Policy Toward International Capital and Labor Flows under Free Trade and Complete Specialization

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Abstract

In a developed free trade environment, a plausible outcome is that different countries specialize in production of different commodities. This study examines a country's optimal policy toward international flows of labor and capital in a model where the trading countries completely specialize in production of different commodities and no restriction on commodity trade exists. Under variable terms of trade, the results demonstrate the interdependence between optimal policies a country toward international flows of labor and capital.

I. Introduction

In the presence of sovereign countries with national interests and borders, a world of free international factor movements seems much farther in the future than a world of free commodity trade. In a free trade environment, a policy-active country can continue to control cross-border movements of labor and capital through various policy measures, *e.g.* direct and indirect quota, subsidy, and tax on the objective factor flows. For instance, the U.S. immigration laws (quotas) continue to play a substantial role in the

control of labor flows into U.S. Similarly, under free commodity trade, U.S. can encourage repatriation of domestic capital employed abroad and inflow of foreign capital *via* a tax on income of domestic capital employed abroad and a subsidy to capital employed in U.S.

Optimal directions (inflows or outflows) of labor and capital that policies of a country should encourage have been the subject of a number of studies, including Ramaswami [1968], Bhagwati and Srinivasan [1983], Calvo and Wellisz [1983], Jones, Coelho, and Easton [1986], Brecher and Choudhri [1987], Kuhn and Wooton [1987], Jones and Easton [1989], and Jones [1990]. These studies utilize a model, referred to as the basic model by Jones *et al* [1986], where two countries specialize in production of the same single output with identical constant return technologies and two internationally mobile factors. Two inherent characteristics of the basic model render doubts on the results of such a single-output model. The first limitation is the absence of terms of trade implications. This short-coming is an outcome of the assumption that the two countries specialize in the same commodity. It is clear that in a developed free trade environment, it is more plausible that different countries specialize in different commodities. The crucial commodity terms of trade implication of a factor flow is also absent from the single-output model of Ruffin [1984, p. 250-253]. The second limitation of the basic model is its assumption of identical technologies in the two countries.

In a more general setting, Kemp [1966] and Jones [1967] utilized a $2 \times 2 \times 2$ model where cross-country technological differences and different patterns of specialization (complete and incomplete) are allowed.[1] Hence, their framework removes the deficiencies of the basic model and incorporates the terms of trade as an endogenous variable. However, the short-coming of the Kemp-Jones model is that capital is the only internationally mobile factor.[2] They examine the free-trade optimal policy (second-best policy)

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1. In the standard Heckscher-Ohlin model [Batra, 1973, p.58], in contrast, factors are not internationally mobile and no cross-country technological difference exists.

2. Firoozi [1993] has examined a general form of the Kemp-Jones model in which both labor and capital are internationally mobile and both countries incompletely specialize (diversify), *i.e.* each country produces both of the commodities in the presence of cross-country technological differences.

toward capital flow in isolation from international labor flow. Brecher [1983] subsequently showed that the second-best capital flow policies of Kemp and Jones can be improved with appropriate domestic consumption and production policies. When the two countries are technologically different, Jones [1967, p. 19, Footnote 2] and Jones and Ruffin [1975] have shown that the most likely outcome at world equilibrium is that the two countries completely specialize in different commodities. The Ricardian aspect of the Kemp-Jones model is also noted in Ruffin [1984, p. 270].

The present study extends the Kemp-Jones model to an environment where both capital and labor are internationally mobile and the two trading countries completely specialize in different commodities. The model removes the stated short-comings of the basic and Kemp-Jones models. Within such a model, the impact of policy-initiated migration and foreign investment on a policy-active country's national income and terms of trade are evaluated under free commodity trade. Specifically, the objectives are to (i) specify directions of optimal policies toward international flows of labor and capital within the stated environment, (ii) demonstrate the interdependence between optimal policies toward labor and capital flows, and (iii) show the adjustments to the second-best capital flow policies of Jones [1967] and Brecher [1983] when both capital and labor are internationally mobile. The structure of the model is developed in Section II. Section III evaluates the active country's income and terms of trade responses to migration and foreign investment. Sections IV-V discuss optimal flow policies and their implications, including terms of trade effects and policy interdependence. The conclusions are summarized in the last section.

