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Foreign Capital Inflow and Regional Immiserization

Bharat R. Hazari
Deakin University

Pasquale M. Sgro
Deakin University

Abstract

In recent years a number of papers have examined the impact of inflow of foreign capital on welfare in a trade theoretic model. Two fundamental questions have been raised in this literature. First, what is the welfare impact of foreign capital inflow under a laissez faire regime? Second, what is the impact of tariff induced capital inflow on welfare? In this paper we depart from the Heckscher-Ohlin framework where there is only one representative agent whose welfare is considered. We exploit a trade theoretic framework to analyse the impact on an inflow of foreign capital on regional welfare, in particular, urban and rural incomes.

The analysis is undertaken in a four goods, two region model where each region produces and consumes its own non-traded good. Foreign capital is only

* Correspondence Address: School of Economics, Faculty of Management, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, AUSTRALIA; (Tel) 03-9244 6034, (Fax) 03-9244-6064; This is a revised version of the paper presented at the International conference on International Trade, Finance and Economic Development at the Feng Chia University, Taiwan. We thank all the participants and in particular Panos Hatzipanayotou and Pat Conway. We would also like to thank two anonymous referees for helpful comments.

used in the urban region and its inflow is treated initially as exogenous and later endogenised via a movement in the terms-of-trade. An exogenous inflow of foreign capital necessarily raises aggregate urban income irrespective of capital intensity conditions. The rural region is 'immiserized' by the inflow of foreign capital provided that the rural traded good is more capital intensive than the rural non-traded good. In this framework rural employment always falls and urban employment always rises. In the case where foreign capital inflow is induced by a change in the terms-of-trade, immiserization may occur in both regions depending on the capital intensities in all sectors. This paper highlights the locational implication of the inflow of foreign capital. (JEL Classification: F2, O1, R1)

I. Introduction

In recent years the impact of the inflow of foreign capital on welfare has been examined by many authors in the context of international trade. Two fundamental questions have been raised in this literature. First, what is the welfare impact of foreign capital inflow under a laissez faire regime.[1] Second, what is the impact of a tariff induced capital inflow on welfare.[2] It has been shown that in this context capital inflow may be welfare reducing. This paper departs from the Heckscher-Ohlin framework where there is usually only one representative agent whose welfare is considered. There are many instances where many agents exist in an economy and whose welfare cannot be necessarily represented by an aggregate utility function. We utilise a trade theoretic framework to analyse the impact of an inflow of foreign capital on regional welfare, in particular, urban and rural incomes. This distinc-

1. A large number of papers have been written on these issues. For example, Beladi and Marjit [1992], Bhagwati and Brecher [1981], Brecher and Diaz-Alejandro [1987], Hatzipanoyatou and Michel [1992], Brecher and Findlay [1983] and Jones [1984].
2. Some countries in fact institutionalise this conflict by having political parties representing regions. For example the Australian National party is essentially a rural-based party. The model could also be applied to conflict among States where the consumption patterns vary across States. In the Canadian context, the presence of different linguistic groups and cultures leads to regional conflict. The outcome of the current Indian elections is a good example of the influences of regional parties in national outcomes.

tion between rural and urban incomes is important in policy making in many countries.[3]

The urban and rural regions are distinguished from each other in terms of both production and consumption. Two goods are produced in each region. The urban sector produces an importable good and an urban non-traded good. This non-traded commodity is not consumed by the rural population. The rural region produces the exportable good and a rural non-traded good which is not consumed by the urban population. The representative consumer in the urban and rural regions thus consume a different bundle of goods: the urban agent consumes two traded and the urban non-traded goods while the rural agent consumes the same traded goods and the rural non-traded good.[4] Urban non-traded goods are mainly consumed by the urban population.

Several interesting results regarding the interrelationship between foreign capital and regional incomes are obtained. First, it is established that foreign capital inflow (both exogenous and endogenous) necessarily 'immiserizes' the rural region provided that the production of the importable good is more capital intensive than the urban non-traded good. The urban region necessarily gains from an inflow of exogenous foreign capital in aggregate terms but not necessarily in per capita terms under the same capital intensity condition. However, the urban region may gain or lose both aggregate and per capita real income as a consequence of endogenous capital inflow induced by a change in the terms-of-trade. We also show that both regions may be 'immiserized' by an endogenous inflow of capital. These results extend the theory of immiserizing growth and foreign capital to regional economics.[5]

