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On the Participation of Local Capital in a Foreign Enclave – A General Equilibrium Analysis

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Abstract

We provide a general equilibrium analysis of a "joint venture" between local and foreign capitalists in an export sector of a small economy. When, due to political reasons, the local government is unable to alter the tariff rates drastically, promoting such joint-ventures improves national welfare. Our results obtained earlier in a "full employment" context continue to hold in a model with unemployment.

I. Introduction

The process of economic liberalization has recently gained momentum in many countries.[1] One crucial ingredient of this process is to remove protection from the existing import-competing sectors coupled with creating more liberalized environment for foreign capital so that the economy becomes

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1. See the Asian Development Outlook, [1992].

competitive in the export markets. However, it is well known that wiping out tariffs entails quite costly political process whereby the vested interest groups pressurize local governments to continue functioning of the pre-existing protectionary apparatus. A basic objective of more "outward" oriented trade policies is to distract domestic capital away from sheltered local markets towards more export oriented ventures. A common feeling shared by a large group of economists is that outward orientation of local capital helps to build up competitive, efficient and growing industrial structure. Such a feeling, to some extent, has been the consequence of remarkable performances of the Asian "tigers" *i.e.,* Taiwan, Hong-Kong, Singapore and South Korea. For countries such as India drastic policy changes may lead to unbreakable socio-political tension in the short run. For example sudden removal of tariffs is likely to be fought tooth and nail by the capitalists and laborers of the protected sector. An implicit threat of unsurmountable political turmoil often causes the shift, to a more liberalized environment, to be only a gradual one.[2] A relatively feasible avenue might be one where without altering the existing tariff structure, local capital is provided with the opportunity to join hands with international capital in the new export projects. This may be done in such a way that the size of the distorted import-competing sector steadily adjusts to the new environment. In this paper we attempt an analysis of joint ventures between the local and foreign capital in terms of a general equilibrium model. The motivation behind this research is two fold. First, we would like to propose a general equilibrium model of joint-venture which is non-existent in the traditional literature on trade and capital movement.[3,4] Second, we identify a policy for a government, whose hands are tied by political commitments, to minimize the size of a distorted import-competing sector without altering the tariffs. The basic framework of

2. The problem of pursuing drastic liberalizing policies in the Indian Economy has been highlighted in the Economic Reform Today - Summer 1992.
3. The literature on Foreign capital and national welfare under protection is vast. Brecher and Alejandro [1977], Jones [1984] and Neary and Ruane [1988] provide stimulating analysis. Neary and Ruane [1988] is the most exhaustive treatment on the topic.
4. Strategic models of joint-ventures are quite popular nowadays. These models use game theoretic or "principal-agent" type frameworks. See in this context Singh and Bardhan [1988] and Marjit [1990a].

analysis is similar to the one recently used in Beladi and Marjit [1992] which is an application of Gruen and Corden [1970][5] in a different context. We divide the paper into four sections. In section II we analyze our results in a full employment framework. In section III we extend our analysis in a model with unemployment. In the last section we conclude the paper.

II. The Basic Model

Our economy consists of three sectors producing X_1, X_2 and X_3. X_1 and X_2 use labor and domestic capital. Sector 1 is the traditional export sector and sector 2 is the protected import competing sector. X_3 is the modern export sector built with the help of foreign capital which also embodies advanced technology not available to the domestic capitalists. We name this sector a foreign enclave. However, one can think of a situation where the foreign capital can transfer part of its advanced knowledge to the domestic capitalists such that domestic capital can accompany the foreign capital in the third sector. We assume that without foreign capital domestic capital is unable to produce X_3.[6] Participation of local capital in the enclave might be a policy variable at the disposal of the government subject to the negotiations with the foreign capitalists. We allow all foreign capital income to be repatriated. Our economy is "small" compared to the rest of the world. However, return to foreign capital is endogenously determined through the exogeneity of the stock of foreign capital which is also controlled during the process of liberalization. It would be evident that in the system described above, welfare effects of a larger stock of foreign capital depend on the degree of participation of the local capital in the foreign enclave *i.e.* X_3.[7] This is particularly induced by the fact that initially the domestic capital intensive manufacturing sector is protected by a tariff.

