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FDI, Unemployment, and Welfare in the Presence of Agricultural Dualism: A Three-Sector General Equilibrium Model

RAKHI BANERJEE and RANJANENDRA NARAYAN NAG

The present paper uses a three-sector general equilibrium framework to examine the effect of Foreign Direct Investment (FDI) on unemployment and welfare in labour-surplus economies in the post-globalisation era. We show that the expansion of land-hungry export-oriented agricultural sector through FDI accentuates the problem of urban unemployment in the presence of sticky urban wage and agricultural dualism. We also note that multiple cross-effects and factor specificity play an important role in determining change in output composition and welfare in the wake of the inflow of foreign capital.

JEL classification: F16, F21
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1. INTRODUCTION

The process of economic reform has led to significant change in the organisation and trade orientation of the agricultural sector in many emerging market economies. A major reflection of such change is the emergence of agricultural dualism. Agricultural sector is no longer a monolithic entity. It is divided into two sub sectors, namely traditional agriculture and modern agriculture. The difference between the two sub sectors can be assessed in terms of nature and intensity of inputs used and elasticity of substitution between inputs. World Development Report (WDR), 2008 reveal that high value agro food commodities are the fastest growing products in most developing countries. These products require land, labour and capital. However, the traditional agricultural products do hardly require capital. Moreover, the emerging pattern of trade is suggestive of the fact that emerging market economies have lost their comparative advantage in traditional agricultural products.

In the face of inadequacy of domestic resources to finance long term development, the issue of attracting foreign direct investment (FDI) is currently a source of major

Rakhi Banerjee <rakhi.banerjee77@gmail.com> is Assistant Professor, Department of Economics, Gurudas College, Kolkata, India. Ranjanendra Narayan Nag <rnnag12@gmail.com> is Associate Professor, Department of Economics, St. Xavier's College (Autonomous), Kolkata, India.

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concern for policy makers. Substantial investments are required to support expansion of export-oriented agricultural sector. Casual empiricism also suggests that huge amount of FDI in the post WTO regime has been flowing into the non-traditional agricultural sector.[1] The earlier works have examined the effect of FDI on welfare, wage gap and unemployment. [See for example, Beladi and Marjit (1992, 1996); Marjit (1996); Beladi, Marjit and Ralph (1998); Chaudhuri (2007**)** among others]. However, there is not much theoretical work on the effect of FDI on unemployment and welfare in presence of agricultural dualism. Given the obvious relevance of such issues to transitional economies, it is of some interest to examine implications of FDI in presence of

(1) urban unemployment,
(2) agricultural dualism,
(3) three factors of production namely, labour, land and capital.

To do so is the objective of this paper.

The paper is organised as follows. In Section 2, we setup a three-sector general equilibrium model in which unemployment of Harris Todaro type is incorporated. We carry out a comparative static exercise pertaining to increase in FDI such that capital base of the economy is augmented. In Section 2 we concentrate on the effect of an exogenous increase in capital stock on urban unemployment of the economy. In Section 3 we explore the welfare implications of an exogenous increase in capital stock. Section 4 contains certain concluding observations.

2. A THREE-SECTOR GENERAL EQUILIBRIUM MODEL

We have a three-sector, small open, economy. One of the sectors is the industrial, protected, import-competing sector, (X). The other two sectors belong to the broad category of agricultural sector. One is the traditional, import competing agricultural sector producing wage goods (Y) and the other one is the export-oriented, modern agricultural sector (Z). The production structure assumed in this paper is quite consistent with a typical emerging market economy.

Next, we consider input use in different sectors. X is produced with labour and capital. Y is produced with the help of labour and land, while land, labour and capital are used in the production of Z. Labour is mobile between all the sectors while capital is also mobile between the sectors X and Z. Labour and capital are substitutes; however, land is not substitutable and is required in fixed proportion. We also take domestic capital and foreign capital to be perfect substitutes. Urban wage is sticky and there is a wage gap between the industrial and the agricultural sector. This wage differential will induce migration of Harris-Todaro type.