II. A Trade Model for Regional Analysis with Foreign Capital

Four goods: X_U, X_N, X_r and X_{Nr} are produced with neoclassical production functions which possesses constant returns to scale and diminishing

3. This distinction was originally made in Hazari and Sgro [1991], [1992].
4. These results are related to Hazari and Sgro [1996] where a model of regional development has been analyzed without foreign and region specific capital.
5. Alternatively agents in both regions could share the repatriation payments to foreign capital. This would not effect the results qualitatively.

returns to factors. The goods X_U and X_N are produced in the urban region with the help of region specific capital (domestic and foreign) and labour. The commodity, X_U, is traded both domestically and internationally while good, X_N, (the non-traded good) is produced and consumed in the urban region only. The employment structure for the urban area is given below:

$$a_{KU}X_U + a_{KN}X_N = \bar{K}_U^d + K^F \tag{1}$$

$$a_{LU}X_U + a_{LN}X_N = E^U \tag{2}$$

where $\bar{K}_U^d$ denotes the inelastic supply of region specific domestic capital, K^F the supply of foreign capital and E^U the endogenously determined aggregate urban employment. The terms a_{ij}'s are the variable input coefficients and are functions of factor prices as shown below:

$$a_{ij} = a_{ij}\,[w, r] \quad [i = K, L, j = U, N] \tag{3}$$

The terms w and r denote the wage rate and rental on domestic and foreign capital.

The competitive pricing equations for the urban region are:

$$a_{LU}w + a_{KU}r = P_U \tag{4}$$

$$a_{LN}w + a_{KN}r = P_N \tag{5}$$

where, P_U, is the exogenously given relative price of the urban traded good, P_N, the endogenously determined relative price of the urban non-traded good.

The market for urban non-traded good clears locally in the urban region only. Hence demand equals supply:

$$D_N[P_U, P_N, I^U] = X_N \tag{6}$$

where I^U denotes urban income. The urban real income is defined below:

$$I^U = P_U D_{UU} + D_{Ur} + P_N D_N = P_U X_U + P_N X_N - rK^F \tag{7}$$

On the consumption side: D_{UU} and D_{Ur}, represent the consumption of the goods X_U and X_r in the urban area. The term rK^F represents the total return to foreign capital which is fully repatriated and paid for by the urban sector.[5] Note that the price of the rural traded goods has been set equal to unity as

this price is used as the numeraire for the model.

In the rural region the goods X_r and X_{Nr} are produced with the region specific rural capital and labour with neoclassical production factors which possess constant returns to scale and diminishing return to factors. The commodity, X_r, is traded both domestically and internationally. The employment structure for the rural region is given below:

$$a_{Kr}X_r + a_{KNr}X_{Nr} = \bar{K}^R \tag{8}$$

$$a_{Lr}X_r + a_{LNr}X_{Nr} = E^R \tag{9}$$

where $\bar{K}^R$ is the inelastically supplied quantity of rural capital and E^R the endogenously determined amount of aggregate rural employment. The rural a_{ij}'s are the variable input coefficients and are functions of factor prices as shown below:

$$a_{ij} = a_{ij}\,[w, R] \quad [i = K, L, j = r, Nr] \tag{10}$$

where R is the return to rural capital. No foreign capital is used in the rural region. Labour is completely mobile between sectors and regions hence the full employment condition is given below:

$$E^U + E^R + \bar{L} \tag{11}$$

where $\bar{L}$ is the inelastically supplied quantity of total labour .

The competitive pricing structure for the rural region is given below:

$$a_{Lr}w + a_{Kr}R = P_r = 1 \tag{12}$$

$$a_{LNr}w + a_{KNr}R = P_{Nr} \tag{13}$$

where P_r is the exogenously given price of the good, X_r, and is chosen as the numeraire and set equal to unity. The relative price of the non-traded good, P_{Nr}, is endogenously determined.

The market for rural non-traded good clears locally in the rural region only, hence demand equals supply:

$$D_{Nr}[P_U, P_{Nr}, I^R] = X_{Nr} \tag{14}$$

where I^R denotes real income in the rural region as shown below.

$$I^R = P_U D_{rU} + D_{rr} + P_{Nr}D_{Nr} = X_r + P_{Nr}X_{Nr} \tag{15}$$

where D_{rU} and D_{rr} represent rural consumption of the urban and rural traded good respectively.

