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## Protection and the gainful effects of foreign capital

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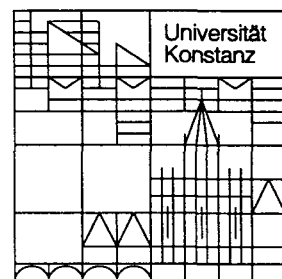
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# **Protection and the Gainful Effects of Foreign Capital**

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## Abstract

An increased foreign capital inflow into a protected sector is generally immiserizing. We show that if the protected sector produces an intermediate input, positive welfare effects may emerge. A striking result is that it might lead to an increased import-demand for the intermediate input which is a substitute for the product of the import-competing sector.

*Keywords:* Exogenous capital; welfare

*JEL Classification:* F20, F21

## I. Introduction

Among the few outstanding results in the theory of trade policy Johnson's (1967) paper is a remarkable one. It was first to point out that growth in the protected sector may be immiserizing for a small economy, complementing Bhagwati's (1958) claim that to be immiserized an adverse terms of trade effect is necessary. Following Johnson (1967), a subsequent series of papers have demonstrated that such welfare loss was a necessary outcome if the growth was induced by foreign capital inflow and the capital income was repatriated in full [see Brecher and Alejandro (1977) among others]. Since then numerous papers have been written in international and development economics modifying, strengthening and extending the observation made by Brecher and Alejandro (1977).<sup>1</sup> Two interesting papers by Jones (1984) and Neary and Ruane (1988) dealt intensively on exogeneity or endogeneity of such capital flows and the resulting welfare implications. It has become a classroom norm to teach the students that foreign-capital-induced growth in a protected sector is immiserizing because it cuts back the volume of trade further for a small economy and moves it further away from a "free-trade" situation which is the optimal policy. In the presence of multiple distortions, the result can change by reducing other distortions at the expense of the growth in one of the distorted sectors.

The purpose of this paper is to propose a theorem that alters the conventional perception, that we are so familiar with, from Bhagwati (1958), Johnson (1967) to Brecher and Alejandro (1977). We introduce a very simple model where only one sector producing an intermediate input is protected. Growth in this sector is induced by an expansion in the availability of foreign capital with the incremental income fully repatriated. There is no

other distortion in the economy. Such a growth may be welfare improving under very reasonable conditions. A surprising implication of our analysis is that such growth in the protected domestic intermediate sector may *increase the demand for imported intermediate, a perfect substitute of the product produced in the protected sector*. We then conclude by observing that part of the strength of the Brecher and Alejandro (1977) result is derived from the emphasis it gives to a final goods sector. Any growth in that sector generally reduces import demand. This may not be true for an intermediate input sector. Thus, the nature of the commodity being protected and allowed to grow becomes very important for the general equilibrium welfare implications. Independent of the possibility of immiserization, a feature of the simple framework that we develop is that expansion in the protected sector may go hand in hand with the expansion in the import demand for the similar product. The next section describes the model and the result. The last section concludes the paper.

## II. The Model and The Result

We have a small open economy producing three goods  $X$ ,  $Y$  and  $M$ .  $M$  is an intermediate input used in sector  $Y$ . Sectors  $X$ ,  $Y$  use labor and capital of type one. Sector  $Y$  also uses  $M$ , the domestic input and imports  $M^*$  for the residual requirement.  $M$  is the import-competing sector. It uses labor and capital of type two.<sup>2</sup> The trade pattern is such that the import-demand for  $M$ , i.e.  $M^*$  is paid by a trade surplus generated in the final goods producing sector. Sector  $M$  is protected by a tariff. There is no other trade or production distortion in the system. Production technology is of constant returns to scale with diminishing returns, resources are fully employed and markets are competitive. The

following symbols are used for the formal presentation of the model.