To describe the general equilibrium of the system we need the following

5. For recent developments on Gruen and Corden [1970] see Marjit [1990b], Jones and Marjit [1992] and Neary and Grada [1991] for interesting applications of a similar structure.
6. On strategic technology transfer under imperfect patent rights see Kabiraj and Marjit [1993].
7. See Jones and Marjit [1992b] on the labor participation in a foreign enclave.

set of symbols.

a_{Li} ; Labor-output ratio in the ith sector $i = 1, 2, 3$
a_{Ki} ; Domestic Capital-output ratio in the ith sector $i = 1, 2, 3$
a^*_{K3} ; Foreign Capital-output ratio in sector 3
w ; wage rate
r^* ; return to capital in the foreign enclave
$\hat{r}^*$; return to foreign capital
R ; return to domestic capital
P_i ; Price of the ith good, $i = 1, 2, 3$
t ; Initial tariff rate in sector 2
$\bar{L}$; given supply of labor
$\bar{K}$; stock of domestic capital
$\bar{K}^*$; stock of foreign capital

The General Equilibrium of the system is described by the following set of equations.

$$wa_{L1} + Ra_{K1} = P_1 \tag{1}$$

$$wa_{L2} + Ra_{K2} = P_2(1 + t) \tag{2}$$

$$wa_{L3} + r^* a^*_{K3} = P_3 \tag{3}$$

$$a_{L1}X_1 + a_{L2}X_2 + a_{L3}X_3 = \bar{L} \tag{4}$$

$$a_{K1}X_1 + a_{K2}X_2 = \bar{K} \tag{5}$$

$$a^*_{K3}X_3 = \bar{K}^* \tag{6}$$

(1)–(3) determine w, R, r^* and hence the factor proportions. (4)–(6) determine X_1, X_2, X_3. We now characterize the idea of a "joint-venture" in the following manner. From equation (3) it is evident that given w/r^*, a_{K3} is determined. However, we assume that working along with foreign capital, domestic capital attain a level of efficiency compatible with foreign technology. Such attainment is entirely conditional on working together. This is almost like transferring the "black-box" of technology through cooperation. If foreign capital is not there, the local-capital cannot successfully operate in the enclave. By this process λa_{K3} can be obtained by using the local capital and $(1 - \lambda)a_{K3}$ by using the foreign capital, $\lambda \in [0, 1)$. This implies we can

accommodate a value of $\lambda = 0$ but not $\lambda = 1$. $\lambda = 0$ implies that the local capital is not involved in the project. $\lambda < 1$ because X_3 cannot be produced only with the domestic capital.[8] It may be noted that the distinction between the domestic and foreign capital is not only in terms of ownership but also in terms of their productivities. One just can not replace foreign input completely by a domestic input. However, upto a stage they may be "perfect substitutes." Such a way of modelling technology is very different from the usual case. As (1) and (2) determine w and R, such a "joint-venture" is feasible if,

$$\lambda R + (1 - \lambda)\hat{r}^* \leq r^* \qquad (7)$$

(7) states that the per unit average return to capital in the collaboration must not be greater than what the project can pay. Assuming that there is no "residual", we treat (7) with strict equality. We assume that in the enclave joint-venture yields $r^* > R$ *i.e.* this sector is relatively more productive than the traditional ones. As we have assumed earlier that $\bar{K}^*$ is exogenous, $\hat{r}^*$ is determined given r^*, R and λ from (7) and $\hat{r}^* > r^* > R$. $\bar{K}^*$ is something like a foreign owned factor of production in the local economy. If $\hat{r}^*$ was given from outside, as in the case of a truly "small" open economy, capital inflow-outflow would be endogenously determined. However, we are more interested in a situation where the local authorities control the size of the enclave by controlling volume of foreign investment and enter into negotiations with the foreign capitalists on λ. With $\lambda > 0$, for the same size of the foreign enclave, one needs only $(1 - \lambda)\bar{K}^*$ amount of foreign capital. This is seen immediately by rewriting (6) as (6)′

