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CAPITAL INFLOW, IMPORT VOLUME AND IMMISERIZING GROWTH

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Abstract: Capital inflow is considered to be welfare immiserizing, when the capital intensive import competing sector is tariff protected and earnings of foreign capital are fully repatriated back to the foreign country. In such models, as the import competing sector expands it crowds out cheaper imports in the process. The present model incorporates features of monopolistic competition and increasing returns to scale and shows that capital inflow might lead to an *unconditional* rise in the import volume of the economy. This occurs as the price of the import competing brands becomes higher and thus consumers demand more of the internationally available cheaper importables.

Key words: Scale economies, monopolistic competition, import volume, tariffs, welfare.
JEL Classification Number: F1, F12, F21.

1. INTRODUCTION

The welfare consequences of capital inflow into a protected import competing sector have been an issue of a long theoretical debate in the literature of international trade. As Sen et al. (1997) observes that this interest was mainly motivated by the policies of the developing nations after the Second World War. These newly independent nations faced a severe scarcity of capital and thus invited foreign capital to meet up the deficiency. Capital inflow occurred mainly into the capital intensive industrial goods sectors which were also the import competing sectors of these economies. Simultaneously these nations followed a policy of import substitution mainly by imposing a tariff on the imports of industrial goods. Athukorala and Rajapaturana (2003) shows in the post Second World war there has been two major episodes of capital inflow surges to developing countries. The first was during the petro dollar recycling process following oil price increases in the 1970's. It ended with the debt crisis in 1982, associated with Mexican debt moratium. The second episode began in the latter half of 1980's till the early 1990's. Malaysia absorbed capital inflows worth 10% of GDP in1991, 15% in 1992, and more than 20% in1993. The average annual inflows to Thailand and Phillipines exceeded 10% of GDP in this period. As noted above almost all these developed

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countries have consistently maintained high tariff rates on their imports. China, even in the 1990's, had a high average tariff rate of about 30%, whereas Vietnam has continued to maintained high tariffs from the mid 1980's (see Chang (2005)). Tariffs have been used by the developing countries not only for protecting their import competing industries, but also to generate high tariff revenue. Chang (2005) shows that the share of total tax revenue attributed to tariffs were as high as 33.7% for Congo DR, 44% for Dominican Republic, 24.1% for India, 54.7% for Swaziland, 50.3% for Uganda as in 2001. In the 1980's protectionist trade policy was quite strong even in the developed countries. As Wong (1997) shows, in the late 1980's there was a huge inflow of foreign capital, mainly in the automobile industry in USA. In presence of VER Japanese automakers continued to invest in the USA. It started with the investment of Honda (1978), followed by Mazda (1987), Toyota (1988), Fuji Heavy Industries (1989), and Isuzu (1989). Thus a natural curiosity emerged about the welfare implications of changes in factor endowments, under such conditions in the field of international trade.

Bhagwati (1958), had shown that if growth is heavily export biased then the country may actually find its terms of trade moving against it, and in some situations this may outweigh the primary round of welfare gains from growth. This phenomenon has been known as immiserizing growth in the literature of international economics. Immiserizing growth is said to occur when economic growth may actually make the country worse off than before (that is as compared to the pre growth situation). The possibility of immiserisation shown by Bhagwati (1958) remains valid for a large country that can influence the world prices. Johnson (1967), demonstrated that in case of a small competitive economy factor accumulation may lead to loss of welfare in presence of distortionary tariffs. In both these cases immiserizing growth involves some kind of suboptimality. A country experiences immiserizing growth only if the growth process occurs subject to some distortion. When growth takes place this distortion may lead to an increased loss as compared to the optimal post growth situation. In Bhagwati (1958) the country has a monopoly power in trade but follows a free trade policy. On the other hand in Johnson (1967) the optimal policy of the small country was free trade policy, but instead it imposes a tariff. This analysis was followed by the contributions of Tan (1969) and Bertrand and Flatters (1971). In a seminal contribution, Brecher and Diaz Alejandro (1977), argued that if there was a capital inflow into a tariff protected, import competing capital intensive sector and there was full repatriation of capital income by the foreigners back to their home country, welfare would be reduced unambiguously. The mechanism by which welfare was shown to be falling was, that as the capital inflow occurred, the capital intensive import competing sector expanded via the Rybczynski effect, crowding out internationally available cheaper importables in the process. Tariff revenue thus was reduced and the economy was immiserized.

