SYSTEMS ANALYSIS OF INDIAN STEEL INDUSTRY : A SIMULATION MODELLING APPROACH

by

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DEDICATED TO

MY PARENTS

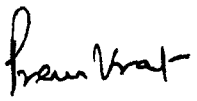
MY TEACHERS

MY GRANDFATHER

MY WIFE MRS. SANGEETA CHADHA

C E R T I F I C A T E

The thesis entitled 'Systems Analysis of Indian Steel Industry : A Simulation Modelling Approach' being submitted by Mr. Rajesh Chadha to the Indian Institute of Technology, New Delhi, for the award of the degree of Doctor of Philosophy, is a record of bonafide research work carried out by him. He has worked under my guidance and supervision, and has fulfilled the requirements for the submission of this thesis, which has attained the standard required for a Ph.D. degree of the Institute. The results presented in this thesis have not been submitted elsewhere for the award of any degree or diploma.



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A C K N O W L E D G E M E N T S

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R Chadha

Rajesh Chadha

A B S T R A C T

Steel plays a crucial role in the economic development of a nation. There is an urgent need for long term planning in steel industry of a developing economy. The present study takes a systems view of Indian steel industry and attempts to analyse and forecast the important elements of this system, viz. steel consumption requirements of Indian economy, demand for various inputs for the production of steel and the production function in Indian steel industry with the help of an econometric simulation model. The primary aim of the study is to help the planning process by supplying the input information in advance as to what are the likely annual needs of steel consumption in Indian economy upto the year 2005 A.D. and how much of each of the various inputs shall be needed every year to produce the desired quantity of steel at the minimum possible cost.

The context and the problem along with major objectives of this study have been identified. The existing relevant literature has been critically reviewed. The variables used in the system's study have been identified and specified.

A steel consumption function for Indian economy has been estimated by using the global method with GNP

as the explanatory variable. A GNP function has also been estimated in case of India.

The cost minimising input demand functions and the relevant cost function in Indian steel industry have been estimated. The corresponding production function has also been derived.

The sub-models of consumption and production of steel have been dovetailed into a simulation model of the system of Indian steel industry. The model so developed has been validated by using graphical and statistical methods. The forecasts of various endogenous variables have been computed upto the year 2005 A.D.

The results of the present study have been extensively analysed along with a sensitivity analysis of various forecasts. The need for a dynamic follow-up of the study has also been emphasised.

At the end, the summary of major findings and the significant contributions made by this study have been discussed. The limitations of the present research and suggestions for future extensions and modifications have also been given.

A bibliography on the subject is included. The appendices of the thesis contain an application of the translog cost function to Indian steel industry, tables

of raw data and the computer listings.

A part of the research reported in this thesis has been published in various journals and conferences. A list of publications based on the work reported has been given at the end.

NOMENCLATURE

The necessary descriptions of the symbols/ notations used in this thesis are given wherever these appear. Unless otherwise specified, the major system variables are described as follows :

Y	:	GNP of India at factor cost at constant (1970-71) prices (Rs. crores)
S	:	apparent consumption of steel in India in terms of crude steel equivalent (thousand tonnes)
Q	:	production of steel in terms of crude steel equivalent (thousand tonnes)
L	:	labour input (lakh man-hours : all employees)
K	:	capital input (gross fixed capital in Rs. lakhs at constant 1960 prices)
F	:	fuels input (lakh tonnes of coal replacement equivalent)
M	:	raw-materials input (Rs. lakhs at constant 1960 prices)
P_L	:	price of labour input (Rs. per man-hour)

P_K : price of capital input (Rs. per rupee of capital input)

P_F : price of fuels input (Rs. per tonne of coal replacement equivalent)

P_M : price of raw-materials input (price index, 1960=100)

Rs. : Indian rupees

Note : The terms 'lakh' and 'crore' have the following numerical values :

$$1 \text{ lakh} = 10^5$$

$$1 \text{ crore} = 10^7$$

C O N T E N T S

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