The following symbols are used for the formal representation of the model:

α_{lx} = labour output ratio in the X sector
α_{ly} = labour output ratio in the Y sector
α_{lz} = labour output ratio in the Z sector
α_{kx} = capital output ratio in the X sector

[1]FDI into the non traditional agricultural sector in the post WTO regime has flowed into Morocco, Spain, Italy, Chile, and India among others [WDR (2008)].

α_{kz} = capital output ratio in the *Z* sector
α_{ty} = land output ratio in the *Y* sector
α_{tz} = land output ratio in the *Z* sector
w = non-unionised wage rate in the agricultural sector
w^* = unionised wage rate in the industrial sector
R = rate of return on land
r = rate of return on capital
L = labour endowment in physical units
K = capital endowment in physical units
T = land endowment in physical units
P^*_x, P^*_Y = prices of *X*, *Y* respectively
L_u = urban Unemployment
T_x = tariff in sector *X*
t_y = tariff in sector *Y*
$\lambda_{i,j}$ = share of factor i in the production of output of sector *j*, *i* =*L*,*K*,*T*, *j*=*X*,*Y*,*Z*
U = Welfare of the economy
dU = change in welfare
$\hat{a}$ = proportionate change in a, where a represents any variable
D_j = Demand for commodity *j* where *j*=*X*,*Y*,*Z*

The general equilibrium structure of the model is as follows.

The price of the modern agricultural sector is taken to be unity and hence, the output of the modern agricultural sector is chosen as the numairare.

Since, markets are competitive, equality between unit cost and price holds. Equations (1)–(3) represent the price system:

$$a_{lx}.w^* + a_{kx}.r = P^*_x(1+t_x) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

$$a_{ly}.w + a_{ty}.R = P^*_y(1+t_y) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$$a_{lz}.w + a_{kz}.r + a_{tz}.R = 1 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

The physical system is represented by Equations (4)–(6):

$$a_{lx}.X + a_{ly}.Y + a_{lz}.Z + L_u = L \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

$$a_{kx}.X + a_{kz}.Z = K \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

$$a_{ty}Y + a_{tz}.Z = T \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

The rural-urban migration stops when expected urban wage equals the rural wage and thus, Equation (7) represents the Harris-Todaro migration equilibrium.

$$\frac{w^*}{w}a_{lx}X + (a_{ly}Y + a_{lz}Z) = L \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

The working of the model is as follows: *w*, *r*, *R*, are determined from Equations (1-3). *X*, *Y*, *Z* are determined from the Equations (5-7). The level of urban unemployment is determined from Equation (4).

Since the model has the standard decomposition property, any change in factor endowment, say due to inflow of foreign capital has no effect on factor prices. However, change in output composition leads to change in the level of unemployment and welfare.

Next, we consider comparative static effects of increase in capital flow.

Differentiating Equations (5) to (7) we have:[2]

$$\hat{Z} = \hat{K}[-\frac{w^*}{w}\frac{1}{A}\lambda_{lx}\frac{1}{\lambda_{kx}}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

Where,

$$A = \frac{1}{w\lambda_{kx}\lambda_{ty}}[-w^*\lambda_{lx}\lambda_{kz}\lambda_{ty} + w\lambda_{kx}(\lambda_{lz}\lambda_{ty} - \lambda_{tz}\lambda_{ly})]$$

$$\hat{Y} = \hat{K}[\frac{1}{A}\frac{w^*}{w}\lambda_{lx}\lambda_{tz}\frac{1}{\lambda_{ty}\lambda_{kx}}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

$$\hat{X} = \frac{1}{A}\frac{1}{\lambda_{kx}\lambda_{ty}}\hat{K}[\lambda_{lz}\lambda_{ty} - \lambda_{ly}\lambda_{tz}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

$$\hat{L}_U = -\hat{K}L_u\frac{\lambda_{lx}}{AL_u\lambda_{kx}\lambda_{ty}}[(\lambda_{lz}\lambda_{ty} - \lambda_{ly}\lambda_{tz})(1-\frac{w^*}{w})] \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