A large portion of the concerned literature is also devoted to the discussion of these types of immiserization results in the context of Harris-Todaro (1970) model. In such models capital inflow with full repatriation of profit in presence of urban unemployment has been found to be welfare immiserizing unambiguously (as in Khan 1982) and conditionally immiserizing in presence of specific factors (as in Tan (1969) and Brecher and

Findlay,1983). Grinols (1991) presents a number of cases where there is a possibility of welfare gains from foreign capital inflow. This happens if the opportunity costs of the labourers are sufficiently low compared to wages earned by the workers who are employed by the new foreign capital. Chandra and Khan (1993) incorporate these results in an Heckscher-Ohlin framework in presence of informal sector. The generally ambiguous welfare implications of capital inflow in these models resulted because of the presence of more than one kind of imperfections (like distortionary tariffs coupled with factor market distortion). However the usual channel of welfare loss remained open, i.e. the expanding import competing sector crowded out cheaper imports in the process.

Sen et al. (1997) departs from the assumptions of competitive framework and constant returns to scale. In a model of increasing returns to scale and monopolistic competition, they find that capital inflow into the protected sector along with full repatriation, can lead to improvement in welfare. They model the import competing sector as exhibiting product differentiation following Dixit and Stiglitz (1977). Capital inflow increases the number of varieties and hence become a channel of welfare gain in this set up. However even in this model, the tariff protected distorted sector expands and this once again opens up the channel of welfare loss through reduction in cheaper imports. The net effect on welfare depends on which effect is stronger. Matsuyama and Takahashi (1998) also discusses the welfare consequences of factor movement in a model of economic agglomeration. The world economy comprises of two regions east and the west. There exists a non tradeable sector in both region, which supplies differentiated goods. Each region has both an absolute and comparative advantage in production of an unique tradeable good respectively. An initial agglomeration in any one region say East would mean higher number of varieties of the non tradeable service. Thus labour (which is the only factor of production) would move from West to East. This in turn reduces the production of the good in which West specializes. A particular parameterization is obtained for which this may reduce the welfare of the migrating workers in the long run.

Marjit and Beladi (1996) and Chakraborty (2000) show an alternative route via which the welfare consequences of capital inflow into the protected sector may get changed. In these models the volume of imports may actually rise thus closing the channel of welfare loss. Marjit and Beladi (1996) build up their model in a competitive framework. In their model, the protected import competing sector produces an intermediate input (which is also imported) that is used in the production of one of the two final goods. An inflow of foreign capital into the protected sector draws labour out of the production of the final goods. The production of the relatively labour intensive final good expands due to Rybczynski effect. This in turn *may* translate into a higher demand for imports, provided the demand share of the imported input is sufficiently high in production of the final good that expands. Chakraborty (2000) builds up a model of monopolistic competition and increasing returns to scale that exhibits a similar result but due to different reason. The economy is assumed to produce a single good, with labour and an array of intermediate inputs that are produced domestically and are also imported. There are gains from specialisation in production, which is directly related to

input substitutability. Capital inflow increases the varieties of intermediate inputs and hence there are productivity gains. Productivity gains if sufficiently strong may cause both the import competing sector and the volume of importables to expand simultaneously. Both these models show that under certain conditions the volume of imports and the import competing sector may expand simultaneously and thus the conventional intuition of Brecher-Alejandro can get reversed.

There has been a parallel literature, that incorporates capital inflows in a dynamic model of growth and international trade. Krugman (1979) comprises of an innovating North and non–innovating South. North innovates new products , but the technology of production later becomes available to South. Thus North imports old goods from South, and exports new products. It is argued that technology progress raises the marginal productivity of capital, wherever it occurs. This opens a channel of foreign investment. Also migration of capital equalizes the income of the factors in both regions, while increasing the inequality of income of immobile factors. Grossman and Helpman (1992a) builds a dynamic model of a small open economy with full capital mobility. The economy trades two consumer goods and also there is a possibilty of trade in financial assets. There is a manufacturing sector which employs labour and capital for production of an intermediary good (which is used in the production of the final goods) and the two final goods. The intermediary good is non-traded. It is shown that inflow of foreign capital may cause the rate of innovation to decline (which is also the growth rate of the economy). For a sufficiently high interest rate, households choose to reallocate some of their savings from local research to initially higher yielding foreign bonds. However, the result may get reversed if inflow of knowledge capital is also incorporated. Grossman and Helpman (1992b) stresses the importance of knowledge capital in long run growth performance of the economy. It is shown that, in case of a large economy international transmission of knowledge along with trade in consumer goods raises the growth rate in comparison to only trade in goods.