II. Model

This section establishes the model and some preliminary results. The assumptions and notation extend those of Jones [1967]. Consider a two-county world consisting of a policy-active home country (H) and a foreign country (F) with fixed endowments of two internationally mobile factors, labor and capital, utilized in the production of two commodities. For the home country, let $E_i = D_i - X_i$ denote the excess demand for ith commodity where D_i and X_i represent the levels of consumption and production, $i = 1$,

2. The real factor rewards are denoted by w, the wage rate, and r, the rental rate of capital, both measured in terms of commodity 1, the numeraire. The commodity terms of trade is $p = p_2/p_1$. The corresponding values for the foreign country are denoted by the starred variables $E_i^*, D_i^*, X_i^*, w^*, r^*, p^*$. Furthermore, let L denote the net foreign labor employed in the home country and K denote the home country's net capital stock employed abroad. Therefore, $L > 0$ and $K > 0$ imply that H is the net importer of labor and the net exporter of capital.

At prevailed world equilibrium, assume H specializes in production and export of commodity 2 and imports all of its demand for commodity 1 $(X_1 = 0)$. Accordingly, F specializes in commodity 1 $(X_2^* = 0)$. The production functions in the two countries are denoted by $X_2 = X_2(k_2, l_2)$ and $X_1^* = X_1^*(k_1^*, l_1^*)$, where k and l represent the levels of capital and labor employed. Each production satisfies the neo-classical assumptions, e.g. constant returns and diminishing marginal products. In addition, assume $(\partial^2 X/\partial l \partial k) > 0$ for every production, i.e. a rise in one factor increases marginal product of the other factor. Full employment and competitive markets prevail so that the reward to each factor represents its marginal product. An implication of complete specialization is that production level and real factor rewards in each country do not respond directly to changes in relative prices:[3]

$$\partial X_2/\partial p = \partial r/\partial p = \partial w/\partial p = 0$$

$$\partial X_1^*/\partial p = \partial r^*/\partial p = \partial w^*/\partial p = 0$$

Output levels and rewards respond directly to changes in factor endowments (flows). Hence, output responses will be evaluated through changes in the relations $X_2 = X_2(K, L)$ and $X_1^* = X_1^*(K, L)$.[4] The factor reward responses will be evaluated through changes in the relations $i = i(K, L)$ and $i^* = i^*(K, L)$, for $i = r, w$.

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3. Kemp [1966, p. 804]. In the notation of Jones [1967, p. 6-7, and footnote 2. p. 7], complete specialization implies $\gamma = \gamma^* = 0$.

4. The functions X_2 and X_1^* are those defined earlier. However, for the purpose of evaluating output responses to factor flows (equations of change), the arguments are now the flows K and L.

Other assumptions are (i) foreign resources receive local rewards that add to aggregate income in the country of origin. (ii) World trade equilibrium prevails so that $E_i + E_i^* = 0$, $i = 1, 2$. If capital is the only internationally mobile factor, the following two assumptions are identical to those applied by Jones [1967, p. 16-23]. Hence, the assumptions are direct extensions of those applied by Jones to the present environment where both factors are internationally mobile. (iii) Following Jones [1967, p. 17], the effects of factor flows are evaluated from a position of unimpeded international factor flows so that initially $w = w^*$, $r = r^*$. Hence, any factor flow is policy-initiated. The rewards in the two countries, however, respond differently to policy-initiated international factor movements $(dw \neq dw^*, dr \neq dr^*)$.[5] (iv) The objective is to evaluate the effects of policy-initiated factor flows in an environment where the active country H effectively controls international flow of factors. In such an environment, the following exogeneity assumption is applied to factor flows: $dL/dK = 0$ and $dK/dL = 0$. With free trade in commodities, the terms of trade and its movements are identical in the two countries $(p = p^*, dp = dp^*)$. Optimal consumption and production prevail in both countries.