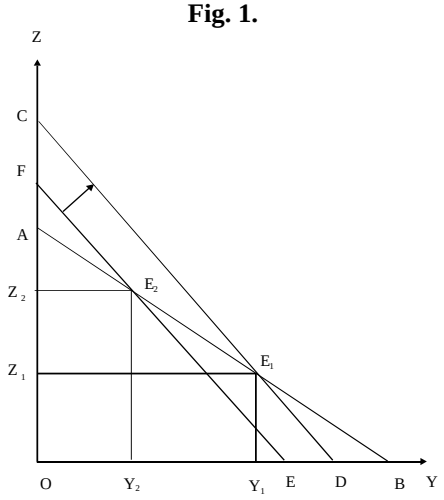
The model leads to the following propositions.

Proposition 1: Inflow of FDI can lead to expansion of both import-competing industrial sector and export-oriented agricultural sector and contraction of the traditional agricultural sector if either modern agricultural sector is land intensive relative to the traditional agricultural sector or modern agricultural sector is capital intensive compared to the traditional manufacturing sector.

Comment: Let us explain the role of factor intensities and factor specificities in determining effects of change in capital flow on output composition. First, we explain the role of land intensity of *Z vis-à-vis Y*. Increase in capital stock will lead to either increase in *X* or *Z*. Suppose, that *X* increases. If *X* increases, it reduces availability of labour to both *Y* and *Z*. If *Y* is labour intensive compared to *Z*, we have the standard Rybzynscki theorem to explain expansion of *Z* and contraction of *Y*. Consider Figure (1). In Figure (1) the lines *AB* and *CD* represent the initial land constraint and labour constraint respectively. Hence, the initial equilibrium point is E_1, where Y_1 amount of *Y* and Z_1 amount of *Z* is produced. Increase in capital stock, reduces the amount of labour available to both *Y* and *Z* sector. Thus, the labour constraint shifts leftwards to *EF*. The new equilibrium point is now E_2 where Z_2 amount of *Z* and Y_2 amount of *Y* is produced.

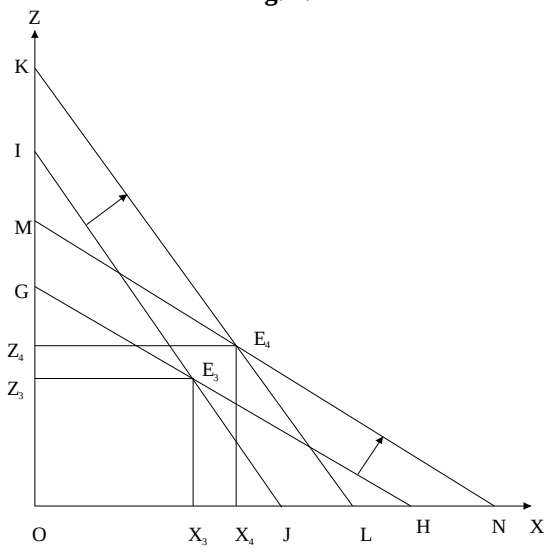
[2]See Appendix for detailed derivation.

Fig. 1.



Next, we consider the role of capital intensity of *Z vis-á-vis X*. Since capital stock of the economy increases, *Z* increases. As land constraint of the economy is given, *Y* contracts. Hence, labour is released from the *Y* sector. As *X* is labour intensive this leads to the expansion of the *X* sector. Thus, we have expansion of *X* and *Z*. Now consider Figure (2). In Figure (2) the lines GH and *IJ* represent the initial capital constraint and labour constraint respectively. Hence, the initial equilibrium point is E_3, where X_3 is the amount of *X* and Z_3 is the amount of *Z* produced. As capital stock of the economy increases, the capital constraint shifts rightwards to *MN* leading to an expansion of the *Z* sector. However, as *Y* contracts, labour available for sectors *X* and *Z* also increases. Thus, the labour constraint shifts rightwards to *KL*. The new equilibrium point is now E_4, where X_4 amount of *X* and Z_4 amount of *Z* is produced.