The present model closely builds on Sen et al. (1997). The production structure is however different from the two sector model of Sen et al. (1997) where, one sector produced a differentiated good and the other a homogeneous one. This model assumes two variety producing domestic sectors whose only difference lies in their technology. Production of varieties in each sector is subject to scale economies (due to presence of fixed costs) and monopolistic competition. Foreign brands also are imported. We consider only one of the domestic sectors to be using foreign capital and model it as the import competing sector. The central result of the paper is that though there is an inflow of foreign capital into the import competing sector, import volume rises unambiguously. The intuition of our result is the following. An extra dose of foreign capital into the protected import competing sector increases the number of varieties produced by that sector. As common in the literature of increasing returns and trade, we assume that this sector is Marshall stable (see Ide-Takayama (1990)). Presence of scale economies and Marshall Stability implies that the prices of the import competing brands shoot up. Consumers switch to higher consumption level of relatively cheaper imported brands and thus import volume rises in the economy. Unlike Marjit and Beladi (1996) and

Chakraborty (2000) there is an unconditional rise in the importables. In the competitive model of Marjit and Beladi (1996) import volumes would rise due to the resource reallocation effect only if the share of imported input is sufficiently high in production of the expanding sector. Import levels rise in Chakraborty (2000) only if productivity gains of an inflow of foreign capital is sufficiently strong. The present result is obtained from an altogether different channel, the rise in imports are a direct outcome of the increased prices of the domestic brands coupled with the substitution possibilities faced by the consumers between the imported brands and domestic brands, and thus is unambiguous. Capital inflow in the present model increases the number of varieties produced by the import competing sector. This gets translated into higher return for labourers in the form of a higher wage rate. As import volume rises in the economy this implies a higher tariff revenue. The only source of welfare loss is that the per brand output of the import competing sector falls and welfare results under general circumstances is thus ambiguous. A particular parameterisation is obtained for which both the import competing sector and the import volume rises in the economy.

The paper is organised as follows: Section I builds the model, Section II discusses the effects of capital flows and finally the last section draws upon the conclusions.

2. THE MODEL

The consumers:

We consider a hypothetical economy with two domestic sectors. One of them is the non traded sector U which produces n_u number of different brands. The other is the traded sector S and produces n_s number of different brands. Consumers also consume n_f brands from the foreign.

The representative consumers maximises a utility function of the Dixit—Stiglitz type and hence has a love for variety.

$$U = \left(\sum_i C_u^{i\theta} + \sum_i C_S^{i\theta} + \sum_i C_f^{i\theta} \right)^{\frac{1}{\theta}} \quad 0 < \theta < 1 \tag{1}$$

Here C_j^i is the consumption of the ith brand of the j th sector and let p_j^i be their corresponding prices. Note that since all consumers are identical hence one can consider these as the aggregate consumptions of the whole economy. The elasticity of substitution between any two brands is given by $\sigma = \frac{1}{1-\theta}$ which is greater than unity. The equilibrium of our model will be a symmetric one, i.e. all firms in a particular sector will charge the same price and produce the same output across all brands. Hence the superscripts are dropped to indicate the symmetry across the varieties. As in Sen et al. (1997) and Venables (1982) we assume that the economy is small and hence the number of foreign brands n_f and the price of the foreign brands p_f^* are exogenously given to the economy. Clearly from the point of view of the consumers all varieties of the domestic and foreign sector enter the utility function symmetrically. Balanced trade, as we will assume, would imply exports in value terms must equal to the value of the imports. Thus the nontraded sector is considered to be the import competing sector in

this model. The S sector is the exporting sector in the economy.