Social welfare functions in the two countries are denoted by $U = U(D_1, D_2)$ and $U^* = U^*(D_1^*, D_2^*)$. Utilizing the notation $U_1 = \partial U/\partial D_1$, differentiation of U and consumption optimality condition $U_2/U_1 = p$ in H lead to:

$$dy = dD_1 + pdD_2 \tag{1}$$

where, by assumption, the welfare in H is indexed to its real national income, y, by $(dU)/U_1 = dy$. A similar procedure in F leads to:

$$dy^* = dD_1^* + pdD_2^* \tag{2}$$

The budget constraint in F for the case where initially $L > 0$ and $K > 0$ is defined by:[6]

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5. In some cases the star superscripts for the foreign country's initial rewards (w^*, r^*) are preserved to distinguish later changes in F's rewards (dw^*, dr^*) from those in H (dw, dr).

6. The results for the other three possible initial cases, namely $(L > 0, K < 0)$, $(L < 0, K > 0)$, and $(L < 0, K < 0)$, can be derived analogously.

$$D_1^* + pD_2^* = X_1^* + wL - r^*K \qquad (3)$$

Lemma 1: *The output responses in the two countries to a joint international labor and capital flow (dL, dK) satisfy:*

$$dX_1^* = r^*dK - w^*dL \qquad (4)$$

$$pdX_2 = -rdK + wdL \qquad (5)$$

Proof: Total differentiation of $X_1^* = X_1^*(K, L)$ yields:

$$dX_1^* = (\partial X_1^*/\partial K)dK + (\partial X_1^*/\partial L)dL \qquad (6)$$

Each factor reward measures the rise in aggregate output in terms of commodity 1 (the numeraire) per unit augmentation in the factor. Since K is capital inflow into F, and L is labor outflow from F:

$$\partial X_1^*/\partial K = r^*, \ \partial X_1^*/\partial L = -w^* \qquad (7)$$

The result (4) follows from applying (7) in (6). A similar procedure applied to $X_2 = X_2(K, L)$ yields (5).[7]   ∎

Lemma 2: *The national income responses in the two countries to a joint international factor flow (dL, dK) satisfy $dy = -dy^*$.*[8]

Proof: Applying Equations (2) and (4) to differentials of $E_1^* = D_1^* - X_1^*$ and $E_2^* = D_2^*$ leads to:

$$dE_1^* + pdE_2^* = (dD_1^* + pdD_2^*) - dX_1^*$$

$$= dy^* - r^*dK + w^*dL \qquad (8)$$

The trade equilibrium condition $E_i + E_i^* = 0 \ (i = 1, 2)$ implies $D_1 = -E_1^*$ and

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7. In the proof for (4), replace X_1^* by X_2, while r^* and $-w^*$ are replaced by $-r/p$ and w/p, respectively. This is due to $p(\partial X_2/\partial K) = -r$ and $p(\partial X_2/\partial L) = w$.

8. Jones [1967, p.16-23] evaluated the free-trade capital flow policies when labor is internationally immobile from the position of unimpeded flow, *i.e.* initially $r = r^*$ and $p = p^*$. Equations (4) and (6) in Jones [1967, p. 4] yield $dy = -dy^*$, which is implicit in the free-trade results of Jones. The present result is a generalization under complete specialization when both capital and labor are internationally mobile.

$D_2 = X_2 - E_2^*$. Differentials of D_i are utilized in (1) to produce:

$$dy = dD_1 + p dD_2 = p dX_2 - (dE_1^* + p dE_2^*)$$
$$= -dy^* + (r^* - r) dK - (w^* - w) dL$$

where the last equality is due to Equations (5) and (8). The result follows from the assumption on equality of initial rewards in the two countries. ∎

Differentiation of (3) with applications of (2) and (4) yield:[9]

$$dy^* = -E_2^* dp - K dr^* + L dw \qquad (9)$$

It follows from Lemma 2 that:

$$dy = E_2^* dp + K dr^* - L dw \qquad (10)$$

Hence, the national income response in H to migration and foreign investment has two components: (i) the terms of trade (indirect) effect measured by $E_2^* dp$, and (ii) the transferred factor income (direct) effect measured by $(K dr^* - L dw)$. The income response will be evaluated through changes in the relation $y = y(p, K, L)$.