Fig. 2.



This result can only be obtained in a three sector General-Equilibrium framework that involves cross effects of different types.

Proposition 2: If an economy receives additional foreign capital, urban unemployment in the economy would increase if the modern agricultural sector is land-intensive as compared to the traditional agricultural sector.

Comment: The effect on unemployment depends on both factor intensity ranking and difference between unionised urban wage and flexible rural wage.

Since, industrial wage is unionised and greater than the flexible rural wage, it's ability to absorb labour is limited. Moreover, it is well known that majority of the labour force in a developing country is absorbed in the agricultural sector. Again, modern agricultural sector is land intensive compared to traditional agricultural sector and it's employment intensity is low compared to the traditional agricultural sector. Since, inflow of foreign capital leads to an expansion in the output levels of modern agriculture and traditional, import-competing manufacturing sector at the cost of traditional agricultural product, urban unemployment increases.

3. WELFARE ANALYSIS

In this section of the paper, we would explore the impact of an exogenous increase in capital stock on welfare of the economy. In presence of tariff, total expenditure on *X,Y,Z* equals the value of production at domestic prices plus tariff revenue.

$$E[q_1, q_2, U\{q_1, q_2, K\}] = P_X X + P_Y Y + Z + t_x P_x^* M_x + t_y P_y^* M_y \quad \ldots \quad \ldots \quad (12)^3$$

Where,

$E\,[q_1, q_2, U\{q_1, q_2, K\}]$= Expenditure Function
P_i = Domestic price of commodity j, $j=X,Y,Z$
M_x =Import of commodity X
M_y = Import of commodity Y
q_1 = relative price of commodity X
q_2 = relative price of commodity Y

Manipulating Equation (12) we have:

$$E\,[q_1, q_2, U\{q_1, q_2, K\}] = P_x^* X + P_y^* Y + Z + t_x P_x^* D_x + t_y P_y^* D_y \quad \ldots \quad \ldots \quad (13)$$

Where,

Differentiating Equation (13) we have:

$$\frac{\delta E}{\delta U}\frac{dU}{dK} = P_x^* \frac{dX}{dK} + P_y^* \frac{dY}{dK} + \frac{dZ}{dK} + t_x P_x^* \frac{\delta D_x}{\delta E}\frac{\delta E}{\delta U}\frac{dU}{dK} + t_y P_y^* \frac{\delta D_y}{\delta E}\frac{\delta E}{\delta U}\frac{dU}{dK} \quad \ldots (14)^4$$

[3]Utility of a consumer depends on the level of *X, Y, Z* consumed. However, it should be noted that production of these commodities depends on parameters of the system and in particular, capital stock of the economy. Hence, maximised value of utility depends on capital stock.

[4]We derive Equation (14) with the help of the fact that

$D_x = D_x\,(q_1, q_2, E[q_1, q_2, U(q_1, q_2, K)])$ and $D_y = D_y\,(q_1, q_2, E[q_1, q_2, U(q_1, q_2, K)])$.

Manipulating Equation (14) we have:

$$dU = \frac{1}{S\tau}[P_x^* X\hat{X} + P_y^* Y\hat{Y} + Z\hat{Z}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (15)$$

where,

$$S = \frac{dE}{dU} > 0$$

$$\tau = [1 - t_x P_x^* \frac{\delta D_x}{\delta E} - t_y P_y^* \frac{\delta D_y}{\delta E}] > 0$$ [5]

This follows from the assumption that all commodities are normal goods.
Substituting (8)-(10) in (15) we have:

$$dU = \frac{1}{S\tau}\hat{K}\{\ XP_x^* \frac{1}{A}\frac{1}{\lambda_{kx}\lambda_{ty}}[\lambda_{lz}\lambda_{ty} - \lambda_{ly}\lambda_{tz}] + Z[-\frac{w^*}{w}\frac{1}{A}\lambda_{lx}\frac{1}{\lambda_{kx}}]$$

$$+YP_y^*[\frac{1}{A}\frac{w^*}{w}\lambda_{lx}\lambda_{tz}\frac{1}{\lambda_{ty}\lambda_{kx}}]\} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (16)$$