The first order condition of utility maximisation will be given by

$$\frac{C_u}{C_f} = \left(\frac{p_u}{p_f}\right)^{-\sigma} \tag{2}$$

As it is clear from equation (2) consumers can always substitute the importables with the brands from the non-trading sector. The economy is tariff ridden. The domestic price of the importables faced by the consumers p_f is above the world price of the importables. That is $p_f = p_f^*(1+t)$ where t is the tariff rate. We assume that entire capital is owned by foreign residents. All returns to capital is repatriated by the foreigners back to their country and the tariff revenue is rebated back to domestic consumers. This is in keeping with the Brecher – Diaz Alejandro assumption. The national income is given by

$$I = wL + tn_f p_f^* C_f \tag{3}$$

where I is the national income, w is the wage rate of the economy, L is the aggregate labour and C_f is the per brand demand for imports.

Finally we can write the demand functions for the different varieties:

$$C_f = \frac{p_f^{-\sigma}(wL + tn_f p_f^* C_f)}{n_u p_u^{1-\sigma} + n_s p_s^{1-\sigma} + n_f p_f^{1-\sigma}} \tag{4a}$$

$$C_U = \frac{p_U^{-\sigma}(wL + tn_f p_f^* C_f)}{n_u p_u^{1-\sigma} + n_s p_s^{1-\sigma} + n_f p_f^{1-\sigma}} \tag{4b}$$

$$C_S = \frac{p_S^{-\sigma}(wL + tn_f p_f^* C_f)}{n_u p_u^{1-\sigma} + n_s p_s^{1-\sigma} + n_f p_f^{1-\sigma}} \tag{4c}$$

The producers:

The U and the S sector differs from the technology side Capital is the only component of fixed cost in the U sector and the rent earned by capital is r. We choose units in such a way that one unit of foreign capital is required to begin production in U sector. Moreover the per unit production of each brand of the non trading sector require β units of labour. Production is thus subject to increasing returns to scale (due to presence of fixed costs) and all markets are monopolistically competitive.

Profit maximisation for each brand implies that producers in the U sector would equate marginal revenue with marginal cost

$$p_u\left(1 - \frac{1}{\sigma}\right) = \frac{\beta w}{\theta} \tag{5}$$

where p_u is the price of the import competing brands. Hence

$$p_u = \frac{\beta w}{\theta} \tag{6}$$

Equation (6) implies that prices are a constant mark up over the marginal cost. The Chamberlinian set up of this model ensures that free entry into differentiated goods sector drives supernormal profits down to zero. This in turn would imply that for each

firm the surplus would be equal to the fixed cost of production. x_u represents the firm output.

So

$$\frac{p_u x_u}{\sigma} = 1r \tag{7}$$

The return to capital is taken to be unity, as capital is chosen to be the numeraire in this model[1].Thus the per firm output can be solved from using equation (5) and is given by

$$x_u = \frac{\theta}{\beta w(1-\theta)} \tag{8}$$

Production in the S sector requiresα^* units of labour to begin production and β^* units of labour are required for each additional unit of output. $x_s$represents each firm's output of this sector.Profit maximisation by the producers would imply that

$$p_S\left(1-\frac{1}{\sigma}\right) = \frac{\beta^* w}{\theta} \tag{9}$$

Hence

$$p_S = \frac{\beta^* w}{\theta} \tag{10}$$

We assume that free entry in the S sector drives profits down to zero. Thus

$$\frac{p_S x_S}{\sigma} = \alpha^* w \tag{11}$$

which in turn would imply that

$$x_s = \frac{\alpha^* \theta}{\beta^*(1-\theta)} \tag{12}$$

Note that the per firm output in the U sector is falling in wages, while the per firm output in the S sector is a constant. Any increase (decrease) in the wage rate implies that per brand output of the non traded sector declines (increases).

Factor markets:

The labour market clears by equating the total demand equal to the total supply (L)

$$n_u \beta x_u + n_s(\alpha^* + \beta^* x_s) = L \tag{13a}$$

The number of brands in the U sector is equal to the units of foreign capital employed i.e.

$$n_u = K \tag{13b}$$

where K is the total foreign capital employed.

The labour market clearing condition (13a) along with the demand relations (4) determine the wage rate in the equilibrium.

