INTERNATIONAL CAPITAL AND NONTRADED GOODS IN THE LONG RUN

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ABSTRACT

The present paper develops the comparative static properties of a small open economy which produces both traded goods and nontraded goods, and is a price taker in the international market for productive capital. Assumptions of full employment, competitive markets, and international mobility of productive cap ital input capture a long run horizon. Comparative static results associated with the wage, labor, and the price of the nontraded good are independent of factor intensity, factor substitution, and demand for the nontraded good. A tax on the traded good and a capital subsidy together raise national income and the real wage.

Many economies, especially less developed ones, rely on international markets for productive capital input. Markets for nontraded goods constitute large shares of every economy. These facts motivate the study of production and trade with the combination of international capital and a nontraded sector.

The model of an economy acting as a price taker in the world capital market is developed by Caves (1971), Srinivasan (1983), and others. A large world market determines the price of capital. Capital supply is perfectly elastic for the price taking small economy, and employment of capital is endogenously determined by its domestic demand. Jones, Neary, and Ruane (1983) build a model in which international capital is specific to each sector. In the present long run model, capital is mobile between sectors.

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Price and output of the nontraded good vary endogenously with supply and demand in the general equilibrium. Demand for the nontraded good depends on national income as well as relative prices. Comparative static effects of exogenous changes in the labor endowment, the endowment of national capital, the international price of capital, and the international price of the traded good are examined. Endogenous adjustment occurs for the wage, the level of international capital employed in the economy, output of the traded good, national income, and price and output of the nontraded good. Effects on the balance of trade and net interest payments are also examined.

Relative shifts in the supply and demand for nontraded goods are discussed for each comparative static adjustment. There are a wide variety of issues at hand. The present paper develops the general characteristics of production and trade for such a small open economy, a model which may capture the essence of many developing countries. A suprising result is that the combination of a tax on the traded good and a subsidy for capital raises the real wage and national income.

I. THE THEORETICAL MODEL: INTERNATIONAL CAPITAL AND NONTRADED GOODS

Nontraded goods are integrated into general equilibrium production structures in the literature by Komiya (1967), Ethier (1972), Jones (1974), Rivera-Batiz (1982), and others. Michael (1992) develops some general properties of a model with one imported good, one exported good, many nontraded goods, and many productive factors, some of which are internationally mobile. Models with nontraded goods are closed by specifying demand for the nontraded good. Production capital input in the present model is supplied from the international market at the exogenous international price r^*. The two sectors produce a traded good (T) and a nontraded good (N). Both neoclassical production functions exhibit constant returns to scale.

Firms in each sector employ capital (K) and labor (L) in cost minimizing unit inputs a_{Kj} and a_{Lj} ($j = N,T$). These unit input functions are homogeneous of degree zero in factor prices. Price p_T^* of the traded good is exogenously given at the world level. The labor endowment (L) is also exogenous. The model endogenously determines output (x_T) of traded good, price (p_N) and output (x_N) of the nontraded good, total capital employment (K), wages (w), and national income (Y).

There is full employment of both labor and capital,

$$L = a_{LN}x_N + a_{LT}x_T \quad \text{and} \quad K = a_{KT}x_T \tag{1}$$

Competitive pricing in each sector is represented by

$$p_j = a_{Lj}w + a_{Kj}r^*, \; j = N,T, \tag{2}$$

where $p_T = p_T^* = 1$. Price variables w, r^*, and p_N are interpreted as relative values stated in terms of the traded good. The relative price of imports in terms of exports is frozen in the present model.

Denote the total endowment of national capital by K' and the foreign owned capital employed at home by K^*. Given some amount of foreign owned capital, $K - K' = K^* > 0$. For simplicity, assume all national capital is employed at home. If the home autarky price of capital is greater than r^*, this condition is ensured.

Demand for the nontraded good is decreasing function of its relative price and an increasing function of national income. Let p represent the relative price of the nontraded good in terms of the traded good: $P = P_N/P_T = P_T^*$. The quantity demanded of the nontraded good equals the quantity supplied,

$$D_N(p, Y) = x_N. \tag{3}$$

Real national income is equal to the value of payments to the national factors of production,

$$Y \equiv wL + r^*K'. \tag{4}$$

The production equilibrium is pictured by the Lerner-Pearce production diagram in Figure 1. Inputs of capital and labor are measured on either axis. The unit value isoquant for the traded good is labelled $1/p^*$. The supporting unit isocost line ($1 = c_j = a_{Lj}w + a_{Kj}r^*$) intersects the K axis at the enogenously given $1/r^*$ and the L axis at $1/w$.

