CHAPTER 4

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THEORETICAL ISSUES ON TRADE LIBERALIZATION, CHILD LABOUR AND INFORMAL SECTOR

4.1 INTRODUCTION

In recent years, one of the biggest curses of developing economy is that the level of child labour in these economies is increasing at an alarming rate, when all over the world an effort is being made to eradicate the problem of child labour. Child labour not only prevailed in the third world countries, but was also present in developed economies of Europe in the late eighteenth and early nineteenth century and especially in Britain during the industrial revolution. But today, developed countries have succeeded in almost eradicating the problem. Thus in recent years, eradication of child labour is one of the important factors which the policy makers of the developing countries keep in mind while formulating various policies. Economist like Eswaran (1996) has suggested that improvement in healthcare services and legislation of compulsory education will be favourable in eradicating the problem of child labour from the economy. Basu and Van (1998 b) in their paper have considered child labour as a luxury commodity to a poor family. When the adult income of a poor family is very low, they send their children to the job market in order to supplement their low income. Thus according to Basu and Van improvement in the level of adults’ wage will be helpful to mitigate the problem of child labour. More recent studies have been made by Dressy (2000) who has advocated in favour of imposition of compulsory education as a means to combat the incidence of

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# I have immensely benefited from the comments and helpful suggestions received from the faculty members of the Department of Economics, Burdwan University, on an earlier version of this chapter presented in a seminar at the above-mentioned department. The present chapter has been thoroughly revised after the seminar presentation.

41 Most of the historical observations are confined to Britain. Description of the similar experience of other European countries, Japan and United States are available in the studies of Weiner (1991).

42 See Eswaran (1996) for details.

43 See the work of Basu and Van (1998b)

44 According to this axiom there exists a critical level of adult wage rate and when an adult earns less than that level, he considers himself poor and does not have the luxury to send his offspring to schools. He is forced to send his children to the job market to supplement his low family income out of poverty.
child labour. Chaudhuri (2000) has also examined the implications of an education subsidy and the removal of tariff restrictions on the child labour market.

One of the important characteristics of the developing countries is the existence of informal sector within the economy. The informal sector workers on an average earn a wage rate, which is close to the minimum subsistence wage rate. As a result the informal sector workers are very poor, which compel them to send their children to the job market to earn their living. Thus, empirically it has been seen that informal sector acts as a reservoir of child labour i.e. the informal sector workers are the producers of child labour and it is the poverty that compels them to send their children to job market. Actually in the conventional literature, it is believed that poverty is the root cause of incidence of child labour. World Development Report 1995 also recognizes poverty as the driving force behind the flow of child labour into the job market. Thus, various policies like increase in income security, decrease in the cost of education, old age security, etc have been introduced in the developing countries to eradicate poverty. But till recent years, very few attempts have been made to analyze the impact of liberalized trade regime on the level of child labour as well as on the level of welfare of the economy.

The motivation behind this chapter is to examine whether trade liberalization is always beneficial for child labour as well as overall welfare of the economy in the presence of informal sector. The issue is especially relevant for the developing economies, which have been advised by the World Trade Organization (WTO) to include tariff and structural reform policies in their globalization programme packages, as that will lead to welfare improvements.

To examine these issues we have considered a model in the present chapter, which is a variant of the work of Chaudhuri and Dwibedi (2002). However our model differs widely from that of Chaudhuri and Dwibedi (2002). We have considered a four-sector model where the informal sector produces an intermediate commodity while in Chaudhuri and

\footnote{See the works of Basu. A. (1993), Ray (1999) and Grootaert (1998).}

\footnote{Many economists like Basu (1999), Bonnet (1993), Basu (2000) etc supports this view.}
Dwibedi (2002) the informal sector produces only a final commodity. In this chapter child rearing is considered similar to that of commodity production and child labour is considered as a separate commodity produced by a different sector. The model is a four sector one in the sense that the three sectors of the model are commodity producing sectors, while the fourth sector produces child labour as a commodity. Chaudhuri and Dwibedi (2002) have used the strong assumption like domestic formal capital stock and foreign capital stock are perfect substitutes, so as to study the impact of trade liberalization. In the present chapter, we have considered domestic capital and foreign capital as imperfect substitutes and they are treated as separate inputs. Unlike Chaudhuri and Dwibedi (2002), our purpose here is to focus only on various aspects of trade liberalization. In the present chapter we have found that trade liberalization resulting in foreign direct investment leads to results which are exactly opposite to the results generated from trade liberalization through tariff reforms.

In this chapter we consider the effects of trade liberalization, both in the form of foreign capital inflow and reduction of protection to the formal manufacturing sector, on the level of child labour and on the level of NI of the economy. A three sector full-employment general equilibrium model consisting of three sectors- the agricultural sector, formal manufacturing sector and the informal intermediate good producing sector has been considered for the purpose of analysis. A fourth sector is considered in this chapter which produces child labour. In this sector, child rearing activity is considered similar to that of commodity production and the final product of this activity is child labour. The formal manufacturing sector is the import competing sector and so it is protected by tariff. The other two sectors—the agricultural sector and the informal intermediate good producing sector in a broader sense can be termed as informal sector. Child labour is used in the (informal) agricultural sector and the informal intermediate good producing sector, where no legislative rules and regulations are imposed i.e. child labour is sector specific to the informal sector (in broad sense). In this chapter, however, from now on we shall not consider informal sector in a broad sense, rather we shall refer to informal intermediate good producing sector as simply ‘informal sector’ and shall refer to the informal agricultural sector as simply “agricultural sector”. In both the agricultural sector and the
informal sector child labour is considered as a substitute for adult labour\(^47\). The labourers working in the formal manufacturing sector earn wage income greater than the competitive equilibrium level and therefore they do not send their children to the job market. On the other hand, labourers working in the other two sectors (agricultural sector and informal sector) earn wage income close to the minimum subsistence level; as a result they send their children to job in order to supplement their low income. Thus child labour is considered as a \textit{luxury item} to these workers\(^48\). In this set up, we shall show the welfare impact as well as the impact of trade liberalization on the level of child labour of the economy. Increase in foreign capital inflow into the economy, increases the level of welfare of the economy but at the same time also increases the extent of child labour prevailing in the economy. But, when trade liberalization takes place through reduction of tariff rate of the manufacturing sector of the economy, the level of child labour of the economy decreases but the level of welfare of the economy falls. Thus, it can be concluded that whether trade liberalization has a favourable impact on the level of child labour or the level of welfare of the economy depends on the form of trade liberalization that has been incurred.

This chapter is organized as follows. The model is described in Section 4.2. Section 4.3 examines the comparative static results. Finally, concluding results are made in Section 4.4 of the chapter.

4.2 THE MODEL

4.2.1 ASSUMPTIONS OF THE MODEL

We consider a small open economy that is classified into the agricultural sector, the formal manufacturing sector and the informal (intermediate) sector. The agricultural

\(^{47}\) In this sector, adults can do what children do. Therefore both types of labour can substitute each other. This assumption of 'substitution' is termed as 'substitution axiom' by Basu and Van (1998b).

\(^{48}\) This assumption is termed as "luxury axiom" by Basu and Van (1998b). According to the axiom the workers whose income is close to minimum subsistence level send their children to the job market, so that their income can supplement their low family income. Thus the income earned by the child labourers is some additional amount of income, which their family can use for a little better living. In other words, we can say that the income of child labour is like a luxury item for their family.
sector and the formal manufacturing sector produce a final product but the informal sector produces an intermediate product for the formal manufacturing sector. The agricultural sector produces an exportable product. The formal manufacturing sector is the import-competing sector and is protected by tariff. Thus the formal manufacturing sector produces its product with the help of adult labour, intermediate product produced by the informal sector and foreign capital, which is specific to that sector. Owing to effective wage legislation and unionization of labour, there is rigidity of wages in this sector, so that the adult wage rate in this sector is given exogenously. Also due to various other legislative restrictions, child labour is not used in this sector. But no such restrictions are imposed on the other two sectors due to which the other two sectors use both adult labour and child labour along with domestic capital to produce their products. In these sectors adult labour and child labour are perfect substitutes subject to a child-equivalent scale correction of $\beta$. In other words we can say adults can do what child labourers can do. It implies that 'substitution axiom' is quite relevant for these sectors. Here in this model, it is assumed that an adult labour is equal to $P$ number of child labour, when $P>1$. Thus the child wage rate will be $(W/\beta)$, when $W$ is the adult wage rate. Child labour is therefore perfectly mobile between the other two sectors, which lead to an equality of child wage rate in both the sectors. But adult workers always search for jobs first in the formal part of the economy due to higher wage rate and labour legislation. If workers fail to get a job in the formal sector they are absorbed either in the informal sector or in the agricultural sector, which again leads to equality of adult wage rate in the agricultural sector and the informal sector. Domestic capital is also perfectly mobile between these two sectors. The fourth sector of the economy produces child labour as a commodity. In other words, child rearing activity is considered similar to

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49 It should be noted that despite the prescription of the WTO, child labour should not be engaged in the production of exportable goods, the fact remains that the developing countries are constrained to employ large number of child labourers in the agricultural as well as the informal sectors in violation of the norm.

50 This assumption was first made by Chaudhuri (2000) on the basis of the 'substitution axiom' explained in the seminal work of Basu and Van (1998b). We have also used in our work.

51 This assumption has been borrowed from Chaudhuri (2000), Chaudhuri and Dwibedi (2002). If $W_c > (W/\beta)$, where $W_c$ is the child wage rate, then adult labour will be cheaper than child labour. In this case no producer in the agricultural sector and the informal sector will be willing to employ child labour. On the contrary, if $W_c < (W/\beta)$, child labour will be cheaper and then no producer will use adult labour. Producers will be indifferent between the two types of labourers only when $W_c = (W/\beta)$. See Chaudhuri (2000) for details.
commodity production in the fourth sector. As the supply of child labour comes entirely from the poor families working in the informal sectors, we assume that a fraction of the adult workers employed in the informal sectors (including agricultural sector) are engaged during working hours in parental activities. We have justified this assumption in the context of our equational structure. Thus the fourth sector of the economy requires adult labour as well as domestic capital to rear child labour.

Production functions satisfy CRS with positive but diminishing returns to each factor. Markets are competitive and all inputs are fully utilized. Owing to the small open economy assumption, prices of the traded goods of the formal manufacturing sector and the agricultural sector are given internationally. Since the informal sector product is the non-traded good, its price is endogenously determined by the demand-supply mechanism. The product of agricultural sector is considered as the numeraire and its price is set equal to unity.

4.2.2 NOTATIONS USED IN THE MODEL

Let x, y and z stand for the agricultural sector, the formal manufacturing sector and the informal sector respectively. Other notations of the model can be stated as follows for \( i = x, y \) and \( z \).