Proposition 3: If modern agricultural sector is land intensive compared to the traditional agricultural sector, inflow of FDI into an economy characterised by agricultural dualism and open urban unemployment may lead to immeserisation if :

$$XP_x^* \frac{1}{A}\frac{1}{\lambda_{kx}\lambda_{ty}}[\lambda_{lz}\lambda_{ty} - \lambda_{ly}\lambda_{tz}] + Z[-\frac{w^*}{w}\frac{1}{A}\lambda_{lx}\frac{1}{\lambda_{kx}}] + YP_y^*[\frac{1}{A}\frac{w^*}{w}\lambda_{lx}\lambda_{tz}\frac{1}{\lambda_{ty}\lambda_{kx}}] < 0$$

Comment: Change in the stock of capital influences the level of welfare in two ways. On the one hand, change in capital availability alters the output composition of the economy and on the other hand, the change in import volume affects the tariff revenue of the economy. If modern agricultural sector is capital intensive compared to the traditional manufacturing sector or the modern agricultural sector is land intensive compared to the traditional manufacturing sector then A<0. Since, $[\lambda_{lz}\lambda_{ty} - \lambda_{ly}\lambda_{tz}] < 0$, the first two terms in expression (16) is positive. Thus, increase in production of *X* and *Z* consequent upon increase in foreign capital is welfare improving. The last term in Equation (16) is negative which in turn is a source of fall in welfare. The contraction of the labour intensive traditional agricultural sector tends to reduce welfare and if this dominates the welfare enhancing effect of increase in foreign capital, immeserisation follows. Injection of foreign capital into the economy characterised by open urban unemployment would be immeserising in nature if

$$XP_x^* \frac{1}{A}\frac{1}{\lambda_{kx}\lambda_{ty}}[\lambda_{lz}\lambda_{ty} - \lambda_{ly}\lambda_{tz}] + Z[-\frac{w^*}{w}\frac{1}{A}\lambda_{lx}\frac{1}{\lambda_{kx}}] + YP_y^*[\frac{1}{A}\frac{w^*}{w}\lambda_{lx}\lambda_{tz}\frac{1}{\lambda_{ty}\lambda_{kx}}] < 0 \quad (17)$$

[5] See Appendix for derivation.

4. CONCLUSION

The purpose of the paper has been to provide a theoretical discussion on the possible impact of exogenous increase in capital stock on unemployment and welfare in a transitional economy. The paper shows that if modern agricultural sector is land-intensive compared to the traditional agricultural sector, the flow of FDI aggravate the problem of urban unemployment. There also exists a possibility of immeserisation in the sense that welfare may decline in the wake of foreign capital inflow. The results in this paper are sensitive to the assumptions of factor intensity ranking and complementarity that is embedded in a three-sector general equilibrium model. Since unemployment and immeserisation are disturbing phenomena, they can be potential sources of discontent against capital market liberalisation. A broad policy message of the paper is that capital flow in general and it's destination in particular should be judiously managed.

APPENDIX

Section 1: DERIVATION OF EFFECT ON OUTPUT AND EMPLOYMENT

Equations (1)–(3) represent the price system:

$$a_{lx}.w^{*} + a_{kx}.r = P^{*}_{x}(1+t_x) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

$$a_{ly}.w + a_{ty}.R = P^{*}_{y}(1+t_y) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$$a_{lz}.w + a_{kz}.r + a_{tz}.R = 1 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

The physical system is represented by Equations (4)-(6):

$$a_{lx}.X + a_{ly}.Y + a_{lz}.Z + L_u = L \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

$$a_{kx}.X + a_{kz}.Z = K \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

$$a_{ty}Y + a_{tz}.Z = T \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

The rural-urban migration stops when expected urban wage equals the rural wage and thus, Equation (7) represents the Harris-Todaro migration equilibrium.