Expansion paths for the homothetic production functions are linear. The endowment of labor is indicated by the vertical dashed line. The model is closed by demand for the non-

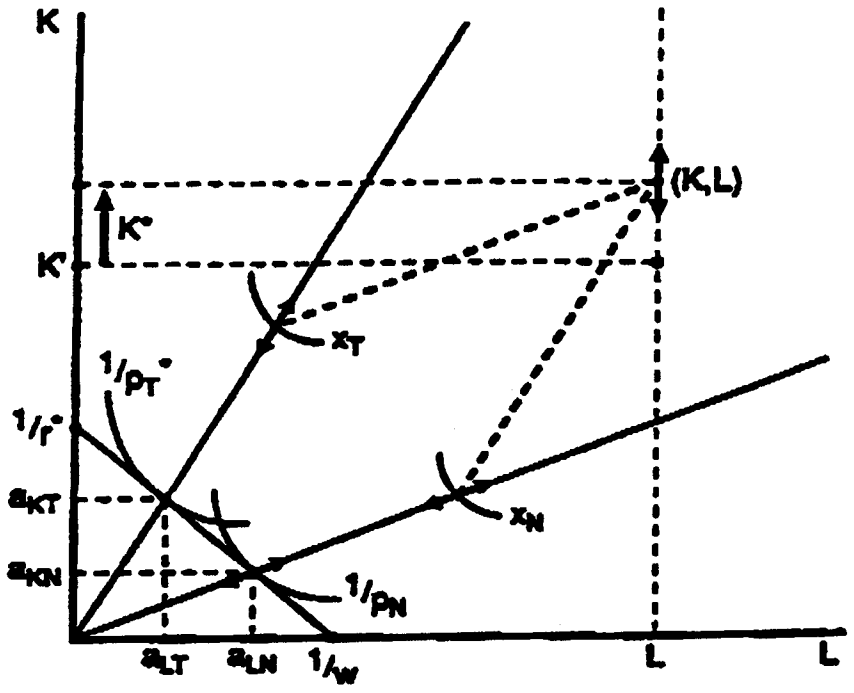

Figure 1. Labor Intensive Nontraded Good

traded good. Output of the traded good and the level of foreign capital adjust to full employment. Arrows indicate endogenous variable adjustment to maintain the conditions of competitive pricing and full employment.

General equilibrium models of production are developed by Jones and Scheinkman (1977), Chang (1979), Takayama (1982), and others. Differentiate the full employment conditions in (1) to arrive at the first two equations in the comparative static system (6). Included are the aggregate factor price substitution terms $s_{ih} \equiv \Sigma_j x_j \partial a_{ij}/\partial w_h$ ($j = N, T$ and $i, h = K, L$). Differentiate the competitive pricing condition (2) and use the cost minimizing envelope result in each sector to find the second two equations of the comparative static system (6).

Differentiate (3) and let subscripts represent the two partial derivatives of demand for the nontraded good to find $D_p\, dp + D_Y\, dY = dx_N$, where $D_p < 0$ and $D_Y > 0$. From the fact that $dp = (p_T^*\, dp_N - p_N\, dp_T^*)/p_T^{*2}$ it follows that

$$D_p\, p_T^*\, dp_N - D_p\, p_N\, dp_T^* + D_Y p_T^{*2}\, dY = p_T^{*2}\, dx_N, \tag{5}$$

the fifth equation in (6). The last equation in (6) captures changes in national income from (4),

$$\begin{bmatrix} s_{LL} & 0 & a_{LN} & a_{LT} & 0 & 0 \\ s_{LK} & -1 & a_{KN} & a_{KT} & 0 & 0 \\ a_{LN} & 0 & 0 & 0 & 0 & -1 \\ a_{LT} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -p_T^{*2} & 0 & D_Y p_T^{*2} & D_p p_T^* \\ -L & 0 & 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} dw \\ dk^* \\ dx_N \\ dx_T \\ dY \\ dp_N \end{bmatrix} = \begin{bmatrix} dL - s_{LK} dr^* \\ -s_{KK} dr^* + dK' \\ -a_{KN} dr^* \\ dp_T^* - a_{KT} dr^* \\ D_p p_N dp_T^* \\ w dL + r^* \mathrm{d}K' + K' dr^* \end{bmatrix}. \tag{6}$$

Use Cramer's rule to find the partial derivative of each endogenous variable (w, K^*, x_N, x_T, Y, p_N) with respect to each exogenous variable (L, r^*, K', p^*) in the general equilibrium. The full range of comparative static outcomes are analyzed to develop the complete picture of how such an economy operates.

