Foreign Capital and Protectionism

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ABSTRACT

In terms of a simple model, it is shown that the growth in the export processing zone through an influx of foreign-owned capital reduces welfare for an economy importing capital-intensive goods and following a protectionary policy. Similarly, it follows that growth in the export-processing zone should benefit economies importing labor-intensive goods.
I. Introduction

The literature on "export-processing zone" (EPZ) or "duty-free zone", have often focused on the welfare implications of establishing such regions within an economy. Papers by Hamilton and Svensson (1982, 1983) have built up different trade-theoretic models to discuss policy issues related to the export-processing zone. Some trade theorists justify the establishment of an EPZ in light of a specific-factor model, others justify subsidizing EPZ, concentrating on a hybrid trade theoretic model with the elements of both Ricardo-Viner and Heckscher-Ohlin structure.

The purpose of this paper is to consider a simple trade model of a small open economy to analyze the welfare implications of an expansion of the EPZ. We shall show that if the economy is an importer of a capital-intensive good and if, due to political reason, there is an import tariff, then growth in the EPZ will reduce welfare. On the other hand, if the economy is an importer of a labor-intensive good, then the expansion in EPZ will prove to be beneficial to the economy. We have a three-sector economy. The first sector represents the EPZ, which uses capital $K_1$ and labor to produce $x_1$. Ownership of $K_1$ rests with the foreigners and $K_1$ is not allowed to flow into the other two sectors. Sectors 2 and 3 produce $x_2$ and $x_3$ using capital of type 2 ($K_2$) and labor. Labor moves among all three sectors. $K_2$ moves between 2 and 3. $K_1$ is specific to sector 1. All goods are traded and their prices are given in the rest of the world. We also assume that entire foreign capital income is repatriated.
II. The Analysis

We need the following symbols to describe the equational structure of the model:

\[ x_i \] - production in the ith sector
\[ w \] - wage rate
\[ r_j \] - return to the jth type of capital \( j=1,2 \)
\[ \bar{L} \] - given endowment of labor
\[ \bar{K}_j \] - given endowment of jth type of capital \( j=1,2 \)
\[ a_{Li} \] - labor-output ratio for the ith sector \( i=1,2,3 \)
\[ a_{Ki} \] - capital-output ratio for the ith sector \( l=1,2,3 \)
\[ P_i \] - price of the ith good
\[ \hat{x} \] - proportional change, i.e., \( \hat{x} \equiv \frac{dx}{x} \).

We assume that the production functions obey CRS and diminishing return to inputs. Markets are competitive and resources are fully employed.

Competitive equilibrium implies:

\[ w a_{L1} + r_1 a_{K1} = P_1 \] (1)
\[ w a_{L2} + r_2 a_{K2} = P_2 \] (2)
\[ w a_{L3} + r_2 a_{K2} = P_3 \] (3)

Full employment conditions imply:

\[ a_{L1} x_1 + a_{L2} x_2 + a_{L3} x_3 = \bar{L} \] (4)
\[ a_{K2} x_2 + a_{K3} x_3 = \bar{K}_2 \] (5)
\[ a_{K1} x_1 = \bar{K}_1 \] (6)

Given prices and endowments, one can solve for \( w, r_1, r_2, x_1, x_2 \) and \( x_3 \) by solving (1) through (6). In this system, price and quantity equations are separable. We can solve for \( w, r_1, \) and \( r_2 \) from (1)-(3) and then solve for the outputs from (4)-(6).
Suppose the economy under consideration imports $x_2$ and exports $x_1$ and $x_3$. Also assume that $x_2$ is capital-intensive relative to $x_3$. Note that $x_2$ and $x_3$ both use $K_2$ and $L$ and form a Heckscher-Ohlin subsystem. The "small" economy does not have any economic justification to impose a tariff on imports of $x_2$. However, suppose, due to political reason, there is a tariff. This completes the initial scenario. In this context, we show that if this country receives an additional $K_1$ to expand its export processing zone, $x_2$ will expand, and $x_3$ will contract, leading to a loss in welfare.