[1] We could have alternatively chosen $p_u = 1$. However as we would require to discuss the stability of the market for the import competing brands p_u is kept free to adjust

3. CAPITAL INFLOW

We want to study the effect of an inflow of foreign capital on our hypothetical economy. We use the following notation:

$$\hat{s} \equiv \frac{ds}{s}$$

Clearly since one unit of foreign capital is required to produce each new brand of the U sector so n_u would increase. That is we have $\hat{n_u} = \hat{K}$. However whether the import competing sector expands or not would also depend on the per brand output which again depends on the wage rate. To solve for the effect of an inflow of foreign capital on the wage rate explicitly total differentiation of equation (13a) and using equation (8) yields

$$\lambda_u \left(\hat{n_u} - \hat{w}\right) + (1 - \lambda_u)\, \hat{n_s} = 0$$

which on rearranging terms can be written as

$$-\lambda_u \hat{w} + (1 - \lambda_u)\, \hat{n_s} = -\lambda_u \hat{K} \tag{14}$$

where $\lambda_u = \frac{n_u \beta x_u}{L}$ is the share of total labour allocated in the U sector. Equation (14) involves two variables $\hat{w}$ and $\hat{n_s}$. To obtain a solution in terms of change in capital stock, another such equation is required. This is obtained by differentiating the demand function for imports.

Differentiating the demand function for the importables given in equation (4a) we obtain the following equation.

$$\hat{C_f} = \gamma\, \hat{w} + (1 - \gamma)\, \hat{C_f} - s_u \left[\hat{n_u} + (1 - \sigma)\, \hat{p_u}\right] - s_s \left[\hat{n_s} + (1 - \sigma)\, \hat{p_s}\right]$$

where $\gamma = \frac{wL}{I}$ represents the ratio of labour income to total income and $s_u = \frac{n_u p_u C_u}{I}$ and $s_s = \frac{n_s p_s C_s}{I}$ represents the expenditure shares accruing to the U sector and S sector respectively.

From the pricing equations (6) and (10) $\hat{p_u} = \hat{p_s} = \hat{w}$. Combining this with the capital market equilibrium condition (13b) the change in demand for imports can be expressed as

$$\gamma \hat{C_f} = \{\gamma + (\sigma - 1)\, [s_u + s_s]\}\, \hat{w} - s_u \hat{K} - s_s \hat{n_s} \tag{15}$$

Now from the first order condition of utility maximization:

$$\frac{C_f}{C_u} = \left(\frac{p_f}{p_u}\right)^{-\sigma} \tag{16}$$

Differentiating (16) we get

$$\hat{C_f} - \hat{C_u} = -\sigma\, (\hat{p_f} - \hat{p_u})$$

$\Longrightarrow \hat{C_f} = \sigma\, \hat{p_u} + \hat{x_u}$ {as $C_u = x_u$, U being the non-traded sector and assuming price of foreign brands to be given}

$$\Longrightarrow \hat{C_f} = \sigma\, \hat{w} - \hat{w} = (\sigma - 1)\hat{w}. \tag{17}$$

Substituting (17) into (15) we obtain another equation involving $\hat{n_s}$ and $\hat{w}$.

$$\gamma\, (\sigma - 2) - (\sigma - 1)\, (s_u + s_s)\, \hat{w} + s_s \hat{n_s} = -s_u \hat{K} \tag{18}$$

Equations (14) and (15) are two equations in the variables $\hat{n}_s$and$\hat{w}$. Solving for these variables we can express the change in wage rate and the number of varieties produced by the

S sector, in terms of change in total capital stock.

$$\hat{w} = \frac{-s_u\,(1-\lambda_u) + s_s\lambda_u}{D}\hat{K} \tag{19}$$

$$\hat{n}_s = \frac{-\lambda_u\{\left[\gamma\,(\sigma-2) - (\sigma-1)\,(s_u+s_s)\right] + s_u\}}{D}\hat{K} \tag{20}$$

where

$$D = \left[\gamma\,(\sigma-2) - (\sigma-1)\,(s_u+s_s)\right](1-\lambda_u) + s_s\lambda_u \tag{21}$$

As common in the literature of scale economies we assume the market of the U sector adjusts according to Marshal's quantity adjustment concept. Marshall stability of the U sector implies that D is negative (see Appendix **A.2**).

