APPENDIX: The input-output model

Out input-output model can be represented by the following linear equations:

$$\begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix} = \begin{bmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & & \vdots \\ z_{n1} & \cdots & z_{nn} \end{bmatrix} \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix} + \begin{bmatrix} f_1 \\ \vdots \\ f_n \end{bmatrix} \qquad (1)$$

where x_i is the gross output of sector i, z_{ij} is the intermediate input from sector i to sector j, and f_i is the total final demand for sector i's product. Equation (1) is equal to the following in matrix notation:

$$X_{n\times 1} = Z_{n\times n} i_{n\times 1} + F_{n\times 1} \qquad (2)$$

The direct input coefficient a_{ij} , which measures the amount of intermediate input from sector *i* used to produce one unit of output in sector *j* with only direct input demand considered, is calculated by dividing the intermediate input from sector *i* to sector *j* by the total output of sector *j*:

$$a_{ij} = z_{ij} / x_{ij}$$

(3)

By substituting (3) into (1) or (2), the input-output model can be rearranged as:

$$\begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix} = \left(\begin{bmatrix} 1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 1 \end{bmatrix} - \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix} \right)^{-1} \begin{bmatrix} f_1 \\ \vdots \\ f_n \end{bmatrix} \qquad (4)$$

which is equivalent to:

$$X_{n\times 1} = (I_{n\times n} - A_{n\times n})^{-1} F_{n\times 1} \qquad (5)$$

where $(I_{n\times n} - A_{n\times n})^{-1}$ is known as Leontief Inverse matrix.

Then, the total input coefficient that describes the amount of output from sector *i* used as intermediate input to meet one unit increase in the final demand of sector *j* is calculated as:

$$B_{n\times n} = (I_{n\times n} - A_{n\times n})^{-1} - I_{n\times n} \qquad (6)$$

We assume the high tech sector's linkage with other sectors is eliminated from the input-output table, that means, we set a_{i1} and a_{1j} at 0 in the A matrix in equation (4) for all *i* and *j* and calculate the new output level for all sectors.

$$\begin{bmatrix} x_{1*} \\ \vdots \\ x_{n*} \end{bmatrix} = \left(\begin{bmatrix} 1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 1 \end{bmatrix} - \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & a_{22} & \cdots & a_{2n} \\ 0 & \vdots & \ddots & \vdots \\ 0 & a_{n2} & \cdots & a_{nn} \end{bmatrix} \right)^{-1} + \begin{bmatrix} f_1 \\ \vdots \\ f_n \end{bmatrix} \tag{7}$$