Factor intensity plays a crucial role in the comparative statics. For notation,

$$b \equiv a_{LN} a_{KT} - a_{KN} a_{LT}. \tag{7}$$

If the nontraded good is labor (capital) intensive, $b > 0$ ($b < 0$).

The nontraded good is rescaled without loss of generality so $p_N = 1$. Factors are also rescaled so $w = r^* = 1$. This simplifying calibration does not affect the qualitative possibilities of the comparative statics in which both p_N and w are endogenous. Partial derivatives can be interpreted as elasticities with this calibration. Price equals average cost from (2): $p_j = a_{Kj} + a_{Lj} = 1$, $j = N, T$. For simplicity, $a_j \equiv a_{Lj} = 1 - a_{Kj}$. It follows that $b = a_N - a_T$.

Table 1. Comparative Statics

	∂L	$\partial K'$	∂r^*	∂p_T^*
∂w	0	0	$-(1-a_T)/a_T$	$1/a_T$
∂K^*	$((1-a_T)-bD_Y)/a_T$	$(-a_T-bD_Y)/a_T$	$(be-s)/a_T^2$	$(s-bc)/a_T^2$
∂x_N	D_Y	D_Y	$-e/a_T$	$-c/a_T$
∂x_T	$(1-a_ND_Y)/a_T$	$-a_ND_Y/a_T$	$(a_Ne-s)/a_T^2$	$(s-a_Nc)/a_T^2$
∂Y	$1(w)$	$1(r^*)$	d/a_T	L/a_T
∂p_N	0	0	$-b/a_T$	a_N/a_T

Table 2. Signs with Labor Intensive Nontraded Good ($b > 0$)

	∂L	$\partial K'$	∂r^*	∂p_T^*
∂w	0	0	−	+
∂K^*	+	−	?	?
∂x_N	+	+	?	?
∂x_T	+	−	?	?
∂Y	+	+	−	+
∂p_N	0	0	−	+

Table 3. Signs with Labor Intensive Nontraded Good ($b < 0$)

	∂L	$\partial K'$	∂r^*	∂p_T^*
∂w	0	0	−	+
∂K^*	+	?	?	+
∂x_N	+	+	?	−
∂x_T	+	−	?	?
∂Y	+	+	?	+
∂p_N	0	0	+	+

Due to constant returns to scale and homogeneity of the factor mix terms, $ws_{Lh} + r^* s_{Kh} = 0$, for $h = K, L$. Since factors have been rescaled, $\Sigma_i s_{ih} = s_{Lh} + s_{Kh} = 0$. Due to Taylor's formula, the substitution terms are symmetric: $s_{LK} = s_{KL}$. For simplicity of notation, $s \equiv s_{LK} = -s_{LL} = -s_{KK} > 0$.

The determinant of the system in (6) is a_T^2. As $a_T \to 0$, the model T becomes unstable. Note that $a_T \to 0$ iff $a_{LT} \to 0$ and $a_{KT} \to 1$. The production cone then approaches the entire positive quadrant in Figure 1 and the model loses its structure. Partial derivative elasticities of the comparative static system are presented in Table 1. Other notation in Table 1 includes:

$$c \equiv bD_p + LD_Y,\ d \equiv a_T K' - (1 - a_T)L, \text{ and } e \equiv bD_p - dD_Y. \tag{8}$$

If the nontraded good is labor intensive ($b > 0$), c may be positive or negative. In Figure 1, $a_{KT}/a_{LT} > K/L$, which implies $(1 - a_T)L > a_T K > a_T K'$. When $b > O$, it follows that $d < O$ and the sign of e is ambiguous. Note that $1 > a_{KT} = 1 - a_T > 0$, and similarly $1 > a_N > 0$. Also, $D_Y < 1$ since some part of an increase in income is spent on the traded good.

