

Foreign Capital and Protectionism

Beladi, Hamid and Sugata Marjit

Working Paper No. 310
January 1992

University of
Rochester

Foreign Capital and Protectionism

Hamid Beladi

and

Sugata Marjit

Rochester Center for Economic Research
Working Paper No. 310

Foreign Capital and Protectionism

by

Hamid Beladi
University of Dayton
Dayton, OH USA

Sugata Marjit
Jadavpur University
Calcutta, India

(Revised)
1991

ACKNOWLEDGEMENT

We are extremely grateful to the referees for comments which improved our understanding of the problem and the technical presentation of the analysis. The usual disclaimer applies. Sugata Marjit would like to thank the Department of Economics at the University of Rochester for partially supporting this research during the summer of 1990.

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.¹

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

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

Competitive equilibrium implies:

$$w a_{L1} + r_1 a_{K1} = P_1 \quad (1)$$

$$w a_{L2} + r_2 a_{K2} = P_2 \quad (2)$$

$$w a_{L3} + r_2 a_{K2} = P_3 \quad (3)$$

Full employment conditions imply:

$$a_{L1}x_1 + a_{L2}x_2 + a_{L3}x_3 = \bar{L} \quad (4)$$

$$a_{K2}x_2 + a_{K3}x_3 = \bar{K}_2 \quad (5)$$

$$a_{K1}x_1 = \bar{K}_1 \quad (6)$$

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,

$$a_{L2}x_2 + a_{L3}x_3 = \bar{L} - (a_{L1} / a_{K1}) \bar{K}_1 \quad (7)$$

$$\lambda_{L2}\hat{x}_2 + \lambda_{L3}\hat{x}_3 = -\alpha \hat{K}_1 \quad (8)$$

where,

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

and,

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

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

$$[\lambda_{K2}\hat{x}_2 + \lambda_{K3}\hat{x}_3] = 0 \quad (9)$$

where,

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

From (8) and (9) one can show that,

$$\hat{x}_2 = (-\alpha \hat{\bar{K}}_1 \lambda_{K3} / |\lambda|) > 0 \quad (10)$$

or,

$$\left(\frac{dx_2}{dK_1} \right) = \left(-\alpha \frac{x_2}{K_1} \lambda_{K3} / |\lambda| \right) > 0$$

where,

$$|\lambda| = [\lambda_{L2} \lambda_{K3} - \lambda_{L3} \lambda_{K2}] < 0, \text{ as } x_2 \text{ is capital-intensive.}$$

The economic intuition behind the result is very simple. As \bar{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,

$$dW \equiv P_1 dD_1 + P_2 dD_2 + dD_3 \quad (11)$$

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,

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

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,

$$P_1 dD_1 + P_2 dD_2 + dD_3 + (P_2^* - P_2) dD_2 = P_1 dx_1 + P_2 dx_2 + dx_3 - tP_2^* dx_2 - r_1 dK_1 \quad (12)$$

Now, the resulting change in the value of production at domestic prices is given by,

$$\begin{aligned} P_1 dx_1 + P_2 dx_2 + dx_3 &= w dL + r_1 dK_1 + r_2 dK_2 \\ &= r_1 dK_1 \end{aligned} \quad (13)$$

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,

$$dW = tP_2^* (dD_2 - dx_2) \quad (14)$$

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,

$$\left(\frac{\partial D_2}{\partial W} \right) dW = dD_2$$

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

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

$0 < m_2 < 1$. Utilizing this in (14), we get,

$$dW = \{ [tP_2^* m_2] / [P_2^* (1+t)] \} dW - tP_2^* dx_2$$

or,

$$\left(\frac{dW}{dK_1}\right) = \left[\frac{-tP_2^*}{\left(1 - \frac{tm_2}{1+t}\right)} \cdot \frac{dx_2}{dK_1} \right] < 0 \quad (15)$$

as $\left(\frac{dx_2}{dK_1}\right) > 0$ 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 (Ψ) at any point in time is given by,

$$\begin{aligned} \Psi &= P_1x_1 + P_2^*x_2 + x_3 - r_1K_1 \\ &= P_1x_1 + P_2x_2 + x_3 - r_1K_1 - tP_2^*x_2 \\ &= wL + r_2K_2 - tP_2^*x_2 \end{aligned} \quad (16)$$

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

1. See also, Yu (1985) and Batra (1986), Marjit (1990) and Jones and Marjit (1990), Hazari and Pattanaik (1980), Hazari (1982), Brecher and Diaz-Alejandro (1977) and Brecher and Findlay (1983).
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

- Batra, R. N., (1986), "A General Equilibrium model of Multinational Corporations in developing Economies", Oxford Economic Papers, 38, pp. 342-53.
- Brecher, R.A. and C.F. Diaz-Alejandro, (1977), "Tariffs, Foreign Capital and Immiserizing Growth", Journal of International Economics, 7, pp. 317-322.
- Brecher, R.A. and R. Findlay, (1983), "Tariffs, Foreign Capital and National Welfare", Journal of International Economics, 14, pp. 277-288.
- Caves, E.R. and W.R. Jones, (1985), "World Trade and Payments", Fourth edition, Boston: Little Brown and Company Inc.
- Hamilton, C. and Lans E.O. Svensson (1982), "On the welfare effects of a duty free zone." Journal of International Economics, 4, pp. 225-241.
- Hamilton, C. and Lans E.O. Svensson (1983), "On the choice between capital import and labor export." European Economic Review, 20, pp. 167-192.
- Hazari, B.R. (1982), Colonialism and Foreign Ownership of Capital: A Trade Theorist's View (London, Croom).
- Hazari, B.R. and Pattanaik, P.K. (1980), "Some Welfare Propositions in a Three Commodity, Three Factor Model of Trade in the Presence of Foreign Owned Factors of Production," Greek Economic Review, vol.2 (April), pp. 12-33.

- Johnson, H. (1967), "The possibility of income losses from increased efficiency or factor accumulation in the presence of tariffs." Economic Journal, 77, 151-154.
- Jones, R. W. (1965), "The structure of simple general equilibrium models." Journal of Political Economy, 73, 557-572.
- Jones, R. and Marjit, S., (1990), "International Trade and Endogenous Production Structure", Essays in honor of T. Rader, Forthcoming.
- Marjit S., (1990), "A simple production model in trade and its applications", Economics Letters.
- Yu, Eden. (1985), "Toward a Theory of Customs Unions with Foreign Investment", Economia Internazionale, Vol. 38, No. 2, pp.222-235.