- $X$  - output in the protected final good sector
- $Y$  - output in the export sector
- $M$  - output in the intermediate sector
- $M^*$  - import demand for the intermediate input
- $T$  - tariff on the intermediate good
- $w$  - the wage rate
- $r_i$  - return to capital of type  $i = 1, 2$
- $a_{mY}$  - intermediate input - output ratio in the export sector
- $a_{LS}$  - labor - output ratio in the sth sector  $s = X, Y, M$
- $a_{KS}$  - capital - output ratio in the sth sector  $s = X, Y, M$
- $\bar{K}_i$  - fixed stock of capital of type  $i = 1, 2$
- $\bar{L}$  - fixed labor supply
- $D_j$  - domestic demand for the jth product  $j = X, Y$
- $\Omega$  - the measure of real income

All prices are normalized to unity. The following equations describe the formal structure of the general equilibrium model. Competitive pricing implies that,

$$[wa_{LX} + r_1 a_{KX}] = 1 \quad (1)$$

$$[wa_{Lm} + r_2 a_{Km}] = (1 + T) \quad (2)$$

$$[wa_{LY} + (1 + T) a_{mY} + r_1 a_{KY}] = 1 \quad (3)$$



Full-employment conditions imply,

$$[a_{LX}X + a_{LY}Y + a_{LM}M] = \bar{L} \quad (4)$$

$$[a_{KX}X + a_{KY}Y] = \bar{K}_1 \quad (5)$$

and,

$$a_{Km}M = \bar{K}_2 \quad (6)$$

Also, demand - supply equilibrium for the intermediate good yields,

$$a_{mY}Y = [M + M^*] \quad (7)$$

From equations (1) and (3) we can solve for  $w$  and  $r_1$ . Then equation (2) may be utilized to get  $r_2$ . Hence, factor prices are determined. Since factor prices are independent of endowments, equation (6) determines  $M$ . Then equations (4) and (5) determine  $X$  and  $Y$ . And finally equation (7) determines  $M^*$ . This completes the general equilibrium structure of the model. Note that once factor prices are determined, factor proportions are also determined.

To develop the national income criterion we start from the trade-balance condition and by differentiating that, we get,

$$\begin{aligned} d\Omega &= dX + dY - dM^* \\ &= (1 + T) dM^* - dM^* \\ &= TdM^* \end{aligned} \quad (8)$$

where  $d\Omega$  measures the change in real national income. Equation (8) suggests that the change in real income in this tariff-distorted economy depends on the change in the volume of imports in the intermediate sector.

Now, consider a situation where  $\bar{K}_2$  increases through an exogenous foreign capital

inflow. One can interpret this as a removal of restriction on foreign investment in this sector such that the entire  $dK_2$  ( $> 0$ ) is financed by foreigners. They are also allowed to repatriate the entire income, i.e.  $r_2 dK_2$ .

Since the term  $r_2 dK_2$  cancels out in equation (8), any change in real income should focus on,

$$\left(\frac{d\Omega}{d\bar{K}_2}\right) = T \left(\frac{dM^*}{dK_2}\right) \quad (9)$$

Now, denoting a  $\hat{\cdot}$  on a variable as a proportional change, from equation (6) we obtain,

$$\hat{M} = \hat{K}_2 \quad (10)$$

Using this in equation (4) and differentiating (4) and (5) we get,

$$[\lambda_{LX}\hat{X} + \lambda_{LY}\hat{Y}] = -\lambda_{LM}\hat{K}_2 \quad (11)$$

$$[\lambda_{KX}\hat{X} + \lambda_{KY}\hat{Y}] = 0 \quad (12)$$

Where,  $\lambda$ 's are allocated factor-shares in the production of  $X$  and  $Y$ . It is easy to show that,

$$\hat{Y} = \left[ \frac{\lambda_{LM}\lambda_{KX}\hat{K}_2}{(\lambda_{LX} - \lambda_{KX}) + \lambda_{LM}\lambda_{KX}} \right] = \frac{\lambda_{LM}\lambda_{KX}\hat{K}_2}{|\lambda|} \quad (13)$$

We would assume that  $|\lambda| > 0$  i.e.  $Y$  is capital-intensive. Then from equation (7) we obtain,

$$[\lambda_m^*\hat{M}^* + \lambda_m\hat{M}] = \hat{Y} \quad (14)$$

Where  $\lambda_m^*$ ,  $\lambda_m$  are respectively the demand shares of the imported input and domestic input as being used in Sector  $Y$ . Thus,

$$\hat{M}^* = \frac{\hat{K}_2}{\lambda_m^*} \left[ \frac{\lambda_{LM} \lambda_{KX}}{(\lambda_{LX} - \lambda_{KX}) + \lambda_{LM} \lambda_{KX}} - \lambda_m \right] \quad (15)$$