$$(1 - \lambda)a^*_{K3}X_3 = \bar{K}^*(1 - \lambda) \qquad (6)'$$

In this case the foreign capitalists earn $\hat{r}^*(1 - \lambda)\bar{K}^*$.

With $\lambda > 0$, (5) is rewritten as (5)′

$$a_{K1}X_1 + a_{K2}X_2 + \lambda a^*_{K3}X_3 = \bar{K} \qquad (5)'$$

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8. As in any neo-classical model capital here is supposed to embody the technology also. Domestic capital does not embody the specific skills required for the production of X_3. However, local capital can substitute for the specialized skills of the foreign capital only to a limited extent. This is reflected in $\lambda < 1$.

We continue to assume that the entire foreign capital income is repatriated. Note that equation (3) does not change in the new situation as,

$$wa_{L3} + \lambda R a^*_{K3} + \hat{r}^*(1-\lambda)a^*_{K3} = P_3$$

$$\text{or, } wa_{L3} + (\lambda R + (1-\lambda)\hat{r}^*)a^*_{K3} = P_3$$

$$\text{or, } wa_{L3} + r^* a^*_{K3} = P_3$$

The reconstructed general equilibrium of the system is given by (1)–(3), (4), (5)′, (6)′. In the above discussion we have identified λ as a policy variable, along with the size of the enclave. Before we proceed to the first proposition let us define the following additional symbols.

$$r_{Ki} \equiv a_{Ki}X_i/\bar{K},\ i = 1, 2,\ r_{Li} \equiv a_{Li}X_i/\bar{L},\ i = 1, 2, 3 \text{ and } r_{K3} \equiv a_{K3}X_3/\bar{K}.$$

Proposition 1. *If* $1 \geq r_{K1}r_{L3}/r_{K3}r_{L1}$, *then* $\exists\ \tilde{\lambda} \in (0, 1)$ *such that* $\forall\ \lambda > \tilde{\lambda}$, *increase in* $\bar{K}^*$ *must increase national welfare.*

Proof – See the Appendix.

Larger value of λ increase the use of domestic capital in the foreign enclave. As $\bar{K}^*$ increases and labor and domestic capital both are drawn into the enclave, local capital might be attracted relatively more contracting the capital-intensive protected sector X_2. This would be welfare-improving. $r_{K1}r_{L3}/r_{K3}r_{L1}$ is the initial value of λ beyond which the resultant Rybczynski effect delivers the favorable result. Note that if 1 is below this critical value, it makes the system vulnerable to the negative welfare impact of an increase in the size of the enclave. On the other hand if 1 is greater than the critical value, then for all $\lambda > \tilde{\lambda} = r_{K1}r_{L3}/r_{K3}r_{L1}$, an increase in $\bar{K}^*$ improves welfare. Note that $r_{K1}r_{L3}/r_{K3}r_{L1}$ is nothing but the capital intensity of the foreign enclave relative to labor *vis-a-vis* the same in sector 1. Rewriting the condition for such a λ to exist

$$r_{K1}r_{L3} < r_{K3}r_{L1} \tag{9}$$

(9) suggests that the capital intensity of the foreign enclave must be higher than the same in the traditional export sector. (9) is the necessary and sufficient condition for proposition 2 to hold. $r_{K1}r_{L3}/r_{K3}r_{L1}$ can also be written as,

$(a_{K1}/a_{L1})/(a^*_{K3}/a_{L3})$. Direct comparison of these ratios are difficult since the technology and factor-prices vary between sector 1 and sector 3.