If $b < 0$, it follows that $c > 0$ but the signs of d and e cannot be determined. If K^* is relatively small, d will be positive. Summarizing the signs of the terms in Table 1 which depend on factor intensity, if $b > O$ the vector $(b\ c\ d\ e)$ has the signs $(+\ ?\ -\ ?)$. If $b < O$, the vector has the signs $(-\ +\ ?\ ?)$. The sign pattern of partial derivatives in Table 2 occurs when the non-traded good is labor intensive, $b > 0$. Table 2 corresponds to Figure 1. Table 3 shows results when the nontraded good is capital intensive, $b < 0$.

II. GENERAL CHARACTERISTICS OF THE COMPARATIVE STATICS

The crucial role of factor intensity is apparent in the tables. Of the 24 comparative static partial derivatives, the signs of nine depend on factor intensity. The nontraded sector, characterized by x_N and p_N, is independent of the degree of factor substitution. Factor abundance is reflected by term d, and only plays a role in determining the effects of changes in r^* on international capital, outputs, and national income.

Factor substitution only influences the effects of changes in r^* and p^* on K^* and x_T. The curvature of the isoquants in Figure 1 picture the degree of factor substitution. A higher degree of substitution would mean flatter or less convex isoquants, larger $\partial x_T/\partial p_T^*$ and $\partial K^*/\partial p_T^*$ terms, and smaller $\partial x_T/\partial r^*$ and $\partial K^*/\partial r^*$ terms. Approaching Leontief technology, s falls to zero and $\partial K^*/\partial r^*$ becomes unambiguously positive.

Zeros in Table 1 reflect a property similar to factor price equalization in the Heckscher-Ohlin factor proportions model. Changes in domestic factor endowments within the production cone do not affect the underlying cost minimization, which is completely determined by exogenous prices r^* and p_T^*. The endogenous wage and price of the nontraded good are thus uniquely determined by the international prices of capital and the traded good. The market for the nontraded good is neutral in its influence on the economy.

The balance of trde is written $B = p_T^*(x_T - c_T)$, where c_T is consumption of the traded good. Net interest payments equal $-r^*K^*$, with all national capital employed at home. The current account is then $C = p_T^*(x_T - c_T) = r^*K^*$. For simplicity, assume $C = O$, and c_T adjusts to keep the current account in balance. Effects on the trade balance and net interest payments are discussed in the following sections.

III. CHANGES IN THE LABOR ENDOWMENT

The labor endowment has an unambiguous positive link to foreign investment. Looking at the expression for $\partial K^*/\partial L$ in Table 1, $(1 - a_T) - bD_Y > 0$ if $b < 0$. When $b > 0$, $\partial K^*/\partial L > 0$ if $(1 - a_T)/b > D_Y$. Since $b = a_N - a_T$, it follows that $(1 - a_T)/b > 1 > D_Y$. Thus, $\partial K^*/\partial L > 0$ regardless of factor intensity. An increasing labor endowment attracts foreign capital.

In Figure 1, an increase in the labor endowment is pictured by a shift in the dotted line at L to the right. Output of the traded good must rise $(\partial x_T/\partial L > 0)$ since $a_N < 1$ and $D_Y < 1$. The

economy produces more of both goods, and K^* increases. Jones, Neary, and Ruane (1983) similarly find that the labor endowment has an unambiguous positive relation with sector specific foreign capital.

When L increases, output of the nontraded good rises but its price remains unchanged. A simultaneous increase in the demand and supply of the nontraded good occurs. There is also increased output of the traded good and higher national income. Wages are not affected, as the demand for labor to produce more output rises to offset its higher supply, analogous to change in the market for the nontraded good. Jones, Neary, and Ruane (1983) find a similar result in that changes in the labor endowment have no effect on the wage or the price of the nontraded good. In the model of Rivera-Batiz (1982) which has internationally immobile capital, the labor endowment is negatively related with the wage and positively related with the return to capital. An increase in L raises both x_T and K^*. Net interest payments $-r^*K^*$ become larger in absolute value. The trade balance must increase. The rise in x_T may be accompanied by a decrease in c_T. When $b > 0$, $\partial x_T/\partial L > \partial K^*/\partial L > 0$. When $b < 0$, $\partial K^*/\partial L$ may be larger than $\partial x_T/\partial L$ and c_T may not have to decline to maintain current account balance.