- \( P_i \) - world price for the product of \( i^{th} \) sector, \( i = x, y \).
- \( P_z \) - domestically determined price of the product of sector \( z \).
- \( t \) - ad-valorem tariff rate on the product of sector \( y \).
- \( P_y(1+t) \) - domestic (tariff inclusive) price of the product of sector \( y \).
- \( a_{ij} \) - quantity of the \( i^{th} \) input required for the production of one unit of output of the \( j^{th} \) sector; \( i = L, K, Z, C \) and \( j = x, y \) and \( z \), where \( K \) implies capital, domestic or foreign, and \( C \) implies child labour.
- \( W \) - adult wage rate in the sectors \( x \) and \( z \).
- \( (W/\beta) \) - child wage rate.
\( \bar{W} \) - institutionally given adult wage rate in sector y.

\( r \) - rate of return on domestic capital.

\( r_F \) - rate of return on foreign capital.

\( L \) - total adult labour endowment for production activity.

\( L_c \) - supply of child labour.

\( K_D \) - total domestic capital endowment.

\( K_F \) - total foreign capital endowment.

\( u \) - fraction of workers of sectors x and z engaged in parental activity.

### 4.2.3 THE EQUATIONAL STRUCTURE OF THE MODEL

The competitive equilibrium conditions of our three sectors are given by the following three equations:

\[
\begin{align*}
1 &= a_{lx} W + a_{Kx} r + a_{Cx} (W/\beta) \quad (4.1) \\
P_y(1+t) &= a_{Lx} \bar{W} + a_{K_Fy} r_F + a_{z} P_z \quad (4.2) \\
P_z &= a_{Lz} W + a_{Kz} r + a_{Cz} (W/\beta) \quad (4.3)
\end{align*}
\]

The workers of the sectors 'x' and 'z' earn a wage rate W. In order to supplement their low family income, they send their children to the labour market. Thus children are treated as a luxury item for the workers of the sectors 'x' and 'z', which contribute a higher family income. It is to be noted that all the adult workers who are employed in the agricultural and in the informal sectors are not engaged in production activity. Let fraction 'u' of the workers employed in sectors 'x' and 'z' take advantage of the informal nature of these two sectors and during working hours they are involved in child rearing activities elsewhere. Thus, they earn wage rate W from both sectors 'x' and 'z' but they are involved in parental activities in the households. This is quite common in developing countries especially when agricultural activities are done in family farms or when informal sector units are parts of family business. Here in this model we have assumed

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52 Broadly speaking, the agricultural sector is also informal in nature. We have already mentioned this earlier.

53 Sometimes the owners of agricultural farms or owner of informal sector units allow their employees to do their parental activities as it will create a reserve stock of child labour in near future.
that child labour is produced as a commodity in a separate sector (the child-rearing sector) using some amount of adult labour and domestic capital. The adult labour force spent not only their wage income but they also spend on capital for child rearing activity. Thus for one unit of child labour the cost for child rearing by adult labour is \((a_{lc}W+a_{kcr})\). The wage rate, which the child labour would earn, is considered as the price per unit of child labour. This was first shown by Chaudhuri and Dwibedi (2002).

Here, however, we have interpreted differently the child rearing activity as compared to the works of Chaudhuri and Dwibedi (2002) and this aspect is something new in the literature. We thus write

\[
(W/\beta)=a_{lc}W+a_{kcr} \tag{4.4}
\]

A fraction of the workers of sectors ‘x’ and ‘z’ are engaged in child rearing (parental) activity and this fraction is given by \(u\). Therefore we get the following relationship

\[
u(a_{lz}Z+a_{lx}X)=a_{lc}L_{c} \tag{4.5}
\]

It is to be noted that \(u\) is not known ‘a priori’. It is endogenous to our system.

The remaining fraction of workers of sectors ‘x’ and ‘z’ are thus actually engaged in the production activities of these two sectors. We express the total labour endowment of the economy (when child labour is also expressed in adult labour terms) in terms of total adult labour endowment for production activity only and assume it to be given.\(^{54}\) We denote it by \(L\).

\[
(1-u)(a_{lz}Z+a_{lx}X)+a_{ly}Y+L_{c}/\beta=L \tag{4.6}
\]

We assume that \(L\) is given

\(^{54}\) It may appear at first sight to be a strong assumption. However, it is to be noted that when we do not consider the case of child rearing, total adult labour endowment and total adult labour endowment for production activity are same. When we take into account of child rearing activity though it is not a part of production activity but such activity generates a child labour force which is a part of production activity in developing economies. Moreover this child labour force can also be expressed in terms of adult labour as they are perfect substitutes subject to a child-equivalent scale correction of \(\beta\). In other words, child rearing activity of the adult work force is embodied within child labour force which can be easily expressed in terms of adult labour force. Thus, even in the presence of child rearing activity effectively there is not much difference between simple adult labour endowment and adult labour endowment for production activity. In most of the small open economy general equilibrium models we find that the (adult) labour endowment is assumed to be given. So the assumption is not so strong as it appears in the first sight.
Using equation (4.5) and simplifying, equation (4.6) can be rewritten as

\[(a_{Lz}Z + a_{Lx}X + a_{Ly}Y) + (1/\beta - a_{LC})L_C = L\]  \hspace{1cm} (4.6.1)\(^{55}\)

Since the intermediary product \(Z\), is used only in the production of the product of sector ‘\(y\)’, its price is endogenously determined. The demand supply equation of the product of sector ‘\(z\)’ is given by

\[a_{zy}Y = Z\]  \hspace{1cm} (4.7)

Factor market equilibrium conditions of the foreign and domestic capital markets are given by the following equations.

\[a_{Kfy}Y = K_F\]  \hspace{1cm} (4.8)
\[a_{Kx}X + a_{Kz}Z + a_{KC}L_C = K_D\]  \hspace{1cm} (4.9)

In this model there are nine equations with nine unknowns: \(W, r, r_F, P_z, X, Y, Z, u\) and \(L_C\). Therefore the system is determinable.

The working of the model can be explained in the following manner. Using equations (4.1) and (4.4) we can determine the value of \(W\) and \(r\), as \(P_x\) is given due to small open economy assumption. Once the values of \(W\) and \(r\) are known, we can solve for \(P_z\) with the help of equation (4.3). Again with the help of equation (4.2) we can solve for \(r_F\) once \(P_z\) is known, as \(P_y\) is given due to small open economy assumption. We can therefore note that decomposability property\(^{56}\) prevails as the four input prices \(W, r, r_F\) and \(P_z\) are determined from the price system, independently of factor endowment. Once the factor prices are known, the input-output coefficients are also known, and therefore we can

\(^{55}\) The first part on the LHS of equation (4.6.1) implies the allocation of labour force in sectors ‘\(x\)’, ‘\(y\)’ and ‘\(z\)’. The second part on the LHS of equation (4.6.1) implies net supply of child labour (expressed in terms of adult labour) when we have netted out from (gross) supply of child labour the child rearing activity of adult labour. One can compare this equation with footnote 54.

\(^{56}\) Decomposability property implies that the factor prices are determined independently of capital stocks and labour endowments. See Corden Findlay (1975) in this context.
solve for $Y$ from equation (4.8). Once $Y$ is known, $Z$ can also be solved for, with the help of equation (4.7). Finally, with the help of equations (4.6.1) and (4.9) we can simultaneously solve for $X$ and $L_C$. Once the value of $X$, $Z$ and $L_C$ are known, we can get the value of $u$ from equation (4.5).

Before going to comparative statics, it is important to mention that our measure of welfare in this small open economy is the NI, $\Omega$, measured at world prices, in the presence of full repatriation of foreign capital income, it is expressed as follows:

$$\Omega = W(a_{lx}X + a_{lz}Z) + \bar{W}(a_{ly}Y) + (W / \beta)L_C + rK_D - tP_y Y$$

or

$$\Omega = W(L + a_{lc}L_C) + (\bar{W} - W)(a_{ly}Y) + rK_D - tP_y Y$$

(4.10)

In equation (4.10), $W(a_{lx}X + a_{lz}Z)$ is the total wage income of the adult labourers, who are employed in the agricultural sector and the informal sector of the economy. $\bar{W}(a_{ly}Y)$ is the total wage income of the labourers employed in the formal manufacturing sector of the economy. $rK_D$ is the rental income from the domestic capital and $tP_y Y$ is the cost of tariff protection to sector $Y$.

### 4.3 THE COMPARATIVE STATIC EFFECTS

In this section of the chapter we would study the effectiveness of liberalized trade and investment policies on the level of child labour as well as on the level of national income of the economy. In a developing economy, trade liberalization can be captured both by an increase in inflow of foreign capital into the economy as well as by reducing the tariff rate, which is imposed on the manufacturing sector of the economy. Though in the developing economy both the policies are simultaneously incorporated, but in order to get a clear picture, we would consider the effects separately. However, we want to discuss at the beginning the major steps involved in achieving the two comparative static effects.

For this we start with a very general situation.

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57 It has already been explained in footnote 30 of the thesis.
Equations (4.1) and (4.3) can be rewritten as

\begin{align*}
1 &= a_{Lx}W + a_{Kx}F \\
P_z &= a_{Lz}W + a_{Kz}F
\end{align*}

(4.1.1) (4.3.1)

where \(a_{Li} = (a_{Li} + a_{Ci}/\beta)\) \((i = x, z)\) represents the total adult labour required for the production of one unit of the product of the \(i^{th}\) sector. \(a_{Li}\) represents the direct requirement of adult labour whereas \((a_{Ci}/\beta)\) represents the amount of child labour, expressed in terms of adult labour, required for the production of the one unit of the product of \(i^{th}\) sector. Therefore \(a_{Li}\) can be expressed as direct requirement and \((a_{Ci}/\beta)\) as the indirect requirement of adult labour required for the production of one unit of the \(i^{th}\) product.

Totally differentiating equations (4.1.1), (4.2) and (4.3.1), considering \(P_x\) and \(P_y\) as given and also using the envelope condition\(^{58}\) and then solving by Cramer’s rule we get (detailed derivations are shown in appendix 4.1, subsection 4.1.1)

\[
\hat{W} = \frac{(\theta_{Ks} \theta_{Kx})}{|\theta|} \hat{P}_z
\]

\[
\hat{r} = -\frac{(\theta_{Kx} \theta_{Ls})}{|\theta|} \hat{P}_z
\]

\[
\hat{r}_F = -\left[\left((\alpha \theta_{Lx} \theta_{Kx} - \theta_{Ls} \theta_{Kx})\left((\theta_{Ks} \theta_{Ls}) - (\theta_{Kx} \theta_{Lx})\right)\right) / |\theta|\right], \text{ where } \alpha = \{v(1+t)\}
\]

we know that

\[
|\theta| = -\theta_{Ls} (\theta_{Kx} \theta_{Kz}) + \theta_{Ks} (\theta_{Kz} \theta_{Ls})
\]

\[
= \theta_{Kx} \theta_{Ls} \theta_{Lz} \{((\theta_{Ks} / \theta_{Ls}) - (\theta_{Kz} / \theta_{Lz})\}
\]

In chapter 3 we have mentioned that in case of relatively mechanized agricultural sector (as we find in case of Green Revolution in India) and labour absorbing informal sector, the agricultural sector is more capital intensive than the informal sector. We retain this assumption here and consider \((\theta_{Ks}/\theta_{L_{**}}) > (\theta_{Kz}/\theta_{L_{**}})\). This implies that the agricultural

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\(^{58}\) Envelope condition in this context implies \(Wd_{a_{L_{**}}} + rda_{K_{**}} = 0, \ Wd_{a_{L_{**}}} + r_{1} da_{Kx} + P_{1} da_{iy} = 0\) and \(Wd_{a_{L_{**}}} + r_{1} da_{Kz} = 0\). The above three conditions can be expressed respectively as (given \(da_{iy} = 0\) as \(a_{iy}\) is fixed) \(\theta_{L_{**}} \theta_{L_{**}} + \theta_{Kx} \theta_{Kz} = 0, \theta_{1} \theta_{1} \theta_{1} + \theta_{K} \theta_{K} \theta_{K} = 0\) and \(\theta_{1} \theta_{1} \theta_{1} + \theta_{K} \theta_{K} \theta_{K} = 0\). See footnote no 31 for details.
sector is more capital intensive than the informal sector in value terms\(^{59}\) when labour is measured by considering both direct and indirect requirements.