Technological specification in the foreign enclave might constrain the value of λ. Suppose, for one unit of required foreign capital at the most $\bar{\lambda}$ could be replaced by the local capital. In that case the relevant maximum λ will be given by $\bar{\lambda}$.

More significant is the participation of local capital in the foreign enclave, greater is the chance that following the expansion in the enclave the erstwhile protected sector will contract. Although it is true that the host government cannot alter $\bar{\lambda}$, it might still be able to choose $\lambda > (a_{K1}/a_{L1})/(a^*_{K3}/a_{L3})$ provided $\bar{\lambda} > (a_{K1}/a_{L1})/(a^*_{K3}/a_{L3})$.

III. An Extension with Unemployment

The framework we developed in the last section can be altered by introducing unemployment of Harris-Todaro variety. The main result continues to hold. This is interesting in the sense that even if there is employment effects of a contraction in the protected sector, real national income improves unambiguously.

To restructure the analysis we change equations (2), (3) and (4) to (10), (11) and (12) by incorporating a fixed urban wage and the Harris-Todaro migration equation.

$$\overline{w}a_{L2} + Ra_{K2} = P_2(1+t) \tag{10}$$

$$\overline{w}a_{L3} + r^*a^*_{K3} = P_3 \tag{11}$$

$$(w/\overline{w})a_{L1}X_1 + a_{L2}X_2 = (w/\overline{w})\bar{L} - a_{L3}X_3 \tag{12}$$

The general equilibrium of the system is solved in the following way. (1), (10) and (11) determine w (the rural wage), R and r^*. (12), (5) and (6) determine X_1, X_2 and X_3. Now we can proceed exactly in the similar way as in section I and define $\tilde{\lambda}$. Proposition 1 can be recast as proposition 2. For an elegant discussion on foreign capital in Harris-Todaro framework see Khan [1982].

Proposition 2. If $\bar{\lambda} > (r_{K1}/r_{K3})\cdot(r^*_{L3}/r_{L1})$ *then* $\exists\ \tilde{\lambda} \in (0, \tilde{\lambda}]$ *such that* $\forall\ \lambda > \tilde{\lambda}$, *increase in* $\bar{K}^*$ *must increase national welfare.*

Proof – See the Appendix

Note that r^v_{L3} is different from r_{L3} as one has to take into account the value intensities instead of physical intensities. For example,

$$r^v_{L3} = a_{L3}X_3 / \bar{L} \text{ where as, } r^v_{L3} = (\bar{w} / w) \cdot r_{L3}.$$

Also implicit is the assumption that the value-intensity ranking between the sectors 1 and 2 does not differ from the physical intensity ranking.

As long as w remains unaffected by the endowment changes, the Harris-Todaro structure exhibits an envelope property. Whatever be the changes in the aggregate employment, total labor income remains the same. This is evident from (12) which reveals $w\bar{L}$ as the aggregate labor income.

With a $\lambda > r_{K1}r^v_{L3}/r_{K3}r_{L1}$, an increase in $\bar{K}^*$ reduces the size of the distorted sector and welfare improves as in a "full-employment" model notwithstanding the employment effects. Before we come to the concluding section, let us devote some to discuss the endogeneity of λ. Up to this stage λ has been kept exogenous. Given the technological capacity of the local capital, there is a maximum "degree" to which a unit of foreign capital could be replaced by its local counterpart. However, the capability of local capital could be perfected through a process of "learning-by-doing." Larger is the size of the enclave, higher might be λ. Such a situation might arise if more and more inflow of foreign capital helps the learning ability of local capital. Thus one may start with a very low value of λ and until and unless the size of the enclave is not elevated up to a certain extent, λ can not go up. One must take note of such dynamic gains. In our model, allowing the enclave size to increase at an early stage with a very low λ, would lead to a welfare loss by escalating the distortionary effect of a tariff. But if λ itself starts increasing, such a welfare loss could be recouped in the future.

