EMPOV II MODEL : Basic Needs Availability and Appropriate Pricing and Income Policies for Poverty Alleviation.

by

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Abstract :

The objective in this paper is to obtain a relevant set of commodity and factor prices to match the availability of basic needs with demands. The idea is that, when the basic needs are made available on a top priority basis, this new price structure, along with the larger availability of basic needs, will act as an important factor in the speedy removal of poverty.

A multi-sectoral goal programming model has been developed to obtain these commodity and factor prices simultaneously. The objective of the model is to minimise the difference between the given target consumption, and the market consumption which is determined using the income group-wise price and income elasticities. The model is solved with the data of Indian economy. Various alternative scenarios have been worked out.

One of the important ways of implementing the revised commodity and factor price structure, as suggested here, may be to constitute national and regional level 'Bureau of Incomes and Prices' involving representatives from managers, workers, bureaucrats and politicians. Similar suggestion was also made in the 'report of the study group on wages, income and prices' (23).

1. INTRODUCTION :

Improving the standard of living of every one along with reducing the inequality in the distribution of income and wealth has been one of the most important objectives of the development planning in the Indian economy. But, the results achieved so far during the course of nearly 4 decades of planning show only certain islands of prosperity in the midst of vast ocean of poverty. The causes of persisting poverty are understandable. The country, in spite of being rich in raw materials and technical manpower, has not been able to produce enough of basic needs, such as, food and nutrition, clothing, common man's housing, primary education, primary health care facilities and certain basic entertainment facilities. Further, it has not been found feasible to import items of basic consumption goods with limited foreign exchange earned by the country. Insufficient availability of basic needs, therefore, appear to be the most important constraints in the pursuit of speedy removal of poverty. It appears that providing adequate supply of basic needs has never been given the appropriate priority.

As is known, the development process in the country was launched without any effective measures to change the vast inequality in the distribution of income & wealth. This led to a distorted demand structure, and resulting in the

production and consumption of semi-luxury and luxury goods in preference to the basic needs items required for the large number of poor people. This phenomenon is one of the major reasons for the perpetuation of poverty in the country since such a long period of time.

The urgent need is, therefore, of recasting the plan priorities. **Top priority should be given to the production of basic needs items by curtailing the growth in the production of semi-luxury and luxury goods wherever the latter compete with the former for the same resources. Simultaneously, the production of all intermediate goods, capital goods and infrastructural items should be geared to this changed priority of provision of basic needs.**

It may be cautioned here that basic needs are relative concepts. Depending on the level of development of the economy, the composition of basic needs gets determined. With improvements in the standard of living, the composition of basic needs will have to be upgraded. In the Indian context basic needs will have to start from scratch. It will cover items which will be necessary as a bare minimum to upgrade people from the present subsistence levels to a level which will help them to develop their physical and mental capabilities in order to be able to contribute effectively in the socio-economic development of the nation.

Many people are employed full time (i.e. working about 8 hours a day for 200 working days a year), but their earnings are too meager to provide their family only a subsistence living. This can be termed as a **'substandard employment'**. It may be worthwhile at this stage to ensure for all, a **'standard employment'** which will ensure them sufficient income to be able to meet their basic needs, as defined from time to time.

The availability of basic needs may not automatically ensure the required purchasing power in the hands of the poor, even though they may be working full time. The income may be too low for the prices at which the basic needs items are available. **The answer lies in simultaneously changing the income structure and/or relative commodity prices to match the availability of basic needs with the demands.**

The first model proposed by Dhar and Rao with this approach under the title EMPOV (Employment & Poverty) model **(5)** has been constructed for a regional economy with an experiment of Bangalore district economy. Dhar, Rao and Goel **(15)** later substantially modified their EMPOV model and worked out projections for the Indian economy as a whole simultaneously for the Eighth and the Ninth plans. The same authors have also developed a multiregional model for India **(22)** using a similar approach of giving top priority to the availability of basic needs simultaneously in all the

regions of the country.

The authors have presented the three models mentioned above to ensure the availability of basic needs simultaneous at the regional and national levels. The task remains now to evolve an appropriate pricing and income policy. It is however, possible to develop an integrated model to cover both availability of basic needs and pricing and income changes. Since this would have made the model too unwieldy to handle, it to treat these two issues of availability and demands of basic needs in two successive stages. The present study is confined to developing a pricing and income policy model for a given level of availability of basic needs in a particular year.