Therefore \(|\Theta| > 0\)

Thus changes in \(W\) and \(r\) are expressed in terms of change in \(P_z\). Change in \(r_F\), however, is not fully dependent on changes in \(P_z\). It is also dependent on change in \(t\).

We now want to examine the changes in the levels of \(X\), \(Z\), \(L_C\) and \(P_z\) as a result of change in \(K_F\) and \(t\). For this we proceed as follows

The labour market allocation condition, given by equation (4.6.1) can be written as

\[
a_{L,z}Z + a_{L,x}X + a_{L,y}Y - a_{L,C}L_C = 0
\]

(4.6.2)

Differentiating the equation (4.6.2), we can write (see the appendix 4.1, subsection 4.1.3, for detail derivations)

\[
\frac{\lambda_{L,x}}{\lambda_{L,z}} X + \left(\frac{\lambda_{L,y}}{\lambda_{L,z}} + \frac{\lambda_{L,z}}{\lambda_{L,z}}\right) Z - \frac{\lambda_{L,z}}{\lambda_{L,z}} L_C = -\left(\lambda_{L,x} \hat{a}_{L,x} + \lambda_{L,y} \hat{a}_{L,y} + \lambda_{L,z} \hat{a}_{L,z} - \lambda_{L,C} \hat{a}_{L,C}\right)
\]

(4.6.3)

where \(\lambda_{ij}\) implies the share of \(i^{th}\) input in the \(j^{th}\) sector out of total endowment of that particular input.

Differentiating and then using envelope condition, equation (4.2) can be written as

\[
\theta_{L,y} \hat{a}_{L,y} + \theta_{K,F} \hat{a}_{K,F} + \theta_{P_y} \hat{a}_{P_y} = 0
\]

Since \(\hat{a}_{P_y} = 0\) (fixed coefficient)

\(^{59}\) Here we assume that the agricultural sector is more capital intensive (when both direct and indirect requirement of labour is taken into consideration) than the informal sector in physical terms i.e. \((a_{K,x} / a_{I,z,x}) > (a_{K,z} / a_{I,z,z})\), where \(a_{I,z,x}\) and \(a_{I,z,z}\) are the total (both direct and indirect) labour requirements of sector ‘\(x\)’ and ‘\(z\)’ respectively. This implies that the sector ‘\(x\)’ is more capital intensive than sector ‘\(z\)’ in value terms also.
We know that the (partial) elasticity of substitution between capital and labour in case of the sector 'y' is given by
\[ \sigma_y = (\hat{\alpha}_{K_y} - \hat{\alpha}_{L_y})/(\hat{W} - \hat{r}) \]

In appendix 4.1 (subsection 4.1.3) we have shown that using the expression for \( \sigma_y \) and using equation (4.2.1) we can write
\[ \hat{\alpha}_{L_y} = \hat{r}_F \sigma_y \{(\theta_{K_y})/(1 - \theta_y)\} \]  
(4.2.2)

Assuming constant elasticity of substitution, we can write the elasticities of substitution of sectors 'x', 'z' and 'c' as
\[ \sigma_x = (\hat{\alpha}_{K_x} - \hat{\alpha}_{L_x})/(\hat{W} - \hat{r}), \sigma_z = (\hat{\alpha}_{K_z} - \hat{\alpha}_{L_z})/(\hat{W} - \hat{r}) \text{ and } \sigma_c = (\hat{\alpha}_{K_c} - \hat{\alpha}_{L_c})/(\hat{W} - \hat{r}) \]

Using equations (4.1.1), (4.3.1) and (4.4) we get the values of \( \hat{\alpha}_{L_x}, \hat{\alpha}_{L_z} \) and \( \hat{\alpha}_{L_c} \) respectively (see appendix 4.1 (sub section 4.1.3) for details), and then substituting in equation (4.6.3) we get
\[ \lambda_{L_x} \hat{X} + (\lambda_{L_y} + \lambda_{L_z}) \hat{Z} - \lambda_{L_c} \hat{L}_C = \]
\[ (\lambda_{L_x} \theta_{K_x} \sigma_x + \lambda_{L_z} \theta_{K_z} \sigma_z - \lambda_{L_c} \theta_{L_c} \sigma_C)(\hat{W} - \hat{r}) - \{(\lambda_{L_y} \theta_{K_y})/(1 - \theta_y)\}\hat{r}_F \sigma_y \]

Putting the values of \( \hat{W}, \hat{r} \) and \( \hat{r}_F \) in the above equation we get
\[ \lambda_{L_x} \hat{X} + (\lambda_{L_y} + \lambda_{L_z}) \hat{Z} - \lambda_{L_c} \hat{L}_C - B\hat{P}_z = -b\hat{t} \]  
(4.6.4)

where
\[ B = [(\lambda_{L_x} \theta_{K_x} \sigma_x + \lambda_{L_z} \theta_{K_z} \sigma_z - \lambda_{L_c} \hat{\alpha}_{L_c} \sigma_C)\]
\[ (1/\{(\theta_{L_x} \theta_{L_z})\} (\theta_{K_x} / \theta_{L_x}) - (\theta_{K_z} / \theta_{L_z})) + \{(\lambda_{L_y} \theta_{K_y} \sigma_y) / (1 - \theta_y)\}] \]

and
\[ b = [\{(\lambda_{L_y} \alpha \sigma_y) / (1 - \theta_y)\}] \]

therefore \( b > 0 \)
We have already assumed that the sector ‘x’ is more capital intensive as compared to that of the sector ‘z’ in physical terms i.e. \( \frac{a_{Kx}}{a_{Lx}} > \frac{a_{Kz}}{a_{Lz}} \) where \( a_{Lx} \) and \( a_{Lz} \) are the total (both direct and indirect) labour requirements of sectors ‘x’ and ‘z’ respectively. This implies that the sector ‘x’ is more capital intensive than the sector ‘z’ in value terms also i.e. \( \frac{\theta_{Kx}}{\theta_{Lx}} > \frac{\theta_{Kz}}{\theta_{Lz}} \).

Under this assumption, \( B > 0 \), as \( \theta_{2y} < 1 \)

Equation (4.6.4) shows that how the labour market condition can be expressed.

Again we differentiate equation (4.9) and get (see appendix 4.1 (subsection 4.1.4) for details)

\[
\lambda_{Kx} \dot{X} + \lambda_{Kz} \dot{Z} + \lambda_{Kc} \dot{C} = -\lambda_{Ks} \dot{a}_{Ks} - \lambda_{Kz} \dot{a}_{Kz} - \lambda_{Kc} \dot{a}_{Kc}
\]  

(4.9.1)

Assuming constant elasticity of substitution, we can write the elasticities of substitution as

\[
\sigma_x = \frac{\dot{a}_{Ks} - \dot{a}_{Lx}}{W - \hat{r}}, \quad \sigma_z = \frac{\dot{a}_{Kz} - \dot{a}_{Lz}}{W - \hat{r}} \quad \text{and} \quad \sigma_c = \frac{\dot{a}_{KC} - \dot{a}_{LC}}{W - \hat{r}}
\]

Using equations (4.1.1), (4.3.1) and (4.4), (for details see appendix 4.1, subsection 4.1.4), equation (4.9.1) can be further transformed as

\[
\lambda_{Ks} \dot{X} + \lambda_{Kz} \dot{Z} + \lambda_{Kc} \dot{C} = -\left( \lambda_{Ks} \theta_{Ls} \sigma_x + \lambda_{Kz} \theta_{Lz} \sigma_z + \lambda_{Kc} \theta_{LC} \sigma_c \right) (W - \hat{r})
\]

Substituting the values of \( W \) and \( \hat{r} \)

\[
\lambda_{Ks} \dot{X} + \lambda_{Kz} \dot{Z} + \lambda_{Kc} \dot{C} = -\left[ \lambda_{Ks} \theta_{Ls} \sigma_x + \lambda_{Kz} \theta_{Lz} \sigma_z + \lambda_{Kc} \theta_{LC} \sigma_c \right] \left( \left\{ \theta_{Ks} / \theta_{Ls} \right\} \left\{ \theta_{Kz} / \theta_{Lz} \right\} - \left( \theta_{Ks} / \theta_{Ls} \right) \right) \hat{P}_2
\]

\[
= A \hat{P}_2
\]

Therefore the above equation can be written as

\[
\lambda_{Ks} \dot{X} + \lambda_{Kz} \dot{Z} + \lambda_{Kc} \dot{C} - A \hat{P}_2 = 0
\]

(4.9.4)

where

\[
A = -\left[ \lambda_{Ks} \theta_{Ls} \sigma_x + \lambda_{Kz} \theta_{Lz} \sigma_z + \lambda_{Kc} \theta_{LC} \sigma_c \right] \left( \left\{ \theta_{Ks} / \theta_{Ls} \right\} \left\{ \theta_{Kz} / \theta_{Lz} \right\} - \left( \theta_{Ks} / \theta_{Ls} \right) \right)
\]
Thus, equation (4.9.4) is expressed in terms of \( \hat{X}, \hat{Z}, \hat{L_c} \) and \( \hat{P}_z \).