IV. Conclusion

Long history of protection in many developing countries (such as India) as well as some of the advanced nations (such as Australia) has generated powerful lobbies nurtured primarily by the local capital and labor. This has become quite a hurdle against pursuing a liberalized trade policy. If drastic

tariff cuts are impossible in the sense that it leads to heated political battle and controversies, is there any other way of escaping that problem? This paper suggests that by alluring domestic capital into the modern export sectors run by the foreign capitalists one can reduce the size of the distorted sector.

Such a policy option might not always exist. Ability to implement a joint-venture rests heavily on the technological capacity of the local capital. While proving the proposition we have used the "balanced trade" condition as is usually done in the literature. In case there is chronic balance of trade problem and the amount of external assistance is given in the short run, a careful analysis should be done to find out the current account implications of a contraction in X_2. However, the standard positive welfare effects of having a smaller protected sector persists.

The main result continues to hold in an altered structure with open urban unemployment modelled in a Harris-Todaro framework. Although the special structure of the model does not allow employment effects to influence the welfare results, for any other structure, where employment effects do matter, they must be weighed against the beneficial effects of a decline in the size of the protected sector.

This paper is a contribution to the traditional literature on immiserization and tariff induced capital inflow. In our model capital flow is exogenous. Jones [1984], Neary and Ruane [1988] forcefully argue that tariff induced capital inflow causes immiserization no matter which sector foreign capital is employed in. However, in a two sector model such immiserization result works through an outflow of capital from the export sector. Foreign capital induced growth in an export sector, leading to immiserization for a small economy, is a possibility only in a multi-sector model. In this paper we discuss several possibilities related to that issue. As the literature in foreign capital and immiserization followed the efforts of many countries to usher in foreign capital in the sheltered import-competing sectors, it is quite natural that foreign capital in export sectors should be the current theme of research when many countries are seeking foreign help for export-led growth.

Appendix

A. Proof of Proposition 1.

Differentiating (4), (5)′ and (6)′ we get,

$$r_{L1}\hat{X}_1 + r_{L2}\hat{X}_2 = -r_{L3}\hat{X}_3 \tag{1A}$$

$$r_{K1}\hat{X}_1 + r_{K2}\hat{X}_2 = -\lambda r_{K3}\hat{X}_3 \tag{2A}$$

$$\hat{X}_3 = \hat{\overline{K}}^* \tag{3A}$$

r_s have been defined in the text and "$\hat{}$" denotes proportional change. Derivations here are related to Jones [1965]

Therefore, $\hat{X}_2 = \hat{\overline{K}}^*[r_{K1}r_{L3} - \lambda r_{K3}r_{L1}]/|r|$

$$|r| = \begin{vmatrix} r_{L1} & r_{L2} \\ r_{K1} & r_{K2} \end{vmatrix} > 0 \quad \text{since } X_2 \text{ is capital intensive.} \tag{4A}$$

Now, balanced trade implies,

$$P_1X_1 + P_2X_2 + P_3X_3 = P_1D_1 + P_2D_2 + P_3D_3 - \hat{r}^*(1-\lambda)\overline{K}^* \tag{5A}$$

where D_i denotes demand for the ith product.