$$\frac{w^{*}}{w} a_{lx}X + (a_{ly}Y + a_{lz}Z) = L \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

Differentiating Equations (5)-(7) we have:

$$\lambda_{kx}\hat{X} + \lambda_{kz}\hat{Z} = \hat{K} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (a)$$

$$\lambda_{ty}\hat{Y} + \lambda_{tz}\hat{Z} = 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (b)$$

$$\frac{w^{*}}{w}\lambda_{lx}\hat{X} + \lambda_{ly}\hat{Y} + \lambda_{lz}\hat{Z} = 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (c)$$

From (a)-(c) we have:

$$\hat{X} = \frac{1}{\lambda_{kx}}[\hat{K} - \lambda_{kz}\hat{Z}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(d)}$$

$$\hat{Y} = -\frac{\lambda_{tz}}{\lambda_{ty}}\hat{Z} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(e)}$$

Replacing (d)-(e) into Equation (c) we have:

$$\hat{Z} = \hat{K}[-\frac{w^*}{w}\frac{1}{A}\lambda_{lx}\frac{1}{\lambda_{kx}}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

Where,

$$A = \frac{1}{w\lambda_{kx}\lambda_{ty}}[-w^*\lambda_{lx}\lambda_{kz}\lambda_{ty} + w\lambda_{kx}(\lambda_{lz}\lambda_{ty} - \lambda_{tz}\lambda_{ly})]$$

Replacing (12) in Equation (e) we have:

$$\hat{Y} = \hat{K}[\frac{1}{A}\frac{w^*}{w}\lambda_{lx}\lambda_{tz}\frac{1}{\lambda_{ty}\lambda_{kx}}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

Replacing (12) in Equation (d) we have:

$$\hat{X} = \frac{1}{A}\frac{1}{\lambda_{kx}\lambda_{ty}}\hat{K}[\lambda_{lz}\lambda_{ty} - \lambda_{ly}\lambda_{tz}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

From Equation (4) we have:

$$\lambda_{lx}\hat{X} + \lambda_{ly}\hat{Y} + \lambda_{lz}\hat{Z} + \frac{L_u}{L}\hat{L}_u = 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(f)}$$

Replacing Equation (12)-(14) into Equation (f) we have:

$$\hat{L}_U = -\hat{K}L\frac{\lambda_{lx}}{AL_u\lambda_{kx}\lambda_{ty}}[(\lambda_{lz}\lambda_{ty} - \lambda_{ly}\lambda_{tz})(1 - \frac{w^*}{w})] \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

Section 2: WELFARE ANALYSIS

$$E = P_x^*(1+t_x)D_x + P_y^*(1+t_y)D_y + D_z \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(i)}$$

Differentiating with respect to E we have:

$$1 = P_x^*(1+t_x)\frac{\delta D_x}{\delta E} + P_y^*(1+t_y)\frac{\delta D_y}{\delta E} + \frac{\delta D_z}{\delta E} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(ii)}$$

Manipulating (ii) we have:

$$[1-t_x P_x^* \frac{\delta D_x}{\delta E} - t_y P_y^* \frac{\delta D_y}{\delta E}] = P_x^* \frac{\delta D_x}{\delta E} + P_y^* \frac{\delta D_y}{\delta E} + \frac{\delta D_z}{\delta E} \quad \ldots \quad \ldots \quad \ldots \quad \text{(iii)}$$

Since *X,Y,Z* are all normal goods

$$P_x^* \frac{\delta D_x}{\delta E} + P_y^* \frac{\delta D_y}{\delta E} + \frac{\delta D_z}{\delta E} > 0$$

Hence,

$$[1-t_x P_x^* \frac{\delta D_x}{\delta E} - t_y P_y^* \frac{\delta D_y}{\delta E}] > 0$$

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