Again differentiating equation (4.8) we get (detailed derivations are shown in appendix 4.1 (subsection 4.1.5))

\[
\dot{Z} = \hat{K}_F - \hat{a}_{K_Fy}
\]  
(4.8.1)

Substituting the value of \( \hat{a}_{Ly} \) (as given by equation (4.2.2)) in equation (4.2.1), we get an expression for \( \hat{a}_{K_Fy} \), given by

\[
\hat{a}_{K_Fy} = \left\{ \frac{(\hat{r}_F \sigma_y \theta_{Ly})}{(1 - \theta_{zy})} \right\}
\]  
(4.2.3)

Substituting (4.2.3) in equation (4.8.1), we get

\[
\dot{Z} = \hat{K}_F + \left\{ \theta_{Ly} / (1 - \theta_{zy}) \right\} \hat{r}_F \sigma_y
\]

Putting the value of \( \hat{r}_F \) in the above equation we get

\[
\dot{Z} = \hat{K}_F + \left\{ (\alpha \sigma_y \theta_{Ly}) / (\theta_{K_Fy})(1 - \theta_{zy}) \right\} \dot{\theta} - \left\{ (\theta_{zy} \sigma_y \theta_{Ly}) / (\theta_{K_Fy})(1 - \theta_{zy}) \right\} \hat{P}_z
\]

\[
\hat{Z} + C \hat{P}_z = \hat{K}_F + \eta \hat{r}
\]  
(4.8.4)

where

\[
C = \left\{ (\theta_{zy} \sigma_y \theta_{Ly}) / (\theta_{K_Fy})(1 - \theta_{zy}) \right\}
\]

and \( \eta = \left\{ (\alpha \sigma_y \theta_{Ly}) / \theta_{K_Fy} (1 - \theta_{zy}) \right\} \)

As \( \theta_{zy} < 1 \)

therefore, \( \eta > 0 \)

Again by differentiating equation (4.4) we get

\[
\dot{W} \{ a_{t_c} - (1 / \beta) \} + (a_{Kc} / W) \dot{r} = 0
\]

Given that \( W \ da_{t_c} + r da_{Kc} = 0 \) by envelope condition, we can rewrite the above equation as

\[
H \dot{W} + G \dot{r} = 0
\]  
(4.4.1)
where \( H = \{a_{LC} - (1/ \beta)\} \) and \( G = (a_{KC} r / W) \)

Putting the values of \( \hat{W} \) and \( \hat{r} \) in equation (4.4.1) we get

\[
[(H \theta_{k_x} \theta_{k_x} - G \theta_{l_x} \theta_{k_x}) / (\theta_i)] \hat{P}_z = 0
\]

\[
\Rightarrow M \hat{P}_z = 0 \tag{4.4.2}
\]

where \( M = \{H \theta_{k_x} - G \theta_{l_x} \theta_{k_x} / \{\theta_{l_x} \theta_{k_x} (\theta_{k_x} / \theta_{l_x} - \theta_{k_x} / \theta_{k_x})\} \}

Thus the four equations (4.6.4), (4.9.4), (4.8.4) and (4.4.2) can be arranged in the matrix form as

\[
\begin{pmatrix}
0 & 1 & 0 & C \\
\lambda_{k_x} & \lambda_{k_z} & \lambda_{KC} & -A \\
\lambda_{l_x} (\lambda_{l_x} + \lambda_{l_z}) - \lambda_{LC} & -B \\
0 & 0 & 0 & M
\end{pmatrix}
\begin{pmatrix}
\hat{X} \\
\hat{Z} \\
\hat{L}_c \\
\hat{P}_z
\end{pmatrix}
= \begin{pmatrix}
(\hat{K}_F + \eta \hat{i}) \\
0 \\
-b \hat{i} \\
0
\end{pmatrix}
\]

4.3.1 IMPACT OF FOREIGN CAPITAL INFLOW ON THE LEVEL OF CHILD LABOUR AND THE LEVEL OF NATIONAL INCOME OF THE ECONOMY

In this section, we would like to discuss how the level of child labour and the level of welfare of the economy are affected by the change in foreign capital stock of the economy. Change in foreign capital stock endowment does not affect the factor prices (due to decomposability property). Thus \( (\hat{P}_z / \hat{K}_F) = 0 \). Therefore \( W \) and \( r \) also remains unaffected due to change in foreign capital stock (see appendix 4.2, subsection 4.2.1).

When we consider \( \hat{K}_F > 0 \), we set \( \hat{i} = 0 \). Thus, we can find that the system reduces to three equation system. Equations (4.8.4), (4.9.4) and (4.6.4) are transformed as follows
\[ \dot{Z} = \dot{K}_F \]  

\[ \lambda_{kx} \dot{X} + \lambda_{kz} \dot{Z} + \lambda_{kc} \dot{L}_C = 0 \]  

\[ \lambda_{l*x} \dot{X} + (\lambda_{ly} + \lambda_{l*y}) \dot{Z} - \lambda_{lc} \dot{L}_C = 0 \]  

Solving the above three equations by Cramer's rule, we get (for detailed derivation see appendix 4.2 (subsection 4.2.1))

\[ \frac{\dot{X}}{\dot{K}_F} = \left\{ \frac{- (\lambda_{kx} \lambda_{lc} + \lambda_{kc} \lambda_{ly} + \lambda_{kc} \lambda_{l*y})}{\Delta} \right\} \]  

\[ \frac{\dot{Z}}{\dot{K}_F} = \left\{ \frac{ (\lambda_{kx} \lambda_{lc} + \lambda_{kc} \lambda_{l*x})}{\Delta} \right\} \]  

\[ \frac{\dot{L}_C}{\dot{K}_F} = \left\{ \frac{ (\lambda_{kx} \lambda_{ly} + \lambda_{kc} \lambda_{l*x} - \lambda_{kx} \lambda_{l*y})}{\Delta} \right\} \]  

where

\[ \Delta = \lambda_{lc} \lambda_{l*x} \{ (\lambda_{kx} / \lambda_{l*x}) + (\lambda_{kc} / \lambda_{lc}) \} \]

Thus \( \Delta > 0 \)

Therefore, we get

\[ \left( \frac{\dot{X}}{\dot{K}_F} \right) < 0 \text{ and } \left( \frac{\dot{Z}}{\dot{K}_F} \right) > 0 \]

\[ \left( \frac{\dot{L}_C}{\dot{K}_F} \right) > 0 \]

if \( \lambda_{kx} / \lambda_{l*x} > \lambda_{kz} / \lambda_{l*z} \)

As \( a_{2y} \) is fixed, from equation (4.7) we can write \( \dot{Z} = \dot{Y} \). So that \( \left( \frac{\dot{Z}}{\dot{K}_F} \right) = \left( \frac{\dot{Y}}{\dot{K}_F} \right) \), as \( \left( \frac{\dot{Z}}{\dot{K}_F} \right) > 0 \) (already proved), therefore \( \left( \frac{\dot{Y}}{\dot{K}_F} \right) > 0 \)

The economic interpretation behind the results is simple. An increase in inflow of foreign capital causes the manufacturing sector, 'y', which uses foreign capital, to expand. Increase in foreign capital also causes no change in \( a_{l*y} \) (due to decomposability property), therefore employment in sector 'y', \( a_{l*y} Y \) increases, which causes a decrease in effective labour endowment for sectors 'x' and 'z'. As child labour is a substitute for adult labour in sectors 'x' and 'z', the shortage of adult labour in these sectors are compensated by an
increase in child labour usage. Hence $L_C$ increases due to an increase in $K_F$. As the input-output ratio $a_{24}$ is fixed, increase in $Y$ implies increase in $Z$ due to foreign capital inflow. So we can say $Y$, $Z$ and $L_C$ increases due to foreign capital inflow. Finally, increase in $Z$ implies increase in employment in sector ‘z’, $a_{1z}Z$, due to the fact that $a_{1x}$ remains unchanged due to increase in $K_F$ following the decomposability property. As the effective labour endowment of adult labour for sectors ‘x’ and ‘z’ falls due to increase in foreign capital inflow and as the level of employment of sector ‘z’ increases, we find that employment in sector ‘x’ falls. Thus, $X$ also falls as $a_{1x}$ remains unchanged (due to decomposability property) as a result of increase in inflow of foreign capital inflow.

We now consider the impact of foreign capital inflow on the level of NI of the economy when the foreign capital income is fully repatriated. It is given by

$$
\Omega = W(a_{1z}X + a_{1z}Z) + W(a_{1y}Y) + (W / \beta)L_C + rK_D - tP_Y Y
$$

Using equation (4.6.1), (see appendix 4.2, subsection 4.2.2) we can rewrite the above equation as

$$
\Omega = W(L + a_{1c}L_C) + (\bar{W} - W)(a_{1y}Y) + rK_D - tP_Y Y \tag{4.10}
$$

where $tP_Y Y$ is the cost of tariff protection of the import-competing sector ‘y’.

Differentiating equation (4.10) with respect to $K_F$ we get

$$
\frac{d\Omega}{dK_F} = W\frac{dL}{dK_F} + L\frac{dW}{dK_F} + Wa_{1c}(dL_C / dK_F) + L_C a_{1c}(dW / dK_F) + W(a_{1y}dY / dK_F) + (\bar{W} - W)Y(da_{1y} / dK_F) - a_{1y}Y(dW / dK_F) + r(dK_D / dK_F) + K_D (dr / dK_F) - tP_Y (dY / dK_F)
$$

As the system is decomposable, the factor prices and the input-output coefficients do not change with an increase in foreign capital inflow. Again all other factor endowments also do not change with a change in foreign capital endowment. Therefore the impact of foreign capital inflow on the level of NI of the economy is given by

$$
\frac{d\Omega}{dK_F} = Wa_{1c}(dL_C / K_F) + (\bar{W} - W)a_{1y}(dY / K_F) - tP_Y (dY / dK_F)
$$

$$
= Wa_{1c}(dL_C / dK_F) + (dY / dK_F)\{(\bar{W} - W)a_{1y} - tP_Y\}.
$$
As a result of foreign capital inflow we find that the supply of child labour and output of formal manufacturing sector increases. An increase in supply of child labour causes a favourable effect on NI by raising the level of wage income. An expansion of formal manufacturing sector (i.e. sector ‘y’) has two opposite effects on NI. On one hand an expansion of sector ‘y’ implies an increase in employment $a_{ly}Y^60$. Thus $a_{ly}(dY/dK_F)$ implies increase in employment in sector ‘y’. The workers of sector ‘y’ enjoys a wage rate $\bar{W}$ which is higher than the wage rate, $W$, in rest of the economy. As the increase in employment in sector ‘y’ is at the cost of reduction in employment in the rest of the economy, the labour reallocation effect due to a change in output (and hence change in employment) measured in terms of wage differential $(\bar{W} - W)$ is given by $(\bar{W} - W)a_{ly}(dY/dK_F)$. In other words, $(\bar{W} - W)a_{ly}(dY/dK_F)$ measures the increase in NI (and hence welfare) due to labour reallocation effect. Thus, $(\bar{W} - W)a_{ly}$ can be considered as the marginal impact of gain in welfare due to ‘labour reallocation effect’ for one unit increase in output of sector ‘y’ due to one unit increase in foreign capital.