The market clearing equations for X_U and X_r, the traded goods are given below:

$$D_{UU} + D_{rU} = X_U + M \tag{16}$$

$$D_{rr} + D_{Ur} = X_r - E \tag{17}$$

where M represents imports and E exports.

When K^F is treated as an endogenous variable its flow can be a function of several variables. However, for analytical convenience it is assumed to be a function of P_U as shown below:[6]

$$K^F = K^F[P_U] \tag{18}$$

It is assumed that, X_U, is the most capital intensive good in the economy, hence; $\hat{r} > 0$ when P_U increases. Assuming that the domestic r rises above the international rental on capital, this change induces an inflow of foreign capital, hence $\hat{K}^F > 0$.

This completes the specification of a regional model of trade with foreign capital. To derive some results it is easier to use a reduced form of the above model. From the assumptions of profit maximisation and an interior solution, the following supply functions are obtained.[7] Throughout the paper it is assumed that the goods are substitutes for each other.

$$X_U = X_U[P_U, P_N, K^F, E^U] \tag{19}$$

$$X_N = X_N[P_U, P_N, K^F, E^U] \tag{20}$$

$$X_r = X_r[P_U, P_{Nr}, E^R] \tag{21}$$

$$X_{Nr} = X_{Nr}[P_U, P_{Nr}, E^R] \tag{22}$$

Equations (19) to (22) provide the supply functions for the four goods. Note that the supply functions also depend on the regional allocation of labour.

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6. The flow of capital in some models in tariff-induced. These results can be rederived for the tariff-induced case, but would merely add complexity without adding anything new to the main insights of this paper.
7. Alternatively, the supply functions could be obtained by using duality theory.

III. Results

In this section we first analyse the effect of an exogenous increase in foreign capital on outputs, employment and most importantly regional welfare (income). From equations (4), (5), (12), and (13) we obtain a solution for the inter-relationship between the relative price of the urban non-traded good and the rural non-traded good, as shown below. This relationship exists because of labour mobility and the consumption of international traded goods in both regions.

$$\hat{P}_{Nr} = \frac{|\theta|^{\bar{R}}}{|\theta|^{\bar{U}}} \hat{P}_N \tag{23}$$

where

$$|\theta|^{\bar{U}} = \theta_{Kr}[\theta_{KU}\theta_{LN} - \theta_{LU}\theta_{KN}] = \theta_{Kr}\theta_{LN}\theta_{LU}(k_U - k_N)$$

$$|\theta|^{\bar{R}} = \theta_{KU}[\theta_{Kr}\theta_{LNr} - \theta_{Lr}\theta_{KNr}] = \theta_{KU}\theta_{LNr}\theta_{Lr}(k_r - k_{Nr})$$

where θ_{ij}'s represent factor shares. Note that $\hat{P}_N$ and $\hat{P}_{Nr}$ are monotonically related. We shall assume throughout this paper that in each region the internationally traded goods are more capital intensive than the non-traded goods, *i.e.*, $\theta_{KU}\theta_{LN} - \theta_{LU}\theta_{KN} > 0$ and $\theta_{Kr}\theta_{LNr} - \theta_{Lr}\theta_{KNr} > 0$.

By differentiating equations (6), (7), (11), (14), (15), (20), and (22) with respect to K^F and using (21) to eliminate $\hat{P}_{Nr}$ we obtain:

$$\begin{bmatrix} \varepsilon_{PN} & \eta_N & -1 & 0 & 0 & 0 & 0 \\ -\varepsilon_{NN} & 0 & 1 & -\varepsilon_{NE} & 0 & 0 & 0 \\ \varepsilon_{PNr}\dfrac{\theta_{KU}|\theta|^R}{|\theta|^{\bar{U}}} & 0 & 0 & 0 & \eta_{Nr} & -1 & 0 \\ -\varepsilon'_{PNr}\dfrac{\theta_{KU}|\theta|^R}{|\theta|^{\bar{U}}} & 0 & 0 & 0 & 0 & 1 & -\varepsilon_{NrE} \\ 0 & 0 & 0 & E^U & 0 & 0 & E^R \\ 0 & 0 & 0 & 0 & 1 & 0 & -\theta_{Er} \\ -\dfrac{\theta_{rF}\theta_{LU}}{|\theta|^U} & 1 & 0 & -\theta_{LU} & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} \hat{P}_N \\ \hat{I}^U \\ \hat{X}_N \\ \hat{E}^U \\ \hat{I}^R \\ \hat{X}_{Nr} \\ \hat{E}^R \end{bmatrix} = \begin{bmatrix} 0 \\ \varepsilon_{NKF}\hat{K}^F \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \tag{24}$$