Choosing $P_3 \equiv 1$ and differentiating (5A) we get,

$$P_1dX_1 + P_2dX_2 + dX_3 = P_1dD_1 + P_2dD_2 + dD_3 - \hat{r}^*(1-\lambda)d\overline{K}^* \tag{6A}$$

or,

$$P_1dX_1 + P_2(1+t)dX_2 + dX_3 - tP_2dX_2 = P_1dD_1 + P_2(1+t)dD_2 + tP_2dD_2 + dD_3 - \hat{r}^*(1-\lambda)d\overline{K}^*$$

Now,

$$P_1X_1 + P_2(1+t)X_2 + X_3 = w\overline{L} + r\overline{K} + \hat{r}^*(1-\lambda)d\overline{K}^*$$

Therefore as, w, R, $\hat{r}^*$ are given,

$$P_1dX_1 + P_2(1+t)dX_2 + dX_3 = \hat{r}^*(1-\lambda)d\overline{K}^* \tag{7A}$$

Also note that the change in national welfare is given by,

$$d\Omega = P_1dD_1 + P_2(1+t)dD_2 + dD_3 \tag{8A}$$

(6A), (7A) and (8A) yield,

$$d\Omega = tP_2(dD_2 - dX_2) \tag{9A}$$

From (9A) it is easy to show that

$$d\Omega / d\overline{K}^* = -\left\{tP_2 / \left(1-\left(tm_2/(1+t)\right)\right)\right\} \cdot dX_2 / d\overline{K}^* \tag{10A}$$

Therefore, $d\Omega / d\overline{K}^* > 0$ iff $dX_2 / d\overline{K}^* < 0$, which holds if (4A) is satisfied. Now if,

$$1 > r_{K1}r_{L3} / r_{L1}r_{K3},\ \exists\ \tilde{\lambda} / 0 < \tilde{\lambda} < 1,\ \tilde{\lambda} = r_{K1}r_{L3} / r_{L1}r_{K3}.$$

Hence, $\forall \lambda \in (\tilde{\lambda},\ 1)$ welfare improves with an increase in $\overline{K}^*$. QED.

B. Proof of Proposition 2

In the Harris-Todaro structure we differentiate equations (12), (5)′ and (6)′ to get,

$$\left\{\left((w/\overline{w})a_{L1}X_1\right)/\left((w/\overline{w})\overline{L}\right)\right\} \cdot dX_1 / X_1 + \left\{a_{L2}X_2 / \left((w/\overline{w})\overline{L}\right)\right\} \cdot dX_2 / X_2$$
$$= -\left\{a_{L3}X_3 / \left((w/\overline{w})\overline{L}\right)\right\} \cdot dX_3 / X_3 \tag{11A}$$

The other two equations are (2A) and (3A).

Rewriting (11A),

$$r_{L1}\hat{X}_1 + r^v_{L2}\hat{X}_2 = -r^v_{L3}\hat{\overline{K}}^* \tag{12A}$$

Proceeding as in the "full-employment" case we get,

$$\hat{X}_2 = \hat{\overline{K}}^* [r_{K1}r^v_{L3} - \lambda r_{K3}r_{L1}] / \left|r^v\right|$$

where, $\left|r^v\right| = \begin{vmatrix} r_{L1} & r^v_{L2} \\ r_{K1} & r_{K2} \end{vmatrix} > 0$ if X_2 is capital intensive in the "value" sense.

Note that r^v_{L2} contains $w/\overline{w}$ and is greater than r_{L2} as $\overline{w} > w$. We assume that the physical-intensity ranking is preserved in the new set up.

In order to calculate the effects on the national welfare we proceed in a similar fashion as in the previous case. It is important to note that now,

$$P_1X_1 + P_2(1+t)X_2 + X_3 = \overline{w}(a_{L2}X_2 + a_{L3}X_3) + wa_{L1}X_1 + R\overline{K}$$
$$+ r^*(1-\lambda)\overline{K}^* = w\overline{L} + R\overline{K} + \hat{r}^*(1-\lambda)\overline{K}^* \tag{13A}$$

(13A) follows from the equation (12) in the text. As long as changes in $\bar{K}$ fail to effect w, we can always generate equation (7A) from (13A). This is an implicit "envelope" property of an "even" Harris-Todaro structure. Given commodity prices, changes in the composition of outputs do not alter the value of production. Once we derive (7A), the rest of the proof is the same as in Proposition 1. QED.

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