So far we have considered the favourable effect of an increase in output of sector ‘y’ on NI (welfare). However, it is to be noted that sector ‘y’ is the import-competing sector and it is protected by a tariff. Hence, its expansion raises the distortionary cost of protection given by $tP_y(dY/dK_F)$. Here, $tP_y$, is the distortionary cost of protection when output of sector ‘y’ increases by one unit due to unit increase in foreign capital inflow. We refer to it as the ‘distortionary effect due to protection’. Thus, the net effect of increase in output of sector ‘y’ depends on relative strengths of ‘labour reallocation effect’ and ‘distortionary effect due to protection’.

We have already seen that $(\dot{Y} / \dot{K}_F) > 0 and (\dot{L}_c / \dot{K}_F) > 0$ so that 

$$(d\Omega / dK_F) > 0 \text{ if } [(\bar{W} - W)a_{ly} > tP_y]$$

$60$ $a_{ly}$ remains unchanged as a result of increase in $K_F$ due to decomposability property.
Thus, we find an increase in foreign capital inflow raises the level of NI or the level of welfare of the economy, if the 'labour reallocation effect' dominates over the 'distortionary effect due to protection'.

The above results can be summarized in the form of following proposition:

**Proposition 4.1:** Trade liberalization, in the form of foreign capital inflow into the economy (with full repatriation of foreign capital income,) leads to increase in the levels of output of the informal sector and in the supply of child labour of the economy, under some reasonable assumptions. The level of national income of the economy also increases due to foreign capital inflow if the 'labour reallocation effect', \((W - W_a)\), exceeds the 'distortionary effect due to protection', \(tP_y\).

### 4.3.2 EFFECT OF TARIFF REDUCTION ON THE LEVEL OF CHILD LABOUR AND THE LEVEL OF NATIONAL INCOME OF THE ECONOMY

We would now like to consider the effectiveness of tariff reduction on the level of child labour as well as national income of our economy. In case of tariff reform, all the four equations of the system remain valid (i.e. equations (4.6.4), (4.9.4), (4.8.4) and (4.4.4)).

The four equations are as follows

\[
\lambda_{LY} \hat{X} + (\lambda_{Ly} + \lambda_{LY}) \hat{Z} - \lambda_{IC} \hat{L} - B\hat{P}_z = -b\hat{t} \tag{4.6.4}
\]

\[
\lambda_{Lr} \hat{X} + \lambda_{Lr} \hat{Z} + \lambda_{IC} \hat{L} - A\hat{P}_z = 0 \tag{4.9.4}
\]

\[
\hat{Z} + C\hat{P}_z = \hat{K}_F + \eta\hat{t} \tag{4.8.4}
\]

\[
M\hat{P}_z = 0 \tag{4.4.4}
\]

The expressions for B, b, A, C, \(\eta\) and M are already shown at the beginning of section 4.3.
From equations (4.6.4), (4.9.4), (4.8.4) and (4.4.2) we get (for detail derivations see the appendix 4.3, subsection 4.3.1)

\[
\frac{\hat{L}}{\hat{i}} = \left[ \frac{\eta (\lambda_{xx} \lambda_{ty} + \lambda_{xx} \lambda_{t2} - \lambda_{xx} \lambda_{t1})}{(\lambda_{xx} \lambda_{t1} + \lambda_{xx} \lambda_{t2})} \right] + \left[ \frac{(b \lambda_{xx}) (\lambda_{xx} \lambda_{t1} + \lambda_{xx} \lambda_{t2})}{(\lambda_{xx} \lambda_{t1} + \lambda_{xx} \lambda_{t2})} \right]
\]

(4.11)

Since \( \eta > 0, b > 0 \) and \( (\lambda_{xx} \lambda_{ty} + \lambda_{xx} \lambda_{t2} - \lambda_{xx} \lambda_{t1}) > 0 \) as \( (\lambda_{xx} \lambda_{t1}) > (\lambda_{xx} \lambda_{t2}) \)

Therefore \( \frac{\hat{L}}{\hat{i}} > 0 \)

Similarly,

\[
\frac{\hat{X}}{\hat{i}} = -\eta (\lambda_{xx} \lambda_{t1} + \lambda_{xx} \lambda_{t2} + \lambda_{xx} \lambda_{t3}) \]

(4.12)

Since \( \eta > 0 \) and \( b > 0 \)

Therefore \( \frac{\hat{X}}{\hat{i}} < 0 \)

Again,

\[
\frac{\hat{Z}}{\hat{i}} = \eta
\]

(4.13)

therefore \( \frac{\hat{Z}}{\hat{i}} > 0 \)

We already know that \( \hat{Y} = \hat{Z} \), therefore

\( \frac{\hat{Y}}{\hat{i}} > 0 \)

Finally,

\( \frac{\hat{P}}{\hat{i}} = 0 \)

A reduction in tariff protection lowers the domestic price of the formal manufacturing sector's product. It is to be noted that as \( W \) and \( r \) are determined from equations (4.1) and (4.4) they are independent of change in the tariff rate, \( t \). Again \( P_z \) is determined from equation (4.3) and as its value is dependent on the values of \( W \) and \( r \), it is also independent of change in tariff rate, \( t \). Thus, a reduction in the domestic price of formal manufacturing sector's product due to a reduction in tariff rate leads to a fall in the rate of return on foreign capital, \( r_F \), on the basis of the competitive equilibrium condition (4.2), given that \( \bar{W} \) is fixed. As a result of reduction in \( r_F \) we find that demand for foreign
capital to produce one unit of output of sector ‘y’, i.e. $a_{K_{Fy}}$, increases. For a given stock of foreign capital, such an increase implies from equation (4.8) that there will be a reduction in the output of sector ‘y’. Sector ‘y’ uses the product of sector ‘z’ as an intermediate input and as the input-output ratio $a_{zy}$ is fixed, it implies a contraction of sector ‘z’. Thus the output of sector ‘z’ falls. A contraction of sector ‘y’ implies more adult labour is available for rest of the economy. As adult labour and child labour are considered as substitutes an increase in availability of adult labour for sector ‘x’ and ‘z’ imply a decrease in the supply of child labour, $L_C$. Again, increase in the availability of adult labour for sectors ‘x’ and ‘z’ and contraction of sector ‘z’ (due to contraction of sector ‘y’) imply reduction in employment in sector ‘z’. This is because $a_{Lz}$ is unchanged due to reduction in tariff as it is a function of $W$ and $r$ and they are invariant to change in the level of $t$. So fall in $Z$ means that $a_{Lz}Z$ falls. Similarly, $a_{Lx}$ remains unchanged due to change in $t$. Hence, reduction in employment of adult labour in sector ‘z’ implies increase in employment of adult labour in sector ‘x’ which means an increase in $a_{Lx}X$. Thus, the output of sector ‘x’, i.e. $X$ rises due to a reduction in tariff.

We now consider the impact of tariff reduction on the level of NI (welfare) of the economy, as given by equation (4.10)

$$\Omega = W[L + a_{LC}L_C] + (\bar{W} - W)a_{Lz}Y + rK_D - tP_Y Y$$

As the factor prices $W$, $r$ and $P_z$ are independent of change in $t$, the input-output coefficients $a_{LC}$ does not change with a reduction in tariff. However, $a_{Ly}$ changes due to a change in $t$, as it is a function of $r_F$, apart from $\bar{W}$ and $P_z$. Again all other factor endowments also do not change due to a fall in tariff rate. Therefore the impact of tariff reduction on the level of NI is

$$(d\Omega / dt) = Wa_{LC} (dL_C / dt) + (\bar{W} - W)a_{Lz} (dY / dt) + (\bar{W} - W)Y (da_{Lz} / dt) - P_Y (Y + t(dY / dt)$$

Since $(dL_C / dt) > 0$ and $(dY / dt) > 0$

From equation (4.2.2), we find that (see appendix 4.1, subsection 4.1.3)

$$(\hat{a}_{Ly} / \hat{t}) = (\hat{r}_F / \hat{t}) \sigma_y \{\theta_{K_{Fy}} / (1 - \theta_{zy})\}$$

And as $(\hat{r}_F / \hat{t}) > 0, \sigma_y > 0, \theta_{zy} < 1$, we find that $(\hat{a}_{Ly} / \hat{t}) > 0$
Thus, \( (d\Omega / dt) > 0 \) if \( (\bar{W} - W)a_{L_y}(dY / dt) > P_y\{Y + t(dY / dt)\} \)

We have already known that with a reduction in tariff rate, the supply of child labour as well as the output level of formal manufacturing sector decreases. A decrease in child labour supply causes an adverse effect on NI by lowering the level of wage income. Again due to tariff reduction, \( a_{L_y} \) decreases. So \( (\bar{W} - W)Y(da_{L_y} / dt) \) has an adverse effect on the level of NI of the economy. Thus, it can be concluded that both the fall in supply of Lc as well as a decrease in \( a_{L_y} \) causes an adverse effect on the level of NI (and hence welfare) of the economy.

The contraction of the manufacturing sector, ‘y’ causes two opposite effects on national income. With the tariff reform as sector ‘y’ contracts, \( a_{L_y}(dY / dt) \), which implies the employment in sector ‘y’ decreases. We already know that the workers of this sector earn a wage rate \( \bar{W} \), which is higher than the wage rate of the rest of the economy, \( W \). As the decrease in employment of sector ‘y’ is at the cost of increase in employment in rest of the economy, the labour reallocation effect due to change in output, measured in terms of wage differential \( (\bar{W} - W) \) is given by \( (\bar{W} - W)a_{L_y}(dY / dt) \). In other words, we can say that \( (\bar{W} - W)a_{L_y}(dY / dt) \) measures the decrease in NI due to labour reallocation effect.

Now, we would like to consider another impact of contraction of sector ‘y’ due to tariff reform. As sector ‘y’ is an import competing sector, it is protected by a tariff. So as the sector ‘y’ contracts, the distortionary cost of tariff protection, given by \( P_y\{Y + t(dY / dt)\} \) decreases, which creates a favourable effect on the level of NI of the economy. Thus, the overall effect of tariff reduction on the level of national income of the economy due to the contraction of formal manufacturing sector depends on the relative strengths of ‘labour reallocation effect’ and ‘distortionary effect due to protection’. In other words, we can say that the level of NI of the economy decreases with the fall in tariff rate if the ‘labour reallocation effect’ dominates the ‘distortionary effect due to protection’.

We summarize the results in the form of following proposition.
**Proposition 4.2:** Trade liberalization in the form tariff reduction leads to decrease in the level of output of informal sector and also the level of child labour of the economy. Finally, this tariff reduction reduces the level of national income (welfare) of the economy if the labour reallocation effect dominates the distortionary effect due to protection.

### 4.4 CONCLUDING REMARKS

This chapter has analyzed the impacts of trade liberalization, both in the form of foreign capital inflow into the economy as well as by reducing the tariff protection of the economy. The foreign capital inflow into the economy increases the level of NI of the economy (a proxy for welfare) but it also increases the level of child labour of the economy. The conclusions are opposite when the economy is liberalized through reduction in tariff rate of the import competing formal manufacturing sector. Thus, we can say whether the extent of child labour prevailing in the economy will increase or decrease under trade liberalization regime, will depend on the nature of trade liberalization. Thus, this chapter makes a humble effort to show that not always the implementation of WTO prescriptions leads to welfare improvement but sometime may produce counterproductive results for the welfare of the relevant economy. We have also shown that even WTO prescribed policies not necessarily produce counterproductive effects on the level of child labour of the economy. The level of child labour may decreases or increase due to trade liberalization, depending on the form of liberalization policy.