III. Flow Effects

The national income and terms of trade responses in H to international factor flows are evaluated in this section. Define the flow elasticities of factor rewards:

$$\delta_{ij} = (\partial i / \partial j)(j/i) , \quad \delta_{i^*j} = (\partial i^* / \partial j)(j/i^*)$$

where $i = r, w$ and $j = K, L$. By the assumptions on marginal products, the responses of factor rewards in H and F to factor flows are given by:[10]

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9. Total differentiation of (3) leads to:
   $$dD_1^* + p dD_2^* = -D_2^* dp + dX_1^* - (r^* dK - w dL) + L dw - K dr^*$$
   which reduces to (9) with applications of (2), $E_2^* = D_2^*$, and (4) where $w = w^*$.
10. Full employment and diminishing return imply an inverse relation between reward on each factor and its endowment. By the assumption $(\partial^2 X / \partial l \partial k) > 0$, reward on one factor is directly related to endowment of the other factor.

$$\partial r/\partial K > 0, \; \partial r/\partial L > 0, \; \partial w/\partial K < 0, \; \partial w/\partial L < 0$$
$$\partial r^*/\partial K < 0, \; \partial r^*/\partial L < 0, \; \partial w^*/\partial K > 0, \; \partial w^*/\partial L > 0 \tag{11}$$

Hence, the signs of δ_{ij} and δ_{i^*j} are determined according to the initial net transferred factors, *i.e.* the signs of K and L. Total differentiation of $r^* = r^*(K, L)$ yields:

$$(dr^*/r^*) = (1/r^*) \, [(\partial r^*/\partial K)dK + (\partial r^*/\partial L)dL]$$
$$= [(\partial r^*/\partial K)(K/r^*)](dK/K) + [(\partial r^*/\partial L)(L/r^*)](dL/L)$$
$$= \delta_{r^*K} \, (dK/K) + \delta_{r^*L} \, (dL/L)$$

Similarly, differentiation of $w = w(K, L)$ leads to:

$$(dw/w) = \delta_{wK} \, (dK/K) + \delta_{wL} \, (dL/L)$$

Application of the last two equations in (10) produces:

$$dy = E_2^* dp + Kr^*(dr^*/r^*) - Lw(dw/w)$$
$$= E_2^* dp + [r^* \delta_{r^*K} - w(L/K)\delta_{wK}] \, dK + [r^*(K/L)\delta_{r^*L} - w\delta_{wL}] \, dL \tag{12}$$

It follows that:

$$\partial y/\partial p \, |_{K, L} = E_2^* \tag{13}$$
$$\partial y/\partial L \, |_{p, K} = [r^* \, (K/L)\delta_{r^*L} - w\delta_{wL}] \tag{14}$$
$$\partial y/\delta K \, |_{p, L} = [r^* \delta_{r^*K} - w(L/K) \, \delta_{wK}] \tag{15}$$

Differentiation of $y = y(p, K, L)$ and the exogeneity of K and L yield:

$$dy/dL = (\partial y/\partial p)(dp/dL) + (\partial y/\partial L) \tag{16}$$
$$dy/dK = (\partial y/\partial p)(dp/dK) + (\partial y/\partial K) \tag{17}$$

where the partial values are specified in (13)–(15). It is clear from (16)–(17) that the terms of trade effects dp/dL and dp/dK play fundamental roles in measurement of the income effects of the flows. The terms of trade effects will be evaluated in Lemma 3 using the following definitions. Let $\eta_2 =$

$p/E_2^* \ [\partial D_2/\partial p \,|_y]$, where the term inside the brackets is the consumption substitution effect of a change in p on D_2, hence, a negative term. Similarly, $\eta_2^* = P/E_2^* \ [\partial D_2^*/\partial p \,|_{y^*}]$. Since $E_2^* > 0$, both η_2 and η_2^* are negative. Let m_2 and m_2^* define the marginal propensities to consume commodity 2 in H and F in terms of the numeraire: $m_2 = p(\partial D_2/\partial y)$ and $m_2^* = p(\partial D_2^*/\partial y^*)$. When commodity 2 is not inferior, m_2 and m_2^* are positive.