IV. CHANGES IN THE NATIONAL CAPITAL ENDOWMENT

Wages are unaffected by a change in the national capital endowment K'. Only changes in exogenous prices affect wages. Wages are thus completely determined by technology and exogenous influences. In the model of Rivera-Batiz (1982), the capital endowment is positively related with wages and negatively related with the return to capital.

When national capital K' increases, output of the nontraded good rises, induced by higher domestic income and demand. A higher income elasticity would mean a stronger increase in the demand for the nontraded good. Since p_N remains unchanged in the comparative static adjustment, the supply of the nontraded good must rise. Output of the traded good falls, even if it is capital intensive. Resources are clearly drawn into producing the nontraded good.

An increase in K' has completely unambiguous effects when the nontraded good is labor intensive. Foreign capital K^* is released from the economy as production shifts toward the labor intensive good. If the nontraded good is capital intensive, the sign of $\partial K^*/\partial K'$ is ambiguous. Output of the capital intensive nontraded good rises, and foreign investment would mean a stronger output shift. A higher income elasticity for the capital intensive nontraded good would favor increased foreign investment.

The negative relation between the output of the traded good and national capital relaxes the link between factor intensity, factor abundance, and outputs. By implication, the Heckscher-Ohlin theorem between two countries would not necessarily hold. For instance, a marginally capital abundant country might not export the capital intensive good when two such trading countries have identical tastes. Similarly, an increase in the labor endowment may increase output of the capital intensive good more than it increases output of the labor intensive good, depending on the income elasticity for the nontraded good.

The link between factor intensity and factor abundance is preserved, however, when stated in terms of the total amount of capital employed. Note that $\partial K/\partial K' = 1 + \partial K/\partial K' = -bD_Y/a_T$. When the nontraded good is labor intensive, it follows that $\partial K/\partial K' < 0$. An

increase in K' lowers total capital employment and shifts production away from capital intensive traded goods. When the nontraded good is captial intensive, $\partial K/\partial K' > 0$ and an increase in K' raises capital employment and shifts production toward the capital intensive nontraded good.

If the nontraded good is labor intensive, the trade balance falls with the decrease in x_T, but the absolute value of net interest payments $-r^*K^*$ falls as well. If $b < 0$, x_T rises as does the trade balance, but the change in net interest payments is ambiguous. The change in the current account is written $0 = dC = p_T^*(\partial x_T/\partial K' - dc_T) - r^*(-a_T - bD_y/a_T)$ from Table 1, which simplifies to $dc_T = 1 - D_y > 0$. Consumption of the traded good ambiguously increases with the increased national capital endowment.

V. CHANGES IN THE PRICE OF INTERNATIONAL CAPITAL

A higher r^* could be due to changes in the international market or a capital tax, pictured in Figure 1 by a lower intercept of the isocost line along the capital axis. The wage falls with a higher r^*, and both sectors switch to more labor intensive production. The isocost line rotates down, tangent to the isoquant of the traded good. Note that the wage falls regardless of factor intensity.

Price of the nontraded good falls if the nontraded good is labor intensive. Demand for the nontraded good falls due to declining national income, but supply may rise enough to create higher output. Output of the nontraded good may then rise or fall.

The general equilibrium demand for capital, represented by the effect of r^* on K^*, has an ambiguous slope. There are diminishing marginal returns for capital in the production of each good, but influences from output adjustments may weigh heavily in the general equilibrium. More flexible factor substitu tion would favor a negative $\partial K^*/\partial r^*$, with demand for capital across the economy falling as firms substitute labor for capital. Because $a_N > b$, if $\partial K^*/\partial r^* > 0$, it must be that $\partial x_T/\partial r^* > 0$ when the nontraded good is labor intensive.

Suppose the nontraded good is capital intensive. If $e > 0$, foreign capital clearly leaves the economy and output of the nontraded good falls if r^* rises. Smaller price and income elasticities for the nontraded good favor a positive e. If the nontraded good is labor intensive and r^* rises, national income falls as declining wages outweigh the increase in the return to capital. Demand for the nontraded good then falls, as both industries switch to more labor intensive production. Price of the nontraded good falls, reflecting its decreased demand, but increased supply may cause x_N to rise. When the nontraded good is capital intensive, national income may rise along with r^*. The falling wage is not enough to offset the rising r^*. A tax on international capital would then raise and redistribute national income.