**PROPOSITION:** If, $\hat{K}_1 > 0$ with $\hat{K}_2 = \hat{L} = 0$, then $\hat{x}_2 > 0$.

**Proof:**

From (4) and (6) we get,

$$a_{L2}x_2 + a_{L3}x_3 = \hat{L} - (a_{L1} / a_{K1}) \hat{K}_1$$

(7)

$$\lambda_{L2}\hat{x}_2 + \lambda_{L3}\hat{x}_3 = -\alpha \hat{K}_1$$

(8)

where,

$$\alpha = (a_{L1} / a_{K1}) \cdot (\hat{K}_1 / \hat{L})$$

and,

$$\lambda_{Li} = (a_{Li}x_i / \hat{L}) \ i=2,3.$$  

This follows from Jones (1965). Differentiating (5) we get:

$$[\lambda_{K2}\hat{x}_2 + \lambda_{K3}\hat{x}_3] = 0$$

(9)

where,

$$\lambda_{Ki} = (a_{Ki}x_i / \hat{K}_2) \ i=2,3.$$  

From (8) and (9) one can show that,
\[ \hat{x}_2 = (-\alpha \hat{K}_1 \lambda K_3 / |\lambda|) > 0 \] (10)

or,

\[ \frac{dx_2}{dK_1} = (-\alpha \frac{x_2}{K_1} \lambda K_3 / |\lambda|) > 0 \]

where,

\[ |\lambda| = [\lambda L_2 K_3 - \lambda L_3 K_2] < 0, \text{ as } x_2 \text{ is capital-intensive.} \]

The economic intuition behind the result is very simple. As \( \hat{K}_1 \) increases, it draws labor away from the other sectors. Since \( x_3 \) is labor-intensive, ala Rybczynski Theorem, \( x_2 \) must go up. To describe the welfare implication of such a result we shall develop the following welfare criterion. Following Caves and Jones (1985), we argue that the change in welfare \((W)\) is given by,

\[ dW = P_1 dD_1 + P_2 dD_2 + dD_3 \] (11)

where \( P_1 \) and \( P_2 \) are domestic prices, \( P_3 \) has been chosen to be the numeraire. Without loss of generality let the corresponding world price of the first good be \( P_1^* = P_1 \), for the second good \( P_2 = P_2^*(1+t) \) and \( P_3 = P_3^* \equiv 1 \) (where \( t \) is the tariff rate). It should be noted that the change in the welfare is measured in the units of \( x_3 \).

The budget constraint is given by,

\[ P_1 D_1 + P_2^* D_2 + D_3 = P_1 x_1 + P_2^* x_2 + x_3 - r_1 K_1 \] (11')

Note that entire foreign capital income is repatriated. Differentiating (11') with fixed prices we get,

\[ P_1 dD_1 + P_2^* dD_2 + dD_3 = P_1 dx_1 + P_2^* dx_2 + dx_3 - r_1 dK_1 \]
or,
\[ P_1 dD_1 + P_2 dD_2 + dD_3 + (P_2^* - P_2) dD_2 = P_1 dx_1 + P_2 dx_2 + dx_3 \]
\[ -tP_2^* dx_2 - r_1 dK_1 \]  
(12)

Now, the resulting change in the value of production at domestic prices is given by,
\[ P_1 dx_1 + P_2 dx_2 + dx_3 = wdL + r_1 dK_1 + r_2 dK_2 \]
\[ = r_1 dK_1 \]  
(13)

As \( dL = dK_2 = 0 \), factor prices are constant and \( P_1, P_2 \) are given.

Now we can state and prove the following proposition.

Proposition: Welfare must fall due to an increase in \( x_2 \).