From the point of view of policy makers liberalization in the form of tariff reduction appears to be better option in terms of our model. This is because it definitely reduces the supply of child labour in the economy, though it reduces NI and hence reduces welfare on the basis of usual assumptions of small open economy general equilibrium models. The question that arises in this context is that how far NI is a true proxy for welfare when we
consider tariff reductions. We have dealt with this question in more details in our last chapter.

The consideration of child rearing activity as a separate sector in our model is something new in the literature. Though we have borrowed the idea from Chaudhuri and Dwibedi (2002) our interpretation of participation of adult labour in child rearing activity is different from the works of Chaudhuri and Dwibedi (2002). To simplify matters, we have considered a static model to explain our ideas and results. We realize that our model would have been more interesting if dynamic elements are incorporated in the child rearing part of the model. Such dynamisation is one of the top priorities of our future research agenda. However, as a starting point we can say that our static model attempts to provide some important insights into the functioning of child labour market in the presence of informal sector (s) from which one can easily attempt to incorporate dynamic elements in explaining child rearing activities.

Though in a transitional economy both foreign capital inflow and reduction of tariff protection are incorporated simultaneously, but in order to simplify matters we have considered the effects separately. We have observed from our analysis that the impact of trade liberalization on child labour cannot be generalized. It depends upon the nature of government policy towards liberalization. Other policies like education subsidy, banning of child labour etc should be implemented along with trade liberalization, which can reduce the incentive of the poor families of sending their children to job.
APPENDICES

APPENDIX 4.1

4.1.1 Expressions for \( \hat{W}, \hat{r}, \hat{r}_F \) and \( (\hat{W} - \hat{r}) \)

Equation (4.1) can be written as
\[
1 = (a_{Lx} + a_{Cx} / \beta)W + a_{Kr} = a_{Lx}W + a_{Kr} \tag{4.1.1}
\]

Similarly equation (4.3) can be written as
\[
Pz = a_{Lx}W + a_{Kr} \tag{4.3.1}
\]

Totally differentiating equations (4.1.1), (4.2), and (4.3.1) and arranging in matrix form we get

\[
\begin{bmatrix}
\theta_{Lx} & \theta_{Kx} & 0 \\
0 & 0 & \theta_{Kzy} \\
\theta_{Lz} & \theta_{Kz} & 0
\end{bmatrix}
\begin{bmatrix}
\hat{W} \\
\hat{r} \\
\hat{r}_F
\end{bmatrix}
= \begin{bmatrix}
0 \\
\alpha \hat{r} - \theta_{zy} \hat{P}_z \\
\hat{P}_z
\end{bmatrix}
\]

where \( \alpha = \{ t / (1+t) \} \)

Solving by Cramer's rule we get

\[
\hat{W} = \{(\theta_{Kx} \theta_{Kzy}) / |\theta|\} \hat{P}_z
\]

\[
\hat{r} = -\{(\theta_{Lx} \theta_{Kzy}) / |\theta|\} \hat{P}_z
\]

and \( \hat{r}_F = -\{(\alpha \hat{r} - \theta_{zy} \hat{P}_z)(\theta_{Lx} \theta_{Kz} - \theta_{Lx} \theta_{Kz}) / |\theta|\} \)

where

\[
|\theta| = -\theta_{Lx} \theta_{Kzy} \theta_{Kz} + \theta_{Kx} \theta_{Kzy} \theta_{Lx} + \theta_{Kp} \theta_{Lx} \theta_{Lz} (\theta_{Kz} / \theta_{Lx}) - (\theta_{Kz} / \theta_{Lx})
\]
Since the sector ‘x’ is more capital intensive as compared to sector ‘z’ i.e.
\[
\{(\theta_{Kx} / \theta_{Lx}) > (\theta_{Kz} / \theta_{Lz})\}
\]
\[
\therefore |\theta| > 0
\]

Putting the value of |\theta|, we get
\[
\hat{r}_F = \left\{-\left(\alpha\hat{\theta}_z \hat{\theta}_z \hat{\theta}_z \theta_{Kx} - \theta_{Lx} \hat{\theta}_{Kx}\right) / \left\{(\theta_{Kx} \theta_{Kz} - \theta_{Lx} \theta_{Kz})\right\}\right\} = \left\{(\alpha\hat{\theta}_z \hat{\theta}_z \hat{\theta}_z \theta_{Kx} - \theta_{Lx} \theta_{Kz})\right\} = \left\{(\alpha\hat{\theta}_z \hat{\theta}_z \hat{\theta}_z) / (\theta_{Kx})\right\}
\]

and
\[
\hat{W} - \hat{r} = \left\{(\theta_{Kx} \theta_{Kx} + \theta_{Lx} \theta_{Kx}) / |\theta|\right\} \hat{p}_z = \left\{(\theta_{Kx} \theta_{Kx} + \theta_{Lx} \theta_{Kx}) / (\theta_{Kx} \theta_{Kz} - \theta_{Lx} \theta_{Kz})\right\} \hat{p}_z = \left\{1 / (\theta_{Lx} \theta_{Kx} - \theta_{Lz} \theta_{Kz})\right\} \hat{p}_z
\]

### 4.1.2 Derivation of equation (4.6.2)

Equation (4.6.1) can be rewritten as
\[
a_{Lx}Z + (a_{C\beta} \beta)Z + a_{Lx}X + (a_{C\beta} \beta)X + a_{Lx}Y + (1 / \beta - a_{LC})L_C - \{(a_{C\beta} \beta)Z + (a_{C\beta} \beta)X\} = L
\]
\[
a_{Lx}Z + a_{Lx}X + a_{Lx}Y - a_{LC}L_C = L \text{(since } a_{Lx}Z + a_{C\beta}X = L_C\) (4.6.2)
\]

### 4.1.3 Partial elasticities of substitution, envelope conditions and derivation of equation (4.6.4)

From equation (4.7) we get \(\hat{y} = \hat{z}\) as \(\hat{a}_{zy} = 0\) (since \(a_{ZY}\) is fixed)

Using the above relation and differentiating equation (4.6.2) we get
\[
\lambda_{Lx} \hat{X} + (\lambda_{Lx} + \lambda_{Lx}) \hat{Z} - \lambda_{LC} \hat{L}_C = -\lambda_{Lx} \hat{\lambda}_{Lx} \hat{\lambda}_{Lx} \hat{\lambda}_{Lx} \hat{\lambda}_{Lx} - \lambda_{Lx} \hat{\lambda}_{Lx} \hat{\lambda}_{Lx} + \lambda_{LC} \hat{\lambda}_{LC}
\]

Differentiating and then using envelope theorem, equation (4.2) can be written as
\[
\theta_{Lx} \hat{a}_{Lx} + \theta_{Kx} \hat{a}_{Kx} + \theta_{Lx} \hat{a}_{Lx} = 0
\]
Since $\hat{a}_{xy} = 0$ (fixed coefficient)

\[ \therefore \hat{a}_{K_F y} = - \left( \theta_{ly} / \theta_{K_F y} \right) \hat{a}_{ly} \tag{4.2.1} \]

We know that the (partial) elasticity of substitution of the sector ‘y’ is given by

\[ \sigma_y (\hat{W} - \hat{r}_F) = \hat{a}_{K_F y} - \hat{a}_{ly} \]
\[ \hat{W} = 0 \]
\[ \therefore - \hat{r}_F \sigma_y = \left( \frac{\theta_{ly}}{\theta_{K_F y}} \right) \hat{a}_{ly} - \hat{a}_{ly} = \left( 1 - \frac{\theta_{zy}}{\theta_{K_F y}} \right) \hat{a}_{ly} \]

Thus, \[ \hat{a}_{ly} = \hat{r}_F \sigma_y \left( \frac{\theta_{K_F y}}{(1 - \theta_{zy})} \right) \tag{4.2.2} \]

Similarly by differentiating equations (4.1.1), (4.3.1) and (4.4) respectively and then using envelope theorem we get the three equations respectively

\[ \theta_{L^x} \hat{a}_{L^x} + \theta_{K_x} \hat{a}_{K_x} = 0 \]
\[ \theta_{L^z} \hat{a}_{L^z} + \theta_{K_z} \hat{a}_{K_z} = 0 \]
\[ \theta_{L^c} \hat{a}_{L^c} + \theta_{K_c} \hat{a}_{K_c} = 0 \]

From the above three equations we get

\[ \hat{a}_{K_x} = - \left( \frac{\theta_{L^x}}{\theta_{K_x}} \right) \hat{a}_{L^x} \]
\[ \hat{a}_{K_z} = - \left( \frac{\theta_{L^z}}{\theta_{K_z}} \right) \hat{a}_{L^z} \]
\[ \hat{a}_{K_c} = - \left( \frac{\theta_{L^c}}{\theta_{K_c}} \right) \hat{a}_{L^c} \]

Assuming constant elasticity of substitution, we can write the elasticities of substituting of the sectors ‘x’, ‘z’ and ‘c’ as

\[ \sigma_x = (\hat{a}_{K_x} - \hat{a}_{L^x})(\hat{W} - \hat{r}) \]
\[ \sigma_z = (\hat{a}_{K_z} - \hat{a}_{L^z})(\hat{W} - \hat{r}) \]
\[ \sigma_c = (\hat{a}_{K_c} - \hat{a}_{L^c})(\hat{W} - \hat{r}) \]

Substituting the value of $\hat{a}_{K_i}$ (where i=x,z and C) in the equation of elasticity of substitution, we get

\[ \hat{a}_{L_i} = \theta_{K_i} \sigma_i (\hat{W} - \hat{r}) \]

