

$$TD = \frac{IC}{ALIC} + \frac{SC}{ALSC}$$

$$TD = \frac{IO \times ICOR}{ALIC} + \frac{SO \times SCOR}{ALSC},$$

where

TD	= total depreciation (dollars per year)
IC	= industrial capital (dollars)
IO	= industrial output (dollars per year)
ICOR	= industrial capital-output ratio (years)
ALIC	= average lifetime of industrial capital (years)
SC	= service capital (dollars)
SO	= service output (dollars per year)
SCOR	= service capital-output ratio (years)
ALSC	= average lifetime of service capital (years)

Using the estimates of service and industrial capital-output ratios derived elsewhere, one can determine a least-squares estimate for the relation between ALIC and ALSC for the countries included in the sample. However, other information must be used to select the most appropriate pair of values for ALIC and ALSC that satisfy the relationship. Because of the greater contribution of buildings to service capital, it is reasonable to expect that the average life of service capital ALSC will be greater than the average life of industrial capital ALIC. Kuznets has estimated lifetimes of 50 years for building and construction materials and 10 years for producers' equipment (Kuznets 1966, p. 258). We would expect the average lifetime for all industrial capital to fall between these two figures. We therefore estimated the following approximate values for the two parameters: ALSC = 20 years, ALIC = 14 years. The CLIP function in the equation for ALIC permits one to change the value of ALIC from ALIC1 to ALIC2 during the simulation when TIME = PYEAR.

#### Industrial Capital Investment Rate ICIR

ICIR.EK=(IO,K)(FIOAI,K)	55, R
ICIR	= INDUSTRIAL CAPITAL INVESTMENT RATE (DOLLARS/YEAR)
IO	= INDUSTRIAL OUTPUT (DOLLARS/YEAR)
FIOAI	= FRACTION OF INDUSTRIAL OUTPUT ALLOCATED TO INDUSTRY (DIMENSIONLESS)

The amount reinvested each year in industrial capital (the industrial capital investment rate ICIR) is by definition the product of industrial output IO and the fraction of industrial output allocated to industry FIOAI. The latter is the fraction that is not allocated to services (FIOAS), agriculture (FIOAA), or consumption (FIOAC). Since depreciation is represented separately, ICIR measures gross investment. FIOAC and FIOAS are described later in this chapter; FIOAA is described in Chapter 4.

FIOAI.K=(1-FIOAA.K-FIOAS.K-FIOAC.K)	56, A
FIOAI	= FRACTION OF INDUSTRIAL OUTPUT ALLOCATED TO INDUSTRY (DIMENSIONLESS)
FIOAA	= FRACTION OF INDUSTRIAL OUTPUT ALLOCATED TO AGRICULTURE (DIMENSIONLESS)
FIOAS	= FRACTION OF INDUSTRIAL OUTPUT ALLOCATED TO SERVICES (DIMENSIONLESS)
FIOAC	= FRACTION OF INDUSTRIAL OUTPUT ALLOCATED TO CONSUMPTION (DIMENSIONLESS)

#### Fraction of Industrial Output Allocated to Consumption FIOAC

FIOAC.E=CLIP(FIOACV,K,FIOACC,K,TIME,K,IET)	57, A
IET=4000	57.1, C
FIOAC	= FRACTION OF INDUSTRIAL OUTPUT ALLOCATED TO CONSUMPTION (DIMENSIONLESS)
CLIP	= A FUNCTION SWITCHED DURING THE RUN
FIOACV	= FIOAC VARIABLE (DIMENSIONLESS)
FIOACC	= FIOAC CONSTANT (DIMENSIONLESS)
TIME	= CURRENT TIME IN THE SIMULATION RUN
IET	= INDUSTRIAL EQUILIBRIUM TIME (YEAR)
FIOACC.K=CLIP(FIOAC2,FIOAC1,TIME,K,PYEAR)	58, A
FIOAC1=.43	58.1, C
FIOAC2=.43	58.2, C
FIOACC	= FIOAC CONSTANT (DIMENSIONLESS)
CLIP	= A FUNCTION SWITCHED DURING THE RUN
FIOAC2	= FIOAC, VALUE AFTER TIME=PYEAR (DIMENSIONLESS)
FIOAC1	= FIOAC, VALUE BEFORE TIME=PYEAR (DIMENSIONLESS)
TIME	= CURRENT TIME IN THE SIMULATION RUN
PYEAR	= YEAR NEW POLICY IS IMPLEMENTED (YEAR)

In all but the equilibrium runs, the fraction of industrial output allocated to consumption was assumed to be a constant, FIOACC. However, after TIME=IET (industrial equilibrium time), FIOAC is set equal to a variable FIOACV. Since IET normally was assigned the value 4,000, FIOAC was typically constant. A CLIP function was included in the equation defining FIOACC so that its value could be changed during the course of the simulation run. After TIME=PYEAR the value of the constant consumption fraction shifts from FIOAC1 to FIOAC2. During most of our analyses both constants were assigned the value of 0.43.

As defined in World3, FIOAC includes all goods generated by the industrial sector that have a lifetime of one year or less and are not invested in agriculture. Thus it includes most textiles, toys, paper, chemicals, packaging, and, as we mentioned earlier, fuel oil and other petroleum products not directly utilized in the production process.

The value of 0.43 for FIOACC was derived from the individual country data of Figure 3-7, which gives consumption as a fraction of total GNP (column 8). If we assume that all agricultural and service outputs are included in total consumption, the component of industrial output IO that is consumed will equal the total consumption minus the sum of service and agricultural output. The fraction of industrial output allocated to consumption FIOAC will be this quantity divided by industrial output IO:

$$FIOAC = \frac{TC - SO - AO}{IO},$$