where

$$\varepsilon_{PN} = \frac{P_N}{D_N}\frac{\partial D_N}{\partial P_N} < 0 \quad = \text{ Own demand elasticity for } X_N$$

$$\varepsilon_{PNr} = \frac{P_{Nr}}{D_{Nr}} \frac{\partial D_{Nr}}{\partial P_{Nr}} < 0 = \text{Own demand elasticity } X_{Nr}$$

$$\varepsilon'_{PNr} = \frac{P_{Nr}}{X_{Nr}} \frac{\partial X_{Nr}}{\partial P_{Nr}} > 0 = \text{Own supply elasticity for } X_N$$

$$\varepsilon_{NN} = \frac{P_N}{X_N} \frac{\partial X_N}{\partial P_N} > 0 = \text{Own supply elasticity for } X_N$$

$$\varepsilon_{NE} = \frac{E^U}{X_N} \frac{\partial X_N}{\partial E^U} = \text{Rybczynski labour elasticity of } X_N$$

$$\varepsilon_{NrE} = \frac{E^R}{X_{Nr}} \frac{\partial X_{Nr}}{\partial E^R} = \text{Rybczynski labour elasticity of } X_{Nr}$$

$$\varepsilon_{NKF} = \frac{K^F}{X_N} \frac{\partial X_N}{\partial K^F} = \text{Rybczynski capital elasticity of } X_N$$

$$\eta_N = \frac{I^U}{D_N} \frac{\partial D_N}{\partial I^U} > 0 = \text{Income elasticity for good } X_N$$

$$\eta_{Nr} = \frac{I^R}{D_{Nr}} \frac{\partial D_{Nr}}{\partial I^R} > 0 = \text{Income elasticity for good } X_{Nr}$$

This paper is mainly concerned with exploring changes in regional income and the relative price of non-traded goods. The solutions are given below:

$$\hat{P}_N = \frac{E^U \varepsilon_{NKF} (\eta_{Nr} \theta_{Er} - \varepsilon_{NrE})}{|D|} \hat{K}^F \tag{25}$$

$$\hat{I}^U = \frac{\theta_{rF} \theta_{LU} E^U \varepsilon_{NKF} (\eta_{Nr} \theta_{Er} - \varepsilon_{NRE})}{|\theta|^U |D|} \hat{K}^F + \frac{\theta_{LU} E^R \varepsilon_{NKF} (\varepsilon_{PNr} A - \varepsilon'_{PNr} A)}{|D|} \hat{K}^F \tag{26}$$

$$\hat{I}^R = \frac{E^U \theta_{Er} \varepsilon_{NKF} (\varepsilon'_{PNr} A - \varepsilon_{PNr} A)}{|D|} \hat{K}^F \tag{27}$$

where

$$A = \frac{\theta_{KU} |\theta|^R}{|\theta|^{\bar{U}}}$$

$$|D| = E_U[\varepsilon_{NN} - \varepsilon_{PN} - \frac{\theta_{rF}\theta_{LU}\eta_N}{|\theta|^U}][\varepsilon_{NrE} - \eta_{Nr}\theta_{Er}]$$
$$+ E_R[\varepsilon'_{PNr}A - \varepsilon_{PNr}A][\varepsilon_{NE} - \eta_N\theta_{LU}] > 0$$

The sign of |D| > 0. This follows from the fact that $[\varepsilon_{NrE} - \eta_{Nr}\theta_{Er}]$ and $[\varepsilon_{NE} - \eta_N\theta_{LU}]$ are positive from the magnification effect of Jones [1965]. The term $[\varepsilon_{NN} - \varepsilon_{PN} - \frac{\theta_{rF}\theta_{LU}\eta_N}{|\theta|^U}]$ is assumed positive to satisfy the stability condition in the market for the urban non-traded good. The following propositions emerge from the analysis.