Thus, substituting the values of $\hat{a}_{L^x}$, $\hat{a}_{L^z}$ and $\hat{a}_{L^c}$ in equation (4.6.3) we get

\[ \hat{\lambda}_{L^x} \hat{X} + (\hat{\lambda}_{L^y} + \hat{\lambda}_{L^x}) \hat{Z} - \hat{\lambda}_{L^c} \hat{L}_c = \]

\[ (\lambda_{L^x} \theta_{K_x} \sigma_x + \lambda_{L^z} \theta_{K_z} \sigma_z - \lambda_{L^c} \theta_{L^c} \sigma_c) (\hat{W} - \hat{r}) - \left( \frac{\theta_{ly} \theta_{K_F y}}{(1 - \theta_{zy})} \right) \hat{r}_F \sigma_y \]
Putting the values of \( \hat{W}, \hat{r} \) and \( \hat{r}_p \) in the above equation and using the expression for

\[
(W - \hat{r})(as \ obtained \ in \ subsection \ 4.1.1 \ of \ appendix \ 4.1) \ we \ get
\]

\[
\lambda_{Lx} \hat{X} + (\lambda_{Ly} + \lambda_{Lz}) \hat{Z} - \lambda_{LC} \hat{L}_C
\]

\[
= [(\lambda_{Lx} \sigma_x + \lambda_{Ly} \sigma_y + \lambda_{Lz} \sigma_z - \lambda_{LC} \sigma_c) \nonumber
\]

\[
(1/{\theta_{Lx} \theta_{Ly} \theta_{Lz}}) \{(\theta_{Kx} / \theta_{Lx}) - (\theta_{Kz} / \theta_{Lz})\}) \hat{P}_z
\]

\[
+ \{((\lambda_{Ly} \sigma_y)/(1 - \theta_{gy})) \} \hat{P}_z - \{((\lambda_{Lx} \sigma_x)/(1 - \theta_{gx})) \}
\]

\[
= B \hat{P}_z - b \hat{t}
\]

where

\[
B = [(\lambda_{Lx} \theta_{Kx} \sigma_x + \lambda_{Ly} \theta_{Ky} \sigma_y + \lambda_{Lz} \theta_{Kz} \sigma_z - \lambda_{LC} \theta_{Kx} \sigma_x) \nonumber
\]

\[
(1/{\theta_{Lx} \theta_{Ly} \theta_{Lz}}) \{(\theta_{Kx} / \theta_{Lx}) - (\theta_{Kz} / \theta_{Lz})\}) + \{((\lambda_{Ly} \theta_{gy} \sigma_y)/(1 - \theta_{gy})) \}
\]

and

\[
b = \{((\lambda_{Lx} \sigma_x)/(1 - \theta_{gx})) \} \nonumber
\]

therefore \( b > 0 \)

since \{((\theta_{Kx} / \theta_{Lx}) > (\theta_{Kz} / \theta_{Lz}) \) and as \( \theta_{gy} < 1 \)

therefore we get \( B > 0 \)

Thus, the above equation can be written as

\[
\lambda_{Lx} \hat{X} + (\lambda_{Ly} + \lambda_{Lz}) \hat{Z} - \lambda_{LC} \hat{L}_C - B \hat{P}_z = -b \hat{t}
\]

\( (4.6.4) \)

\subsection{4.1.4 Derivation of equation (4.9.4)}

Differentiating equation (4.9) we get

\[
\lambda_{Kx} \hat{X} + \lambda_{Kz} \hat{Z} + \lambda_{KC} \hat{L}_C = -\lambda_{Kx} \hat{\alpha}_{Kx} - \lambda_{Kz} \hat{\alpha}_{Kz} - \lambda_{KC} \hat{\alpha}_{KC}
\]

\( (4.9.1) \)

where \( \lambda_{ij} \) represent the share of \( i^{th} \) input in the \( j^{th} \) sector out of the total endowment of that particular input.

Incorporating the values of \( \hat{\alpha}_{Li} \) \((i = x, y \text{ and } C) \) (as derived above) in the expressions of \( \hat{\alpha}_{Ki} \) we get

\[
\hat{\alpha}_{Kx} = (\theta_{Lx}) (W - \hat{r}) \sigma_x, \hat{\alpha}_{Kz} = (\theta_{Lz}) (W - \hat{r}) \sigma_z \text{ and } \hat{\alpha}_{KC} = (\theta_{LC}) (W - \hat{r}) \sigma_c
\]
Substituting the values of $\dot{a}_{Kx}, \dot{a}_{Kz}$ and $\dot{a}_{KC}$ in equation (4.9.1) we get

$$
\lambda_{Kx} \dot{X} + \lambda_{Kz} \dot{Z} + \lambda_{KC} \dot{L}_C = -\lambda_{Kx} \theta_{Lx} (\dot{W} - \dot{r}) \sigma_x - \lambda_{Kz} \theta_{Lz} (\dot{W} - \dot{r}) \sigma_z - \lambda_{KC} \theta_{LC} (\dot{W} - \dot{r}) \sigma_C
$$

Putting the values of $\dot{W}$ and $\dot{r}$ in the above equation we get

$$
\lambda_{Kx} \dot{X} + \lambda_{Kz} \dot{Z} + \lambda_{KC} \dot{L}_C
$$

$$
= -\{[\lambda_{Kx} \theta_{Lx} \sigma_x + \lambda_{Kz} \theta_{Lz} \sigma_z + \lambda_{KC} \theta_{LC} \sigma_C })(\{1\}/\{\theta_{Lx} \theta_{Lz}\})\{\{\theta_{Kx}/\theta_{Lx}\} - (\theta_{Kz}/\theta_{Lz})\}\} \dot{P}_z
$$

$$
= \dot{A} \dot{P}_z
$$

The above equation can also be written as

$$
\lambda_{Kx} \dot{X} + \lambda_{Kz} \dot{Z} + \lambda_{KC} \dot{L}_C - \dot{A} \dot{P}_z = 0 \tag{4.9.4}
$$

where

$$
A = -\{[\lambda_{Kx} \theta_{Lx} \sigma_x + \lambda_{Kz} \theta_{Lz} \sigma_z + \lambda_{KC} \theta_{LC} \sigma_C })(\{1\}/\{\theta_{Lx} \theta_{Lz}\})\{\{\theta_{Kx}/\theta_{Lx}\} - (\theta_{Kz}/\theta_{Lz})\}\}]
$$

4.1.5 Derivation of equations (4.8.4) and (4.4.2)

Again differentiating equation (4.8) we get

$$
\dot{a}_{KFy} + \dot{Z} = \dot{K}_F
$$

$$
\Rightarrow \dot{Z} = \dot{K}_F - \dot{a}_{KFy} \tag{4.8.1}
$$

Incorporating the value of $\dot{a}_{Ly}$ (as given by equation (4.2.2) in equation (4.2.1), we get

$$
\dot{a}_{KFy} = -[(\theta_{Ly}/\theta_{Kfy}) \sigma_y \{\theta_{KFy}/(1 - \theta_{Ly})\}] \dot{F}_F
$$

$$
\dot{a}_{KFy} = -\{\theta_{Ly} \sigma_y /(1 - \theta_{Ly})\} \dot{F}_F \tag{4.2.3}
$$

Substituting the value of $\dot{a}_{KFy}$ (as given by equation (4.2.3)) in equation (4.8.1) we get

$$
\dot{Z} = \dot{K}_F + \{\theta_{Ly}/(1 - \theta_{Ly})\} \dot{F}_F \sigma_y
$$
Putting the value of \( \hat{r}_F \) in the above equation we get

\[
\dot{Z} = \dot{K}_F + \{ (\alpha \sigma_y \theta_{ly} )/(\theta_{KFP})(1-\theta_{zy}) \} \dot{r} - \{ (\theta_{zy} \sigma_y \theta_{ly} )/(\theta_{KFP})(1-\theta_{zy}) \} \dot{P}_z
\]

\[
\dot{Z} + C \dot{P}_z = \dot{K}_F + \eta \dot{r}
\]

where

\[
C = \{ (\theta_{zy} \sigma_y \theta_{ly} )/(\theta_{KFP})(1-\theta_{zy}) \}
\]

and \( \eta = (\alpha \theta_{ly} \sigma_y )/(1-\theta_{zy})\theta_{KFP} \)

therefore, \( \eta > 0 \)

Again by differentiating equation (4.4) we get

\[
\dot{W} \{ a_{lc} - (1/\beta) \} + (a_{kc} r / W) \dot{r} = 0
\]

\[
\Rightarrow H \dot{W} + G \dot{r} = 0
\]

where \( H = \{ a_{lc} - (1/\beta) \} \) and \( G = (a_{kc} r / W) \)

Putting the values of \( \dot{W} \) and \( \dot{r} \) in the equation (4.4.1) we get

\[
[(H \theta_{KFP} - G \theta_{l*})/(\theta_{KFP})] \dot{P}_z = 0
\]

\[
\Rightarrow [(H \theta_{KFP} - G \theta_{l*})/(\theta_{l*} \theta_{r*} - \theta_{k*} \theta_{r*})] \dot{P}_z = 0 \Rightarrow M \dot{P}_z = 0
\]

where \( M = [(H \theta_{KFP} - G \theta_{l*})/(\theta_{l*} \theta_{r*} - \theta_{k*} \theta_{r*})] \)

Arranging equations (4.8.4), (4.9.4), (4.6.4) and (4.4.2) in matrix form, we get

\[
\begin{pmatrix}
0 & 1 & 0 & C \\
\lambda_{Kx} & \lambda_{Kz} & \lambda_{KC} & -A \\
\lambda_{l*r} (\lambda_{ly} + \lambda_{l*z}) - \lambda_{lc} & -B \\
0 & 0 & 0 & M
\end{pmatrix}
\begin{pmatrix}
\dot{X} \\
\dot{Z} \\
\dot{L}_c \\
\dot{P}_z
\end{pmatrix}
= \begin{pmatrix}
(\dot{K}_F + \eta \dot{r}) \\
0 \\
- b \dot{r} \\
0
\end{pmatrix}
\]
APPENDIX 4.2

4.2.1 Impact of foreign capital inflow on the level of child labour

In this section we put \( \hat{\tau} = 0 \). Again, \((\hat{\gamma}_z / \hat{K}_F) = 0\)

Therefore from equations (4.1.1), (4.2), and (4.3.1) we get

\[
\hat{W} = \{(\theta_{Kx}, \theta_{K_{Lz}}) / |\theta|\}(\hat{\gamma}_z / \hat{K}_F) = 0
\]

\[
\hat{r} = -\{(\theta_{Lz}, \theta_{K_{Lz}}) / |\theta|\}(\hat{\gamma}_z / \hat{K}_F) = 0
\]

and

\[
\hat{r}_F = \{(\theta_{Lz} (\theta_{K_{z}}, \theta_{K_{z}}, \theta_{K_{z}})) / |\theta|\}(\hat{\gamma}_z / \hat{K}_F) = 0
\]

where

\[
|\theta| = -\theta_{Lz} \theta_{K_{Lz}} \theta_{K_{z}} + \theta_{Kx} \theta_{K_{Lz}} \theta_{Lz}
\]

\[
= \theta_{K_{Lz}} \theta_{Lz} \theta_{K_{z}} (\theta_{Kx} / \theta_{Lz}) - (\theta_{Kz} / \theta_{Lz})
\]

We now want to examine the impact of foreign capital inflow on the levels of X, Z and \( L_C \).