Define:

$$\Delta = -[(\eta_2 + \eta_2^*) + (m_2 - m_2^*)]$$

Lemma 3: *The commodity terms of trade responds to international flows of labor and capital according to:*

$$dp/dL = [(m_2 - m_2^*)/(E_2^*\Delta)] \ [r^*(K/L) \ \delta_{r^*L} - w\delta_{wL}] \qquad (18)$$

$$dp/dK = [(m_2 - m_2^*)/(E_2^*\Delta)] \ [r^*\delta_{r^*K} - w(L/K) \ \delta_{wK}] \qquad (19)$$

Poof: $E_2 = D_2(p, y) - X_2(K, L) = E_2(p, y, K, L)$. Total differentiation of E_2 yields:

$$\begin{aligned} dE_2 &= (\partial E_2/\partial p)dp + (\partial E_2/\partial y)dy + (\partial E_2/\partial K)dK + (\partial E_2/\partial L)dL \\ &= E_2^* \ [(\partial E_2/\partial p)(p/E_2^*)]dp/p + E_2^* \ [(\partial E_2/\partial y)(1/E_2^*)]dy \\ &\quad + [\partial E_2/\partial K]dK + [\partial E_2/\partial L]dL \end{aligned} \qquad (20)$$

The terms in the brackets are now evaluated. Using the definitions for η_2 and m_2 in partial differentials of $E_2 = D_2 - X_5$ yields:

$$\partial E_2/\partial p = \partial D_2/\partial p = (E_2^*/p)\eta_2$$
$$\partial E_2/\partial y = \partial D_2/\partial y = m_2/p$$
$$\partial E_2/\partial K = -\partial X_2/\partial K = r/p$$
$$\partial E_2/\partial L = -\partial X_2/\partial L = -w/p$$

Substitution into (20) yields:

$$dE_2 = E_2^* \ [\eta_2(dp/p) + (m_2/(pE_2^*)) \ dy] + (1/p)(rdK - wdL) \qquad (21)$$

Similar procedure applied to $E_2^* = E_2^* (p, y^*, K, L)$ leads to:

$$dE_2^* = E_2^* [\eta_2^* (dp/p) + (m_2^*/(pE_2^*))dy^*] + [\partial E_2^*/\partial K]dK$$
$$+ [\partial E_2^*/\partial L]dL \qquad (22)$$

Trade equilibrium $(E_2^* = -E_2)$ implies $\partial E_2^*/\partial K = -\partial E_2/\partial K = -r/p$ and $\partial E_2^*/\partial L$ $= -\partial E_2/\partial L = w/p$. Substitution into (22) produces:

$$dE_2^* = E_2^* [\eta_2^* (dp/p) + (m_2^* /(pE_2^*))dy^*] - (1/p) (rdK - wdL) \qquad (23)$$

Adding (21) and (23) and a use of Lemma 2 yield:

$$d(E_2 + E_2^*) = E_2^* \{(\eta_2 + \eta_2^*) (dp/p) + [(m_2 - m_2^*)/(pE_2^*)]dy\}$$

Substituting (12) for dy, factoring, and using the definition for Δ lead to:

$$d(E_2 + E_2^*) = (1/p) \{-E_2^*\Delta dp + (m_2 - m_2^*)[r^*\delta_{r^*K} - w(L/K)\delta_{wK}]dK$$
$$+ (m_2 - m_2^*)[r^*(K/L)\delta_{r^*L} - w\delta_{wL}]dL\} \qquad (24)$$

An application of the trade equilibrium condition $d(E_2 + E_2^*) = 0$ to (24) and solving for dp yield:

$$dp = [(m_2 - m_2^*)/(E_2^*\Delta)] \{[r^* \delta_{r^*K} - w(L/K)\delta_{wK}]dK$$
$$+ [r^*(K/L)\delta_{r^*L} - w\delta_{wL}]dL\} \qquad (25)$$

The results (18) and (19) follow from (25) and the exogeneity of L and K. ∎

An implication of Equation (24) is that, if the world excess demand for commodity 2 is inversely related to its international price, the coefficient of dp must be negative, *i.e.* $E_2^*\Delta > 0$.[11] When this condition is satisfied, the world markets are said to be stable. Since $E_2^* > 0$, the stability requires $\Delta > 0$.