This study covers the following tasks:

a. development of conceptual framework,
b. construction of mathematical model,
c. development of computer software, and
d. empirical analysis.

Having discussed the conceptual framework above, in the next section we give a brief review of literature pertaining to uses of multisectoral models for determining income and price changes. The mathematical model is covered in section 3 and the empirical analysis including description of computer package used follows in section 4. Section 5 contains a summary of the conclusions and limitations of the present study.

2. REVIEW :

It may be worthwhile here to mention the major deficiencies in the Planning Commission models in tackling the problems of poverty and inequality in the distribution of income, and the proposed improvements to be made in the approach followed in the present study.

Starting with the Fifth Five Year Plan, Planning Commission has been constructing multisectoral consistency models to obtain various plan projections for achieving the given plan objectives including poverty alleviation targets. The Fifth Plan, 1974-79 model **(9)** was constructed for 66 sectors, Sixth Plan 1980-85 model **(10)** with 89 sectors, and the Seventh Plan, 1985-90 model **(11)** with 50 sectors. The vector of sectoral consumption is worked out in these models assuming a given change in relative share of aggregate consumption for the various income groups with the share of the poorer sections improving substantially to be able to reduce the percentage of poor people during each successive Five Year Plans.

The Task force on 'Minimum Needs and Effective consumption Demand' constituted by Planning Commission, 1979 defined the poverty line as the per capita monthly expenditure of Rs.49.09 in rural areas and Rs.56.64 in urban areas at 1973-4 prices. This corresponds to the per capita daily calorie requirements of 2400 in rural areas, and 2100 in urban areas. The estimated breakup of these total values in terms of cereals, other food items, and non-food expenditures in rural and urban areas seperately are presented in the table below.

(Rs. per capita/month at 73-74 prices)

Items	Rural	Urban
1. Cereals	18.4 (37.5 %)	15.69 (27.7 %)
2. Other food items	16.55 (33.71%)	23.2 (40.96%)
3. Non-food	14.14 (28.79%)	17.75 (31.34%)
Total	49.09 (100)	56.64 (100)

These values are revised from time to time to take account of mainly the inflation factor. Once the aggregate consumption levels for the different income groups are thus decided, the breakups into various sectors is worked out using estimated values of expenditure elasticities for the various items consumed by different expenditure groups. The other items of final demand vectors, such as, Government Consumption, Investment (Net Fixed Investment, Replacement Investment and Inventory Investment), Foreign Exports net of Imports are seperately estimated and then the output vector is projected using the **Leontief inverse of the current input technology matrix.** These projections are then compared with those of individual sectors worked out independently by the relevant expert groups and, then the final targets are decided.

There are several loose ends in this approach. The model assumes that whatever output is required to meet the given final demands, can be produced. No constraints on capacity expansion is assumed.

Secondly, the Planning Commission models are completely silent about the changes required in the distribution of income in each sector. It is extremely difficult in actual practice to implement any change in income distribution in favour of the poorer sections without simultaneously changing the price structures, while Planning Commission models assume constant prices.

Planning Commission targets are worked out first for the

economy as a whole, and then the shares of the public sector, broken down further into Central and State parts are determined. Moreover, there are a large number of special projects/programmes to help the poor. The extent of success in poverty alleviation thus depends on the roles played by the private sector, Central & State Public sectors and the success of special projects/programmes.

As discussed below, the approach suggested here proposes to remove several deficiencies in the Planning Commission models.

Instead of using multisectoral consistency models, optimising models are proposed, so that constraints on capacity expansion, exports, imports, investment, consumption, etc. could be considered.

The model gives top priority to the production and/or imports of basic needs by simultaneously restricting the growth of production and/or imports of semi-luxury and luxury goods when there is a conflict in the allocation of resources between the basic needs on the one hand and the semi-luxury and the luxury goods items on the other. All other intermediate goods, capital goods and infrastructure sectors will be allowed to grow in tune with this changed priority.

The model allows simultaneous change in both commodity and factor prices in order to balance income with consumption plus savings of each income group separately under specified upper and lower limits for each one of them.

Further details of this model are discussed in the next section.