From equation-(19) we get

$$\frac{\hat{w}}{\hat{K}} = \frac{-s_u\,(1-\lambda_u) + s_s\lambda_u}{D}$$

Since S is the exporting sector, so domestic consumption must be less than total production. Hence $C_s \leq x_s$

$$\Rightarrow C_s \leq \frac{\alpha^*}{\beta^*} + x_s$$

which in turn would mean that $\frac{\beta^* C_s}{C_u} \leq \frac{(\propto^* + \beta^* x_s)}{x_u}$ (as $C_u = x_u$)

$$\Rightarrow \frac{n_s\,p_s C_s}{n_u\,p_u C_u} \leq \frac{n_s\,(\propto^* + \beta^* x_s)}{n_u \beta x_u}$$

$$\Rightarrow \frac{s_s}{s_u} \leq \frac{(1-\lambda_u)}{\lambda_u}$$

which after rearranging means $s_u\,(1-\lambda_u) + s_s\lambda_u \leq 0$. Thus the effect of capital inflow on the wage rate is thus given by the following proposition

Proposition 1: Capital inflow into the non traded import competing sector causes the wage rate to rise in the economy i.e. $\frac{\hat{w}}{\hat{K}} > 0$

Since prices are a mark-up over the wage rate prices of the import competing brands also rises. The increased price of the domestic brands in both the sectors (which is reflected as higher wages) causes the consumers to switch from the domestic brands to cheaper imports. Thus in the present model the demand for the importables rises unambiguously. This can be seen also from equation-(17)

$$\hat{C_f} = \sigma\,\hat{w} - \hat{w} = (\sigma-1)\hat{w} > 0$$

It is to be noted that this is in complete contrast to the standard Brecher Alejandro model where the import competing sector expanded, simultaneously reducing the internationally available cheaper imports. The total output produced by the import competing sector in the model is $n_u x_u$. As wages rise due to the inflow of capital, x_u falls (see equation 8) and n_u rises. The net effect on the non traded sector is ambiguous. From

the labour market equilibrium condition given in equation (13a), an expanding (contracting) U sector would imply a fall (rise) in the number of varieties produced by the S sector. In the present model since there is no restriction on the change in the number of varieties of the S sector, it may very well be the situation that both the import competing sector and the volume of imports expand simultaneously.

Now from equation (6) and equation (8)

$$\frac{\hat{x_u}}{\hat{p_u}} = -1 \tag{22}$$

We can use equation (4a) to get the demand curve for the import competing brands (shown in Appendix A.2)

$$\begin{aligned}\hat{C}_u = {} & \frac{1}{\gamma\,(1-\lambda_u)}\left\{(\sigma-1)\left[-\gamma+(s_u+s_s)\right](1-\lambda_u)-s_s\lambda_u\right\}\hat{p}_u \\ & +\frac{\hat{K}}{\gamma\,(1-\lambda_u)}(-s_u\,(1-\lambda_u)+s_s\lambda_u)\end{aligned} \tag{23}$$

It can be shown that $\gamma > s_u + s_s$ (See Appendix A.1), which implies that the first term in the RHS is negative. This would in turn mean a negatively sloped demand curve. The second term in the RHS acts as a shift parameter, i.e. it measures the change in demand for the import competing brands when prices are held constant and capital inflow occurs. Trade situation guarantees that this term is negative when $\hat{K} > 0$. The situation is depicted in the following figure

Capital inflow causes the demand for x_u to shift from $D_0D_0\,to\,D_1D_1$ and prices rise. (and hence wages). Marshal stability requires that the negatively sloped demand curve is steeper than the negatively sloped supply curve (a negatively sloped supply relation is the manifestation of the scale economies present in the model.) It is this stability

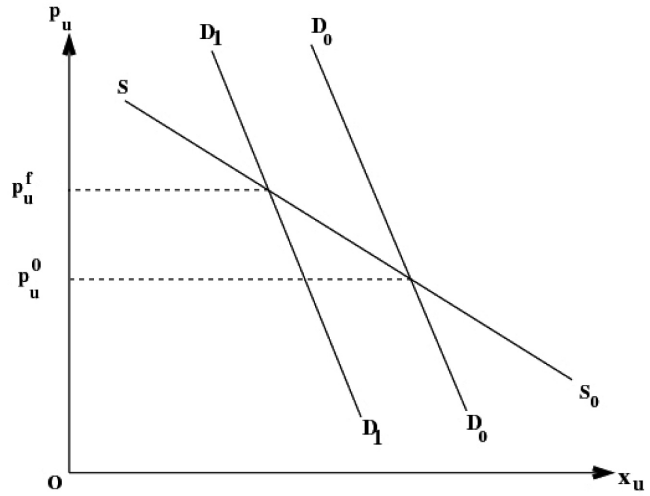

Figure 1.