Proof: From (12) and (13) we obtain,
\[ dW + (P_2^* - P_2) dD_2 = -tP_2^* dx_2 \]
or,
\[ dW = tP_2^* (dD_2 - dx_2) \]  
(14)

where,
\[ D_2 = D_2 (P_1, P_2, W) \]

Since \( D_2 \) can change only with changes in \( W \) as prices are fixed, so that,
\[ \frac{\partial D_2}{\partial W} dW = dD_2 \]

Following Caves and Jones (1985, pages 526-7),

\[ P_2, \left\{ \frac{\partial D_2}{\partial W} \right\} = m_2, \] where \( m_2 \) = marginal propensity to consume \( x_2 \) and

\[ 0 < m_2 < 1. \] Utilizing this in (14), we get,
\[ dW = \left\{ \frac{tP_2^* m_2}{P_2^*(1+t)} \right\} dW - tP_2^* dx_2 \]

6
or,
\[
\frac{dW}{dK_1} = \left[ \frac{-tP^*}{tm_2} \right] \cdot \frac{dx_2}{dK_1} < 0
\]
(15)
as \( \frac{dx_2}{dK_1} > 0 \) from (10). Therefore, welfare must go down following an increase in \( K_1 \) and \( x_2 \). QED.

Johnson (1967)\(^2\) argued about the possibility of income loss from the growth in the protected sector. The condition for his case to occur is the decline in the value of domestic output at world prices subsequent to the growth in the protected sector. In our model the value of domestic output, net of foreign capital cost (\( \Psi \)) at any point in time is given by,

\[
\Psi = P_1 x_1 + P_2^* x_2 + x_3 - r_1 K_1
\]
\[
= P_1 x_1 + P_2^* x_2 + x_3 - r_1 K_1 - tP^*_2 x_2
\]
\[
= wL + r_2 K_2 - tP^*_2 x_2
\]
(16)
with an increase in \( K_1 \), as factor prices and domestic resource endowments are held fixed, \( x_2 \) will go up if it is \( K_2 \) intensive. Therefore, the net value of domestic output at world prices must fall due to such a growth. On the other hand if \( x_2 \) was labor intensive, welfare must improve. This may be viewed as a situation where the Johnson (1967) result necessarily holds. For welfare to fall in this situation one needs to guarantee that the value of domestic productions at world prices, net of the repatriation cost, must go down. With full repatriation, this is necessarily the case.\(^3\)

It is interesting to note that Brecher and Diaz-Alejandro
(1977) also find that, with repatriation of capital income, an influx of foreign capital changes the Johnson result from one of ambiguity to one of certain welfare loss. However, in our model while production structure is different, foreign capital need not to be employed in the import-competing sector to have the negative impact on welfare.

III. Concluding Remarks

In terms of a simple model, we have been able to make a welfare judgment regarding the growth of the EPZ in a "small" economy. The paper raises a doubt about the efficacy of expansion in the EPZs in economies importing capital-intensive goods. Since generally the LDCs import capital-intensive goods and in most of these countries import-competing sectors are heavily protected, growth of the EPZs in these countries might not lead to unambiguous welfare improvement. We have kept ownership of $K_1$ exogenous to this system to highlight the basic issue. One can extend the analysis by endogenizing the ownership of $K_1$ and then, we think, one can find out conditions under which our results will continue to hold.
FOOTNOTES


2. We are indebted to one of the referees for clearing up our understanding about Johnson (1967).

3. Brecher and Diaz-Alejandro (1977) and Brecher and Findlay (1983) have also analyzed foreign capital and the issue of immiserizing growth. However, there are two major differences. Our production structure is entirely different from the ones developed in the above studies. Moreover, we show that foreign capital does not need to be employed in the import-competing sector to get the negative impact on welfare. Our model has a "multi-sector" property absent in the above models. We can have lots of export-processing zones with different types of foreign capital and growth in any one of them will be sufficient for W (welfare) to go down through an increase in $x_2$. 


REFERENCES