A typical developing country has an abundant labor supply and a labor intensive nontraded sector. In such a situation, $\partial Y/\partial r^* < 0$. A falling wage would outweigh the rising return to capital owners in national income. A higher international price of capital then unambiguously lowers national income. A capital subsidy in such a developing country would lower the effective price of capital input, increasing the wage, the price of the nontraded good, and national income. Output of the traded good might rise or fall with the capital subsidy as foreign capital enters the developing economy.

The change in the current account due to a change in r^* is $p_T^*(\partial x_T/\partial r^* - dc_T)$ and net interest payments change according to $r^*\partial K^*/\partial r^* + K^* dr^*$. The change in the current account from Table 1 is $dC = (a_N e - s)/a_T^2 - dc_T - (be - s)/a_T^2 - K^* dr^* = e/a_T - dc_T = 0$, which implies $dc_T = e/a_T$. Consumption of the traded good may rise or fall, and adjusts to keep the current account in balance.

VI. CHANGES IN THE PRICE OF THE TRADED GOOD

An higher price in the traded good sector would cause the wage to rise. The traded good isoquant in Figure 1 falls toward the origin with r^* fixed. The ratio of capital to labor increases in both sectors. With w rising, national income rises, causing an increase in the demand for the nontraded good. A simultaneous higher price level in the traded sector and lower price of international capital would cause both the wage and price of the nontraded good to rise.

A higher p_N occurs with the increase in its demand. The nontraded good isoquant in Figure 1 endogenously adjusts downward. If $b > 0$, $\partial p_N/\partial p_T^* = a_N/a_T > 1$, which means the change in the price of the nontraded good is magnified beyond the exogenous change in p_T^*. If $b < 0$, $\partial p_N/\partial p_T^* < 1$.

The endogenous price variables, w and p_N, are linearly homogeneous in the prices of capital and the traded goods. This can be seen because $\partial w/\partial r^* + \partial w/\partial p_T^* = \partial p_N/\partial r^* + \partial p_N/\partial p_T^* = 1$, with all prices normalized to 1. Proportional changes in international prices would thus be neutral on domestic real prices. This strong result applies to the general equilibrium with outputs adjusting. Such a property has not been noted in any of the models developed in the literature. The rescaling in the present model makes this property transparent.

A higher price for the traded good would cause output of the nontraded good to fall if the nontraded good is capital intensive. Supply of the nontraded good then falls enough to offset rising demand.

There is a convex production frontier if the term $\partial x_T/\partial p_T^*$ is negative, which is more likely for positive and larger c. When $b < 0$, it follows that $c > 0$. When $b > 0$, c is more likely positive for smaller D_p and larger D_Y. If substitution is then small enough, $\partial x_T/\partial p_T^* < 0$. With income rising, demand for the nontraded good rises and production of the traded good may fall in the face of a higher p^*. The production frontier would then be locally convex to the origin.

Less substitution in production, a highly labor intensive nontraded good, and a high income elasticity all favor a negative sign for $\partial K^*/\partial p_T^*$ when $b > 0$. Conditions which favor a capital outflow when p_T^* rises also favor decreased output in the traded good sector.

If there are nontrivial income effects, $\partial x_T/\partial p_T^*$ could be positive even with a labor intensive nontraded good. Then $\partial x_N/p_T^*$ would clearly be negative. Production of the traded good is linked with the movement of international capital. If $c > 0$, an increase in p_T^* lowers x_N. If $\partial x_T/\partial p_T^* < 0$, it must be that $\partial K^*/\partial p_T^* < 0$ since $b > a_N$. The production frontier would contract with the departing international capital. If $c < 0$, as would occur with a positive b and no income effect, the increase in p^* would raise K^* and both outputs.

Jones, Neary, and Ruane (1983) also find that wages and the price of the nontraded good rise with a higher price of the traded good. Crosshauling of capital occurs in their model,

with sector specific capital coming into the traded good sector and leaving the nontraded good sector. Output of the nontraded good clearly falls in their short run model. This crosshauling evolves into the ambiguous net capital flow in the long run as capital becomes mobile across sectors.