assumption that causes the price to rise from $p_u^0 top_u^f$. Since capital inflow increases the number of brands available to the consumers, the consumers per brand demand falls (as shown inthe figure). This increase in wages itself becomes a channel of welfare gain. Moreover from equation-19, the higher wages gets translated into a higher demand for imports.

The increased price of the domestic brands in both the sectors (which is reflected as higher wages) causes the consumers to switch from the domestic brands and substitute by a higher consumption of importables. This result is completely opposite to that exhibited in standard Brecher-Alejandro type models. Thus in the present model the demand for the importables rises unambiguously.

Finally we consider the welfare consequences of capital inflow in our model. The welfare consequences of an inflow of foreign capital are given in the following proposition.

Proposition 2: The welfare of the economy may rise or fall depending upon suitable parameter values. There is one case at least where welfare of the economy rises unambiguously and the import competing sector also expands.

Proof: The change in welfare is given by:

$$\hat{U} = \{-s_u (1 - \lambda_u) + s_s \lambda_u - \gamma (\sigma - 2) + \theta (\sigma - 1) \frac{\hat{K}}{\theta D} \tag{24}$$

(See Appendix A.3 for derivation). Note that the first and the third term is negative for any inflow of foreign capital. ($\hat{K} > 0$). However there is no restriction on the sign of the second term and hence a sufficient condition for welfare to rise in this economy is given by

$$-\gamma (\sigma - 2) + \theta (\sigma - 1) > 0 .$$

We consider a special case when$\sigma \epsilon (1, 2)$. In that case welfare of the economy rises unambiguously even when the import competing sector of the economy expands. To see this fact first note the expression for$\hat{n_s}$as given in equation (17). Clearly $\sigma < 2$ would mean the number of varieties in the S sector falls. This would mean that since there is full employment of labour the U sector of the economy expands. In this special case both demand for importables rises in the economy and also the import competing sector expands simultaneously. Note that such a result is contrary to what one sees in standard Brecher Alejandro set up. Also in Sen (1997) the import competing sector expanded crowding out the importable. The welfare gain in that model was coming from an increased number of varieties. We find a different channel via which welfare rises. For suitable restriction on σ an inflow of capital not only causes the demand for importables to rise but also the import competing sector expands and there is an additional channel for welfare gain.

4. CONCLUSION

Brecher and Alejandro in their seminal paper (1977) showed that capital inflow into the capital intensive import competing sector leads to welfare immiserization. This

occurs as the import competing sector expands by the Rybczynski effect and the volume of cheaper imports is crowded out. Moreover the lower volume of the imports led to fall in national income as the tariff revenue decreases.

The present model forgoes the assumption of competitive markets and constant returns to scale. In our model an increase in the number of varieties of the import competing sector causes the wage rate to rise in the economy. Since all domestic brands have prices which are a mark up above the wage rate, consumers find the domestic brands dearer and switches to cheaper importable and thus contrary to what happens in standard Brecher-Alejandro model import volumes expands. Thus three major channels of welfare gain is identified in the model. Firstly the import volume rises. Secondly the wage rate rises and hence the national income. Finally the import competing sector may also expand. Hence if one incorporates features of increasing returns to scale and monopolistic competition the standard Brecher-Alejandro result may no longer hold.