Lemma 4: *The national income responds to international flows of labor and capital according to:*

$$dy/dL = [1 + (m_2 - m_2^*) (1/\Delta)][r^*(K/L) \delta_{r^*L} - w\delta_{wL}] \qquad (26)$$

$$dy/dK = [1 + (m_2 - m_2^*) (1/\Delta)][r^*\delta_{r^*K} - w(L/K)\delta_{wK}] \qquad (27)$$

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11. This is equivalent to the world market stability condition in Jones [1967, p. 18-19].

Proof: The result (26) follows immediately from applying (13), (14), and (18) in (16). Similarly, (27) is a result of applying (13), (15), and (19) in (17).   ∎

When the world markets are stable ($\Delta > 0$), the terms in the first brackets in (26) and (27) are positive: $[1 + (m_2 - m_2^*)(1/\Delta)] = [-(\eta_2 + \eta_2^*)/\Delta] > 0$. Hence, the signs of dy/dL and dy/dK are determined by the signs of the second brackets in (26) and (27). It is clear that the crucial determinants of these signs are the flow elasticities of reward, δ_{ij} and δ_{i^*j}.

IV. Optimal Flow Policies

The fundamental equations describing optimal directions of international flows of labor and capital are specified in (26) and (27). For instance, $dy/dL > 0$ and $dy/dK > 0$ imply that flow policies must encourage inflow of labor and outflow of capital. Strictly speaking, Equations (26)–(27) are two differential equations, each in terms of L and K. The system is solved simultaneously for the function $y(L, K)$ utilizing the initial values L_0 and K_0. Maximization of $y(L, K)$ produces K_1 and L_1, and the optimal flows are $dK = K_1 - K_0$ and $dL = L_1 - L_0$. Given the optimal flow quantities dK and dL, the policy-maker has the freedom to choose from an array of policy instruments (*e.g.* quota, subsidy, tax) to implement the specific flows. This freedom of choice regarding policy instrument is an advantage of the present approach over the alternative where a specific policy instrument is incorporated as an endogenous variable. In the present environment, given a policy instrument and the objective optimal flow dL or dK, the optimal adjustment to the policy instrument to achieve the desired flow can be determined.

Intuitive justifications exit for the optimal flow conditions derived from Equations (26)–(27). Consider, for example, the case where H is initially the net importer of labor ($L > 0$) and the net exporter of capital ($K > 0$). In this case, optimal policies encourage repatriation of capital when the condition $r^* K \delta_{r^*K} < wL\delta_{wK}$ holds. Utilizing the definitions for δ_{r^*K} and δ_{wK} the condition for optimal repatriation of capital reduces to $K(\partial r^*/\partial K) < L(\partial w/\partial K)$, which can be written as $K|\partial r^*/\partial K| > L|\partial w/\partial K|$.[12] An interpretation of the condition is that a marginal repatriation of capital ($dK < 0$) generates an additional

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12. The latter form is due to $(\partial r^*/\partial K) < 0$ and $(\partial w/\partial K) < 0$. See the relations in (11).

income for domestic capital employed abroad ($K| \partial r^*/\partial K |$) which is larger than the additional income that the capital repatriation generates for foreign labor employed at $H(L| \partial w/\partial K |)$. Similar interpretations can be developed for optimal conditions regarding labor flow and other cases.

We now utilize the results in Lemma 3 to evaluate the terms of trade effect of an optimal flow of a factor. Note that non-zero terms of trade responses to factor flows can emerge when the marginal propensities in the two countries are not identical ($m_2 \neq m_2^*$). When markets are stable ($\Delta > 0$), the impact of an income-raising (optimal) flow on the country's terms of trade is evaluated in the following two cases.

(i) $m_2 > m_2^*$. The terms of trade and national income responses to international labor and capital flows assume identical signs. Hence, the flow policies that raise national income will also lead to improvements in the terms of trade. Intuitively, when the marginal propensity for the domestic output (X_2) is larger in H (relative to the propensity in F), a rise in domestic income (with an equivalent fall in foreign income) leads to a rise in the world relative price of the exportable (X_2).

