_t^m = \frac{\phi_t}{\theta_t}[Y_t^m - F_t^m + F_{t-1}^m(1 + i_t^m) - R_t^m] - \frac{P_t^h Y_t^h}{e_t}$ (21)

$$\frac{\partial r_t^m}{\partial Y_t^h} = -\frac{P_t^h}{e_t} \quad (22)$$

Again from equation (20)

$$\frac{\partial r_t^m}{\partial Y_t^m} = \frac{\phi_t}{\theta_t} \quad (23)$$

From equation (11)

$$R_t^m = \frac{1}{e_t}[F_t^h - F_{t-1}^h(1+i_t^h) + P_t^h(A_t - A_{t-1})] + r_t^m \quad (24)$$

$$\frac{\partial R_t^m}{\partial A_t} = \frac{P_t^h}{e_t} - \beta \frac{P_{t+1}^h}{e_{t+1}} \quad (25)$$

$$\frac{\partial R_t^m}{\partial i_t^m} = F_{t-1}^m \quad (26)$$

From equation (24) $\frac{\partial R_t^m}{\partial i_t^h} = \frac{1}{e_t}[-F_{t-1}^h]$ (27)