5. APPENDIX

A.1

In this section we show that $\gamma > s_u + s_s$

Proof: Balanced trade implies that total income should be equal to the total expenditure

$$I = wL + tn_f p_f^* C_f = n_u p_u C_u + n_s p_s C_s + n_f p_f C_f$$

or, $wL = n_u p_u C_u + n_s p_s C_s + n_f p_f^* C_f$

Dividing both sides by the income level (I) we get

$$\gamma = s_u + s_s + B \tag{A.1.1}$$

$B > 0$ and hence $\gamma > s_u + s_s$

A.2

As shown in the main text

$$\hat{C_f} - \hat{C_u} = -\sigma(\hat{p_f} - \hat{p_u})$$

Substituting equation-(15) we get

$$\hat{C_u} = \frac{1}{\gamma}\left(\{\gamma + (\sigma - 1)[s_u + s_s]\}\hat{w} - s_u\hat{K} - s_s\hat{n_s}\right) - \sigma\hat{p_u} \tag{A.2.1}$$

Now using equations (19) and (20)

$$\hat{C_u} = \frac{1}{\gamma(1-\lambda_u)}\left\{(\sigma-1)\left[-\gamma + (s_u + s_s)\right](1-\lambda_u) - s_s\lambda_u\right\}\hat{p_u} + \frac{\hat{K}}{\gamma(1-\lambda_u)}(-s_u(1-\lambda_u) + s_s\lambda_u) \tag{A.2.2}$$

In this section we want to study the stability analysis of the market for U goods. Putting $\hat{K} = 0$ in equation A.3.1,

$$\frac{\hat{C_u}}{\hat{p_u}} = \frac{1}{\gamma(1-\lambda_u)}\left\{\left[-\gamma(\sigma-1) + (\sigma-1)(s_u + s_s)\right](1-\lambda_u) - s_s\lambda_u\right\} \tag{A.2.3}$$

We consider in all markets except that of the U sector, output adjusts instantaneously. It is assumed that output in the U market adjusts according to the following output adjustment rule (See Ide-Takayama (1990) and the discussion in Wong (1997)).

$$\dot{x_u} = a\left(\frac{p_u^d(x_u)}{p_u^s(x_u)} - 1\right) = R(x_u) \quad \text{where } a > 0 \tag{A.2.4}$$

Linearizing around the equilibrium value of x_u, stability in the U market requires

$R^{'}(x_u) < 0$. Also noting the fact that equation (A.2.3) gives the change in demand price of the importing brands, the price-quantity adjustment mechanism in the U market requires:

$\frac{\hat{p}_u^d}{\hat{x}_u} - \frac{\hat{p}_u^s}{\hat{x}_u} < 0$(evaluated at equilibrium) where $\hat{p}_u^d$ is the change in demand price and $\hat{p}_u^s$ is the change in the supply price.

Using relation (A.2.2) and (22)

$$\begin{aligned}\gamma(1-\lambda_u) &> \left[\gamma(\sigma-1) - (\sigma-1)(s_u+s_s)\right](1-\lambda_u) + s_s\lambda_u \\ &\Rightarrow \left[\gamma(\sigma-2) - (\sigma-1)(s_u+s_s)\right](1-\lambda_u) + s_s\lambda_u < 0 \end{aligned} \tag{A.2.5}$$

or, $D < 0$

A.3

Finally the expression for welfare in the economy is derived

Taking logarithms of both sides of (1) and differentiating we get

$$\begin{aligned}\theta\hat{U} &= s_u\left(\hat{n_u} + \theta\hat{C_u}\right) + s_s\left(\hat{n_s} + \theta\hat{C_s}\right) + s_f\left(\hat{n_f} + \theta\hat{C_f}\right) \\ &= s_u\hat{K} + \theta s_u\left(-\hat{w}\right) + \theta s_f\hat{C_f} + \theta s_s\left(-\hat{w}\right) + s_s\hat{n_s} \\ &= s_u\hat{K} + \theta\hat{w}\left(s_f\sigma - 1\right) + s_s\hat{n_s}\end{aligned} \tag{A.3.1}$$

Using equation (19) and (20) we get

$$\begin{aligned}&= s_u\hat{K} + \frac{\theta(s_f\sigma-1)(-s_u(1-\lambda_u)+s_s\lambda_u)\hat{K}}{D} + \frac{s_s(-\lambda_u\hat{K})}{D} \\ &\quad \times\left\{\left[\gamma(\sigma-2) - (\sigma-1)(s_u+s_s)\right] + s_u\right\}\end{aligned}$$

$\hat{U} = \{-s_u(1-\lambda_u) + s_s\lambda_u - \gamma(\sigma-2) + \theta(\sigma-1)\frac{\hat{K}}{D\theta}$ which is equation (23) in the text.

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