(ii) $m_2 < m_2^*$. In this case the national income effect and the terms of trade effect of a flow assume opposite signs. Hence, optimal flow policies lead to a deterioration in the terms of trade. In this case the positive transferred factor income (direct) effect of an optimal flow more than offsets the negative terms of trade (indirect) effect.[13]

V. Policy Interdependence

This section shows the interdependence between optimal policies toward international flows of labor and capital. The results specify the necessary adjustments to the second-best capital flow policies of Jones [1967] and Brecher [1983] when labor is internationally mobile. To demonstrate that optimal policy regarding the flow of capital depends on the flow of labor, consider the case where initially labor is internationally immobile. The effect of a capital flow on income is then derived from (27) by setting $L = 0$:

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13. See the statement following Equation (10). In terms of Equations (16) and (17), the direct (income) effects are reflected by $\partial y/\partial L$ and $\partial y/\partial K$ evaluated in (14) and (15).

$$dy/dK \mid_{L=0} = [1 + (m_2 - m_2^*)(1/\Delta)]r^* \delta_{r^*K}$$

$$= (r^*/\Delta)[-(\eta_2 + \eta_2^*)]\delta_{r^*K} \tag{28}$$

which is identical to the income effect of a capital flow in Jones [1967, p. 19, Equation (17)] under complete specialization ($\gamma = \gamma^* = 0$). The second-best capital flow policy of Jones is derived from (28): foreign investment is encouraged if $(dy/dK \mid_{L=0}) > 0$ and discouraged if $(dy/dK \mid_{L=0}) < 0$. However, when labor becomes internationally mobile ($L \neq 0$), Equation (27) replaces (28). The direction of the Jones second-best capital flow policy is then (i) preserved if $(r\delta_{r^*K})$ and $[r\delta_{r^*K} - w(L/K)\delta_{wK}]$ possess identical signs, or (ii) reversed if $(r\delta_{r^*K})$ and $[r\delta_{r^*K} - w(L/K)\delta_{wK}]$ assume different signs. It is clear that the Jones second-best capital flow policies are derived as a special case. A similar procedure applied to (26) shows that a second-best policy toward labor flow depends on transferred capital (K). An implication of the interdependence for welfare maximization is that optimal flow policies toward labor and capital must be determined jointly.

Brecher [1983] showed that the welfare derived from the free-trade optimal capital flow policies (second-best policies) suggested by Jones [1967] can be improved with appropriate domestic consumption and production policies. Hence, Brecher argued, the second-best policies of Jones are in fact third-best. Under complete specialization, the present results demonstrate that when both labor and capital are internationally mobile, second-best policies toward capital flow (with appropriate domestic consumption and production policies) must be designed jointly with policies toward labor flow to achieve second-best welfare.

VI. Conclusions

This study has examined a country's policy toward international flows of labor and capital in a $2 \times 2 \times 2$ trade model where the two countries specialize in production of different commodities and no restriction on commodity trade exists. The setting is a generalization of the Kemp-Jones model to an environment where both capital and labor are internationally mobile. The results have specified the necessary adjustments to the second-best (free-trade welfare-improving) capital flow policies of Jones [1967] and Brecher

[1983] when both capital and labor are internationally mobile. The second-best capital flow policy of Jones is derived as a special case. We have also shown that the optimal flow of one factor depends on the flow of the other factor. An implication for welfare maximization is that optimal (second-best) policies toward international flows of labor and capital must be designed jointly. Depending on consumption marginal propensities in the two countries, an optimal factor flow can lead to a deterioration in the country's commodity terms of trade.

Some possible extensions of the results involve different environments in which all production factors are internationally mobile. Clearly, the free trade income effects evaluated in this study and those of Jones [1967] must be altered when the assumption (iii) in Section II does not hold. When a factor flow is initially impeded, the rewards in the two countries may not be initially identical (even under free trade in commodities). In the present study, Lemma 2 must then be generalized accordingly. Other extensions include incomplete specialization by one of the countries and the presence of a factor-specific production.

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