1 The classical transfer problem

Let two countries each have a Ricardian technology, with a single factor (labor) capable of producing two tradable goods and one nontradable, at constant returns to scale. Let consumer preferences be identical and homothetic within and across countries. Assume that in an initial equilibrium under free trade, country $k$ ($k = 1, 2$) is specializing in the production of commodity $k$ (a tradable) and commodity 3 (its nontradable), thus exporting commodity $k$ and importing commodity $j \neq k$. Labor is fully employed. Let $p_j$ denote the price of commodity $j$.

(a) Derive each country’s trade-demand function $\hat{h}_j^k(p_1, p_2, D^k) \ (j, k = 1, 2)$, and show that

$$\frac{\partial \hat{h}_j^k}{\partial D^k} = \frac{\partial h_j^k}{\partial Y_k} \ (j \neq k) \quad \text{and} \quad \frac{\partial h_k^k}{\partial D^k} = \frac{\partial h_k^k}{\partial Y_k} + \frac{b_i^k}{b_k^k} \frac{\partial h_3^k}{\partial Y_k} \ (k = 1, 2),$$

where $Y^k = p_3y_3^k + p_3y_5^k + D^k$ is country $k$’s disposable national income, $y_j^k$ being country $k$’s output of commodity $j = k, 3$ and $D^k$ being the deficit in country $k$’s balance of payments on current account, and where $b_i^k$ is amount of labor required to produce one unit of commodity $i = 1, 2, 3$ in country $k$.

(b) Assuming that the two countries maximize identical aggregate consumer-utility functions of the loglinear form $U(x) = \sum_{j=1}^{3} \theta_j \log x_j$, where $\theta_j > 0$ and $\sum_{j=1}^{3} \theta_j = 1$, show that a unilateral transfer from country 1 to country 2 will improve country 2’s (and worsen country 1’s) terms of trade. Explain why this assumption about preferences is needed for the result.

(c) Show that under the above assumptions, with equal nominal prices of the two tradable goods in the two countries, if the world is on a gold standard and the demand for gold in each country is proportional to its disposable income (the same proportion in each country), and there is a constant stock $G$ of gold in
the world economy, gold will move from country 1 to country 2 as a result of the transfer. Show also that the nominal price $p^k$ of the nontradable will rise in country 2 and fall in country 1.

(d) In place of the assumptions of (c), suppose that the world operates under flexible exchange rates, and that the monetary authority in each country $k$ acts so as to stabilize its general price level

$$\bar{p}^k = \bar{x}_1^k p_1^k + \bar{x}_2^k p_2^k + \bar{x}_3^k p_3^k,$$

where $p_i^k$ is the nominal price of commodity $i = 1, 2, 3$ in country $k = 1, 2$, the weight $\bar{x}_i^k$ in the price index is the amount of commodity $i = 1, 2, 3$ consumed in country $k$ before the transfer, and $\bar{p}^k$ is the general price level fixed by country $k$’s monetary authority. Show that the transfer from country 1 to country 2 will lead to an appreciation of country 2’s exchange rate, defined as $e = p_i^2 / p_i^1$ for $i = 1, 2$, where $e = 1$ in the initial equilibrium.