The four equations system reduces to three equations system, which when expressed in
matrix form is as

\[
\begin{pmatrix}
0 & 1 & 0 \\
\lambda_{Kx} & \lambda_{Kz} & \lambda_{KC} \\
\lambda_{Lz} & (\lambda_{Lz} + \lambda_{L_{Lz}}) & -\lambda_{LC}
\end{pmatrix}
\begin{pmatrix}
(\hat{X} / \hat{K}_F) \\
(\hat{Z} / \hat{K}_F) \\
(\hat{L}_C / \hat{K}_F)
\end{pmatrix}
= \begin{pmatrix}1 \\ 0 \\ 0\end{pmatrix}
\]

Solving by Cramer’s rule we get

\[
(\hat{X} / \hat{K}_F) = \{-\lambda_{KC} \lambda_{Lz} + \lambda_{KC} \lambda_{Lz} \lambda_{L_{Lz}}\} / \Delta
\]

\[
(\hat{Z} / \hat{K}_F) = \{(\lambda_{Kx} \lambda_{LC} + \lambda_{KC} \lambda_{L_{Lz}})\} / \Delta
\]
\[
(\dot{L}_c / \dot{K}_F) = \{(\lambda_{Kx} \lambda_{Iy} + \lambda_{Kx} \lambda_{Iz} - \lambda_{Kz} \lambda_{Iz})\} / \Delta
\]

where \( \Delta = \lambda_{lc} \lambda_{Iz} \{ (\lambda_{Kx} / \lambda_{Iy}) + (\lambda_{KC} / \lambda_{lc}) \} \)

\[
\therefore \Delta > 0
\]

\[
(\dot{X} / \dot{K}_F) < 0,
\]

\[
(\dot{Z} / \dot{K}_F) > 0 \text{ and }
\]

\[
(\dot{L}_c / \dot{K}_F) = \{(\lambda_{Kx} \lambda_{Iy} + \lambda_{Kx} \lambda_{Iz} - \lambda_{Kz} \lambda_{Iz})\} / \Delta = \{(\lambda_{Kx} \lambda_{Iy} + \lambda_{Iz} \lambda_{Iz} (\lambda_{Kx} / \lambda_{Iy} - \lambda_{Kz} / \lambda_{Iz})\},
\]

\[
\Rightarrow (\dot{L}_c / \dot{K}_F) > 0
\]

\[
\text{if } (\lambda_{Kx} / \lambda_{Iz}) > (\lambda_{Kz} / \lambda_{Iz})
\]

Since \( \dot{Z} = \dot{Y} \) (from equation (4.7)) we get \( (\dot{Y} / \dot{K}_F) > 0 \)

### 4.2.2 Impact of foreign capital inflow on the level of NI of the economy

The level of NI of the economy is given by

\[
\Omega = W (a_{lx} X + a_{lz} Z) + \overline{W} (a_{ly} Y) + (W / \beta) L_c + rK_D - tP_Y Y
\]

\[
= W [L - a_{ly} Y + a_{lc} L_c - (L_c / \beta)] + \overline{W} (a_{ly} Y) + (W / \beta) L_c + rK_D - tP_Y Y
\]

\[
= W [L + a_{lc} L_c] + (\overline{W} - W) a_{ly} Y + rK_D - tP_Y Y
\]

Differentiating the above equation we get

\[
(d\Omega / dK_F) = Wa_{lc} (dL_c / dK_F) + (\overline{W} - W) a_{ly} (dY / dK_F) - tP_Y (dY / dK_F)
\]

\[
= Wa_{lc} (dL_c / dK_F) + (dY / dK_F) ([\overline{W} - W] a_{ly} - tP_Y)
\]

Since \( (dL_c / dK_F) > 0 \) and \( (dY / dK_F) > 0 \)

Therefore \( (d\Omega / dK_F) > 0 \) if \( ([\overline{W} - W] a_{ly} > tP_Y) \)
APPENDIX 4.3

4.3.1 Impact of tariff reform on the level of child labour

In this section the values of $\tilde{W}$, $\tilde{r}$ and $\tilde{r}_F$ can be expressed as follows

$$(\tilde{W} / \tilde{T}) = \{((\theta_{Kx}, \theta_{KFy}) / \theta) (\tilde{P}_z / \tilde{T})$$

$$(\tilde{r} / \tilde{T}) = -((\theta_{Ls} \theta_{KFy}) / \theta) (\tilde{P}_z / \tilde{T})$$

and $$(\tilde{r}_F / \tilde{T}) = -\{((\alpha - \theta_{Ls}) (\tilde{P}_z / \tilde{T}) (\theta_{Ls} \theta_{Kx} - \theta_{Ls} \theta_{Kx})) / \theta\}$$

where $\theta = -\theta_{Ls} \theta_{KFy} \theta_{Kx} + \theta_{Kx} \theta_{KFs} \theta_{Ls}$

$$= \theta_{KFs} \theta_{Lt} \theta_{Kx} \{(\theta_{Kx} / \theta_{Ls}) - (\theta_{Kx} / \theta_{Ls})\}$$

The four equations (4.8.4), (4.9.4), (4.6.4) and (4.4.2) when arranged in matrix form, we get

$$\begin{pmatrix}
0 & 1 & 0 & C \\
\lambda_{Kx} & \lambda_{Kx} & \lambda_{KC} & -A \\
\lambda_{Ls} (\lambda_{Ls} + \lambda_{Ls}) - \lambda_{LC} & -B \\
0 & 0 & 0 & M
\end{pmatrix}
\begin{pmatrix}
\hat{X} \\
\hat{Z} \\
\hat{L}_C \\
\hat{P}_z
\end{pmatrix}
= \begin{pmatrix}
(\hat{K}_F + \eta \hat{t}) \\
0 \\
- \beta \hat{t} \\
0
\end{pmatrix}$$

where

$$\Delta' = -\left[I[\lambda_{Kx} (-\lambda_{LC} M) + \lambda_{KC} (\lambda_{Ls} M)]\right]$$

$$= [\lambda_{Kx} \lambda_{LC} + \lambda_{KC} \lambda_{Ls}] M$$

$$\therefore \Delta' > 0$$

It is to be noted that when $\tilde{T} > 0$, we have $\hat{K}_F = 0$

Using Cramer’s rule, we get
\[
\hat{L}_C = [(\eta i)\{\lambda_{Kz}(-\dot{\lambda}_{LC} - \dot{\lambda}_{Lz}M - \dot{\lambda}_{xM}M) - b\hat{\alpha}(\lambda_{KC}M)\}] / \Delta'
\]

Thus,

\[
(\hat{L}_C / i) = [(\eta M(\lambda_{Kz}(-\dot{\lambda}_{LC} - \dot{\lambda}_{Lz} - \dot{\lambda}_{xM})) / (M(\lambda_{Kz} + \lambda_{KC} + \lambda_{Lz}))]
\]

\[
(\hat{L}_C / i) = [(\eta M(\lambda_{Kz}(-\dot{\lambda}_{LC} - \dot{\lambda}_{Lz} - \dot{\lambda}_{xM})) / (M(\lambda_{Kz} + \lambda_{KC} + \lambda_{Lz}))]
\]

Since \( \eta > 0 \), \( b > 0 \) and \( (\lambda_{Kz} \dot{\lambda}_{LC} + \lambda_{Kz} \dot{\lambda}_{Lz} - \lambda_{Kz} \dot{\lambda}_{xM}) > 0 \), therefore

\[
(\hat{L}_C / i) > 0
\]

Similarly,

\[
\hat{X} = [(\eta i)\{\lambda_{Kz}(-\lambda_{LC}M) - \lambda_{KC}(-\dot{\lambda}_{LC}M + \dot{\lambda}_{Lz}M) - b\hat{\alpha}(\lambda_{KC}M)\}] / \Delta'
\]

Thus,

\[
(\hat{X} / i) = [-cM(\lambda_{Kz} \dot{\lambda}_{LC} + \lambda_{KC} \dot{\lambda}_{Lz} + \lambda_{Kz} \dot{\lambda}_{xM}) - b\hat{\alpha}(\lambda_{KC}M)] / \Delta'
\]

\[
(\hat{X} / i) = [-cM(\lambda_{Kz} \dot{\lambda}_{LC} + \lambda_{KC} \dot{\lambda}_{Lz} + \lambda_{Kz} \dot{\lambda}_{xM}) - b\hat{\alpha}(\lambda_{KC}M)] / \Delta'
\]

Since \( \eta > 0 \) and \( b > 0 \), therefore

\[
(\hat{X} / i) < 0
\]

Again,

\[
\hat{Z} = [-(\eta i)\{\lambda_{Kz}(-\lambda_{LC}M) - \lambda_{KC}(-\lambda_{Lz}M))\}] / \Delta'
\]

Thus,

\[
(\hat{Z} / i) = [\eta M(\lambda_{Kz} \dot{\lambda}_{LC} + \lambda_{KC} \dot{\lambda}_{Lz})] / \Delta'
\]

\[
(\hat{Z} / i) = [\eta M(\lambda_{Kz} \dot{\lambda}_{LC} + \lambda_{KC} \dot{\lambda}_{Lz})] / \Delta'
\]

(4.11)
Since \( \eta > 0 \), therefore \[
\hat{Z} / \hat{t} > 0
\]

We already know that \( \hat{Y} = \hat{Z} \), therefore \[
(\hat{Y} / \hat{t}) > 0.
\]

Finally, \[
(\hat{P}_z / \hat{t}) = 0
\]

Thus, \[
(\hat{r}_P / \hat{t}) = -\alpha [(\theta_{L_x^z} \theta_{K_z^z} - \theta_{L_x^2} \theta_{K_z^2}) / \{-\theta_{K_F Y} (\theta_{L_x^z} \theta_{K_z^z} - \theta_{L_x^2} \theta_{K_z^2})\}]
\]

\[= (\alpha / \theta_{K_F Y}) > 0\]

4.3.2 Impact of tariff reform on the level of national income of the economy

The level of NI of the economy is given by
\[
\Omega = W(a_{L_x}X + a_{L_z}Z) + \overline{W}(a_{L_y}Y) + (W / \beta)L_C + rK_D - tP_Y
\]
\[= W[L - a_{L_y}Y + a_{L_C}L_C - (L_C / \beta)] + \overline{W}(a_{L_y}Y) + (W / \beta)L_C + rK_D - tP_Y
\]
\[= W[L + a_{L_C}L_C] + (\overline{W} - W)a_{L_y}Y + rK_D - tP_Y
\]

Differentiating the above equation we get
\[
(d\Omega / dt) = W\alpha_{L_C} (dL_C / dt) + (\overline{W} - W)a_{L_y} (dY / dt) + (\overline{W} - W)Y (da_{L_y} / dt) - P_Y Y - tP_Y (dY / dt)
\]

Since \((dL_C / dt) > 0\) and \((dY / dt) > 0\)

We know from equation (4.2.2) that
\[
(\hat{a}_{L_y} / \hat{t}) = (\hat{r}_P / \hat{t})\sigma_y \{\theta_{K_F Y} / (1 - \theta_{y_y})\}
\]

We already know that \((\hat{r}_P / \hat{t}) > 0, \sigma_y > 0, \theta_{y_y} < 1\)

Therefore \((\hat{a}_{L_y} / \hat{t}) > 0\)

Thus, \((d\Omega / dt) > 0\) if \((\overline{W} - W)a_{L_y} (dY / dt) > P_Y \{Y + t(dY / dt)\}\)