The following theorem is immediately available,

**Theorem.** *An increase in  $K_2$  with full repatriation of capital income increases welfare iff,*

$$\lambda_m^* > \frac{\left[ \frac{\lambda_{LX} - \lambda_{KX}}{\lambda_{LM} \lambda_{KX}} \right]}{\left[ 1 + \frac{\lambda_{LX} - \lambda_{KX}}{\lambda_{LM} \lambda_{KX}} \right]}$$

**Proof:** From equation (15) we know that,

$$\hat{M}^* > 0 \text{ iff } [\lambda_{LM} \lambda_{KX} - \lambda_m (\lambda_{LX} - \lambda_{KX}) - \lambda_m \lambda_{LM} \lambda_{KX}] > 0$$

Now, simplifying and remembering that  $\lambda_m = (1 - \lambda_m^*)$  we have,

$$\hat{M}^* > 0 \text{ iff } \lambda_m^* > \frac{\left[ \frac{\lambda_{LX} - \lambda_{KX}}{\lambda_{LM} \lambda_{KX}} \right]}{\left[ 1 + \frac{\lambda_{LX} - \lambda_{KX}}{\lambda_{LM} \lambda_{KX}} \right]}$$

From equation (9) we know that  $d\Omega_2 > 0$  iff  $dM^* > 0$ . Hence, the result *QED*.

The intuitive explanation of this theorem is this. An increase in  $K_2$  draws labor into sector  $M$  and away from sectors  $X$  and  $Y$ . Since  $X$  is labor-intensive, due to the Rybczynski effect, production in sector  $Y$  increases. If  $\lambda_m^*$  is sufficiently high, growth in demand for intermediate input induced by a growth in  $Y$  cannot be offset fully by a growth in  $M$  (as  $\lambda_m$

is low), hence imports i.e.  $M^*$  must rise. At this point two observations are in order. First, for such a result sector  $Y$  has to be capital intensive. If  $|\lambda| < 0$ ,  $\hat{Y} < 0$  and with  $\hat{M} > 0$ ,  $\hat{M}^* < 0$ . Second, if  $|\lambda| > 0$  but  $\lambda_{LX} < \lambda_{KX}$ , then  $\hat{Y} > \hat{M}$  and therefore  $\hat{M}^* > \hat{Y} > \hat{M}$ .

Our result shows that an influx of foreign capital in a distorted sector without any other distortion may be welfare improving. Here, due to a tariff in the intermediate sector,  $Y$ 's production is adversely affected relative to the "free-trade" level. Although the first-best strategy is to remove the tariff, an increase in  $K_2$  may increase  $Y$  to such an extent that  $M^*$  is increased and the extent of distortion is reduced.

### III. Some Concluding Remarks

This paper has shown that, contrary to the conventional wisdom, foreign capital inflow into a tariff-distorted intermediate sector and with full repatriation of income can be welfare improving, thus qualifying the established result which only focuses on the inflow of foreign capital into the final goods sector. In a conventional model, foreign-capital-induced growth in a tariff-ridden sector decreases the volume of imports and hence reduces gains from trade. But the same foreign capital inflow into a distorted intermediate sector can increase import demand for the same input.

One might argue that similar results might arise when there is more than one import-competing final goods sector and capital flows into one of them and through general equilibrium effects reduces the volume in others. But note that in such a system the sector where foreign capital flows *must experience a shrinkage in import demand*. But with an intermediate good such demand can increase. We could complicate the model by assuming

that sector  $X$  also uses  $M$ . Still meaningful conditions can be derived where our result would be true.

### Footnotes

1. See in this context two recent papers by Chao and Yu (1994) and Sen (1994), etc.
2. The production model used here is related to Gruen and Corden (1970), Beladi and Marjit (1992) and Jones and Marjit (1993).

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