The change in the current account due to a change in p_T^* is written $dC = ((s - a_N c)/(a_T 2 - dc_T) - (s - bc)/a_T^2 = - c - a_T dc_T/a_T = 0$, which implies $dc_T = -c/a_T$. If $b > 0$, the changes in x_T, K^*, and c_T are all ambiguous. If $b < 0$, dx_T and dK^* are both positive and $dc_T < 0$. The current account rises, as do net interest payments.

The present results relate directly to the magnification effect. Since $1 - a_T > b$, it follows that $\hat{w}/\hat{r}^* < \hat{p}_N/\hat{r}^*$, where $\hat{}$ represents percentage change. Consider an increase in r^*. The partial magnification effect is written $\hat{r}^* > \hat{p}_T = 0 > \hat{w}$, since p_T is held constant and percentage changes in factor prices must flank prices. The percentage change in the price of the nontraded good $\hat{p}_N$ may lie on either side of $\hat{p}_T = 0$ but must be less than $\hat{r}^*$ and greater than $\hat{w}$. The real wage unambigously falls with a higher r^*.

Also consider an increase in p_T^*. With $\hat{p}_T^* > 0$ and $\hat{r}^* = 0$, $\hat{w}/\hat{p}_T^* > \hat{p}_N/\hat{p}_T^*$ since $a_N < 1$. There are two potential magnification effects: $\hat{w} > \hat{p}_T > \hat{p}_N > \hat{r} = 0$ and $\hat{w} > \hat{p}_N > \hat{p}_T > \hat{r} = 0$. Either way, the real wage clearly rises with a higher price of the traded good.

VII. CONCLUSION

The present paper analyzes the full array of long run influences in a small open economy which depends on international capital and produces a nontraded good. Factor intensity, factor substitution, domestic factor endowments, and demand for nontraded goods are all critical to some of the comparative static outcomes. It is possible in every circumstance to determine the relative strengths of shifts in demand or supply in the market for the nontraded good.

An increase in the labor endowment leaves the wage and the price of the nontraded good unchanged, but both outputs increase. The supply and demand for the nontraded good increase, and international capital is attracted to the economy. National income increases by its gradient with respect to labor, namely the wage. Both the trade balance and interest payments to foreign capital increase.

An increase in the endowment of national capital would also leave the wage and the nontraded price unchanged, but increase output of the nontraded good. Both supply and demand for the nontraded good increase, as labor is attracted to that sector. Output of the traded good falls. National income rises by its gradient with respect to capital. If the nontraded good is labor intensive, the trade balance and net interest payments both fall. If the nontraded good is capital intensive, the trade balance increases.

The international price of capital is inversely related to the wage due to the cost minimizing behavior of firms and the fixed international price of the traded good. A subsidy for capital thus unambiguously raises the wage. According to the magnification effect, the real wage rises. When the price of capital falls, firms in both sectors raise their ratios of capital to labor input.

The international price of the traded good has a positive effect on the wage, national income, and price of the nontraded good. A higher price for the traded good raises the

demand for labor, and the real wage rises. The ensuing increase in national income leads to a higher demand and price for the nontraded good. If the nontraded good is capital intensive, both the trade balance and net interest payments become more positive.

All other comparative static outcomes depend in some way on factor intensity. Factor substitution and demand elasticities come into play only in the effects of international prices on international capital and output of the traded good. When the nontraded good is labor (capital) intensive, price of the nontraded good is negatively (positively) affected by the price of international capital. National income is less likely to be positively associated with the price of international capital when the country is more labor abundant.

A subsidy on international capital lowers its input price and attracts international capital to the economy. As production adjusts, the ratio of capital to labor rises in both sectors. National income might fall due to the lower rent received by national capital owners. Lower national income would mean decreased demand for the nontraded good, with international capital released from the economy.

Similar properties would evolve in a model with three productive factors (adding natural resources or skilled labor) and three international markets (splitting the traded good into exports and imports). The pattern of factor inputs would determine the different effects of export subsidies and tariffs. The present model describes less developed countries which depend on international capital and produce labor intensive domestic nontraded goods. A tax on traded goods could be implemented through a tariff and a proportional export tax. Couple this tax with a subsidy for international capital, and the real wage would unambiguously increase. This scheme assumes all tax revenue is spent on the capital subsidy, and transfer costs are zero. Such a coordinated policy would also raise national income and the relative price of nontraded goods.

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