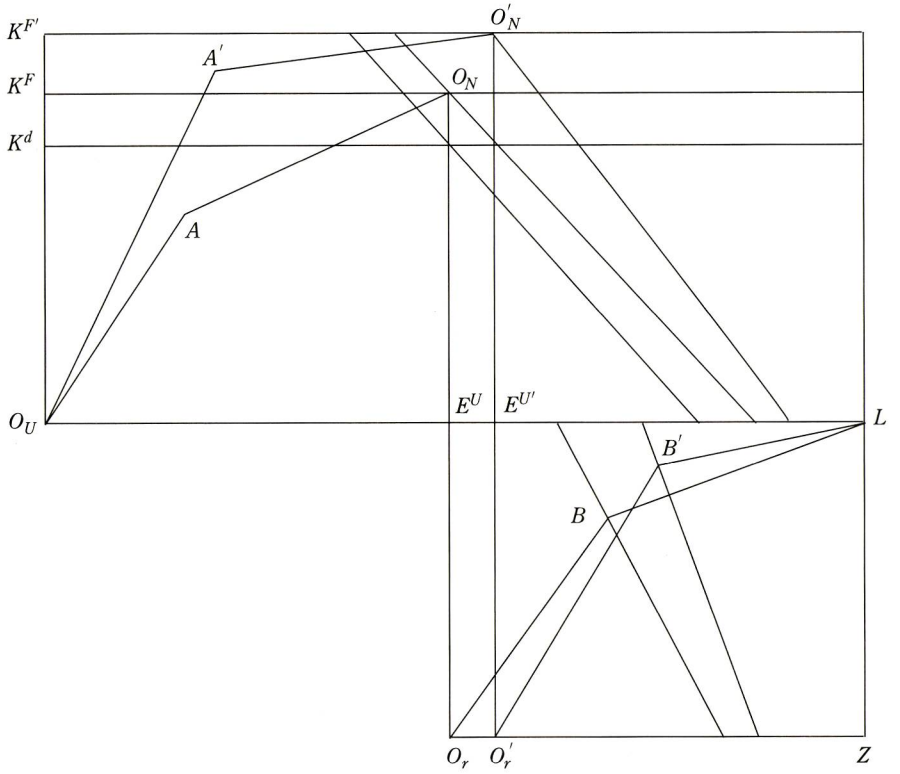
Proposition 1: *An increase in foreign capital inflow necessarily raises the relative price of the urban and rural non-traded goods provided that* $k_u > k_N$ *and* $k_r > k_{Nr}$. *From the Stolper-Samuelson theorem it follows that w rises and the return to capital in both regions falls.*

Proposition 2: *An increase in foreign capital inflow necessarily increases urban income (welfare) and lower rural income (welfare) provided that* $k_u > k_N$ *and* $k_r > k_{Nr}$.

It is clear from Proposition 2 that an inflow of foreign capital raises urban income and lowers rural income provided the factor intensity conditions are satisfied. The intuitive explanation of this result is contained in Proposition 1 and is developed in terms of Figure 1. Since both regions use labour the relative price of the urban and rural non-traded goods are related to each other via the factor intensity conditions. The real income effect of these price changes on factor rewards are different in the two regions due to non-identical consumption baskets. Proposition 1 shows that the rental on rural capital necessarily falls as a consequence of foreign capital inflow. This decline causes a fall in the real income of the rural region. Urban capital rental also falls but is compensated by the benefit of receiving foreign capital and labour from the rural region – leading to an increase in urban income.

A variant of the box diagram is used to present the above results. The diagram exploits the concept of sectoral factor employment vectors for the urban region and isoquants for the rural region. In Figure 1 the distance O_UL denotes the inelastically supplied amount of labour available to the

Figure 1
Foreign Capital Inflow and Regional Welfare



economy as a whole. The vertical axis in the top half represents urban capital which consists of domestic and foreign capital O_UK^d domestic capital and K^dK^f foreign capital. Given the exogenous values of P_U, K_F, $\bar{L}$, $P_r(=1)$, K_U^d, and $\bar{K}^R$, the endogenous variables can be solved. The employment vectors corresponding to the equilibrium values of X_U and X_N are given by O_UA and AO_N.

In Figure 1 the employment vectors give rise to total urban unemployment E^U as shown by the distance O_UE^U. This allows us to determine the residual amount of the labour force that is available for employment in the rural region shown as E^UL (which in the equation system equals E^R). The distance O_rE^U represents the inelastic supply of the region specific rural capital $\bar{K}^R$. The rectangle O_rE^ULZ defines the traditional Edgeworth-Bowley box for the rural region which solves like a Heckscher-Ohlin model. The initial equilibrium is shown by point B where $k_r > k_{Nr}$.

