

On Endogenising Population in Input-Output Framework

A. Ghosh and D. Chakraborty

1. THE CLOSED INPUT-OUTPUT MODEL

In this paper an attempt has been made to extend the input-output model in a new direction by bringing the population into the model on the lines of other sectors but in a meaningful way by extending slightly the concept of the augmented matrix¹ which incorporates the consumption vector (col) and employment vector (row) within the model with its own system of co-efficients.

For the augmented model consider a 3 x 3 matrix where there are two output sectors and one household sector, the latter being an endogenous sector whose output (value added) is designated as y as below:

$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + a_{13}y &= x_1 \\ a_{21}x_1 + a_{22}x_2 + a_{23}y &= x_2 \quad \dots \quad 1.1 \\ a_{31}x_1 + a_{32}x_2 + a_{33}y &= y \end{aligned}$$

2. THE INPUT-OUTPUT MODEL INCORPORATING POPULATION

Suppose only labour is the primary factor. Let w_0 be the wage per unit of labour in the base period, l_1, l_2 the labour units employed in sectors 1 and 2 and w_0 the uniform wage rate. Let the total labour unit $l_1 + l_2$ be denoted by 1. Then we may write the system as follows:

$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + \frac{c_1}{lw_0} \cdot lw_0 &= x_1 \\ a_{21}x_1 + a_{22}x_2 + \frac{c_2}{lw_0} \cdot lw_0 &= x_2 \quad \dots \quad 2.1 \\ \frac{l_1w_0}{x_1} \cdot x_1 + \frac{l_2w_0}{x_2} \cdot x_2 &= lw_0 \end{aligned}$$