Let us suppose that the amount of foreign capital increases from K^dK^F to $K^dK^{F'}$. Since this increase is at non-constant factor and commodity prices the new equilibrium value of E^U is represented by O_N', the employment vectors by O_UA' and $A'O_N'$. In this case outputs of sector X_U increases and X_N falls. Urban employment increases from O_UE^U to $O_UE^{U'}$. As the urban region attracts both foreign capital and labour its income increases with the inflow of foreign capital. Note that the wage rental ratio in the urban region represented by the slope of the line through O_N is flatter than the through O_N' reflecting the result that it has increased. The wage rental ratio in the rural sector also rises as reflected by the change in the slope of the line through B and B'. It is obvious from examining equations (26) and (27) that the urban region gains more than the rural region. Hence, the rural region may be compensated by a suitable policy. This result is in keeping with the Pareto Rule.

We now proceed to examine the effect of a change in the terms of trade on regional incomes assuming the endogeneity of foreign capital. By differentiating the regional income equations (7) and (15) we obtain:

$$P_{Ud}D_{UU} + dD_{ur} + P_N dD_N + D_{UU}dP_U + D_N dP_N$$
$$= P_U dX_U + P_N dX_N - rdK^F - K^F dr + X_U dP_U + X_N dP_N \qquad (28)$$

which reduces to:

$$dI^U = -(D_{UU} - X_U)dP_U + wdE^U - K^F dr \qquad (29)$$

where $dI^U = P_U dD_{UU} + dD_{Ur} + P_N dD_N$. In a similar manner we derive the change in real income for the rural region:

$$dI^R = -D_{rU}\, dP_U + wdE^R \qquad (33)$$

where

$$dI^R = P_U dD_{rU} + dD_{rr} + P_{Nr} dD_{Nr}$$

Note that in this model both regions real income changes due to the migration of labour and changes in relative prices for non-traded goods. We shall assume that the migration is a function of foreign capital which in turn depends on P_U. This function for the urban region is given below:

$$E^U = E^U[K^F(P_U)] \tag{31}$$

It is assumed that:

$$\frac{dE^U}{dP_U} = \frac{\partial E^U}{\partial K^F}\frac{\partial K^F}{\partial P_U} > 0 \tag{32}$$

This states that labour follows capital.

The expression for the change in the rental on capital is obtained by assuming that P_N is initially constant,[8] hence by differentiating equating (4) and (5) we obtain:

$$dr = \frac{\theta_{LN}}{|\theta|^U} dP_U \tag{33}$$

From equation (29) and (30) it follows:

Proposition 3: *An induced inflow of foreign capital necessarily 'immiserizes' the rural region.*

Proposition 4: *An induced inflow of foreign capital raises (lowers) welfare in the urban region provided* $-(D_{UU} - X_U)\,dP_U + w\,dE^U - K^F dr > 0\ (< 0)$.

The rural region suffers a welfare loss due to two reasons. First, it's welfare declines due to a terms of trade effect which is captured by the terms $-D_{rU}\,dP_U$. The second source of welfare decline in this region arises because labour follows foreign capital and migrates to the urban region as captured by the terms $w dE^R$.

The income expression for the urban region is more complicated. From equation (29) it is obvious that there are three effects: the terms of trade effect $(-(D_{UU} - X_U)dP_U)$, the influence of migratin $w dE^U$ and impact of repatriation payments. In a regional model it is not essential for $(D_{UU} - X_U)$ to be positive since commodity, X_U, is consumed in both regions. However, we expect this term to be negative as the urban-regions generally consume imported goods. Hence, for the urban region the terms-of-trade effect would be negative. The migration effect, in our model, always benefits the urban

8. To obtain the income changes in this paper, we have used the Mundell [1960] technique of assuming that prices of non-traded goods are initially constant and are then allowed to move to clear the market.

region. The repatriation payments depend on the nature of the model under consideration. For example in the tariff induced flow case of $dr = 0$. On the other hand if there are some elements of bilateral or multilateral monopoly power in trade then $dr \geq 0$ and this possibility is captured in Proposition 4.

IV. Conclusion

This paper clearly shows the difference between the impact of exogenous vis-à-vis endogenous inflow of foreign capital on regional income (welfare). Given the structure of our model the region that does not receive foreign capital is always immiserized for the intensities we have assumed. In the urban region the results are not as clear cut. An exogenous inflow of foreign capital increases urban welfare, however, an endogenous inflow may increase or lower urban welfare. These results provide insights for targeting the inflow of foreign capital.

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