We will now turn specifically to discuss some of the past attempts in the use of multisectoral models to study the various implications of income and price changes

Following the contributions of **Leontief (1)**, multisectoral models were being used in many developed and developing countries to study the effect of changes in either wage rates, profits or indirect taxes on the prices of various sectors of the economy. This is because any change in wages, profits or indirect taxes in any or a set of products, will not only change the costs and prices of the sectors where such changes have taken place, but will also change the costs and prices of other sectors through their input output linkages. These changes are by no means uniform across all the sectors. Leontief, using the Input Output table of the American economy, 1939, has shown the changes in prices of various sectors as a result of arbitrary 10% changes separately in wages, profits and indirect taxes in agricultural and non-agricultural groups of sectors. However, the extent of changes in sectoral prices will depend

on to what extent any changes in wages are offset by changes in profits.

In the context of the Indian Economy, price effects of commodity taxation were studied by **Radhakrishnan and Rangarajan (3)** using the Input Output table of the Indian Economy for 1965 as presented in **Rudra & Manne study (20)**. Specifically, they studied the price effects of commodity taxation proposed in 1967-68 Central budget relating to items such as Coffee & Tea, Cigarettes, Footwear, Petroleum, Plastics, Man-made Fibres, Rubber Manufactures, etc.

Rangarajan, Sah & Reddy (5) later used the 66X66 Input Output table as prepared by **Planning Commission (9)** to study the impact of hike in prices of coal & petroleum products on the other sectors of the economy. This study was conducted by clamping the prices of certain commodities at a particular level as a policy measure, to study the impact of prices in the rest of the sectors. Thus, in this study alternative scenarios of impact in prices were worked out taking into consideration no change in railway prices, electricity prices etc., as they are controlled by the Government.

In India prices in a large number of sectors are controlled by the Government. For increasing the resource potential of the Government, the administered prices of many public sectors are changed from time to time. **Gupta and Srinivasan (4)** have used the 89X89 Input Output table that was developed for the preparation of the **Sixth Plan (10)** to study the impact on sectoral prices as a result of changes in administered prices in certain public sectors. The study has also estimated the net additions to public sector resources.

Sarkar and Panda (6) have constructed a Computable General Equilibrium (CGE) model for India to study the Quantity-Price-Money interactions. This is a very comprehensive model. It considers income by different income classes. The income levels along with sectoral prices determine the sectoral consumption patterns using Linear Expenditure System. Consumption in turn affects output levels. One added advantage of this model unlike the above-mentioned ones is that consumption is treated as endogenous variables. The model is used to study the effect of alternative tax expenditure policies on the various endogenous variables including prices, consumption etc.

Olav Bjerkholt (13) has discussed the uses of Input Output models in national budgeting policies and in medium term planning in the Norwegian economy. The latest version of this model is called MODIS IV. This model covers about 2000 exogenous variables and about 5000 endogenous variables. The results are obtained as impact coefficients

which indicate the effect on the price indices of private consumption, government consumption, gross investment, and gross domestic product due to changes in import prices, wage rates, and selected indirect taxes and subsidies.

Leontief in one of his recent papers (2) has described a revised version of the basic input output price model to analyse the effect of the new wave of technological changes in the US economy in the next two decades. For this he has extended prices, wages and non-wage income relationships by introducing an additional parameter of rate of return on capital within the framework of a given technology, or, rather a given set of technologies. Unlike the earlier models, this is a linear programming model. The idea is to obtain an optimal combination of old and new technologies in each sector with the objective of minimizing the cost-of-living index, given the overall rate of interest, money wage rates of different sectors and types, and current and capital coefficient matrices for new and old technologies. The sectoral prices are treated as variables.

Dhar and Rao (17) have developed, a multisectoral optimising model (REMPOV) to obtain a set of changes in domestic and imported commodity prices, and the factor income of different income groups simultaneously, given the targets of consumption and savings.

The present **EMPOV II** model is an extension of the above REMPOV model. The consumption function estimating market determined consumption through price and income elasticities which was ignored in REMPOV model has been included. Instead of assuming a fixed level for the average propensity to save (APS), both upper and lower limits have been specified for APS, so that the actual value can be anywhere within this range. Unlike REMPOV model, prices of imported items have not been considered separately in this model. Only a single set of commodity prices, same for all income groups, and, uniform factor prices, same for all the sectors, have been considered.

The model is solved for the national economy as a whole, considering foreign trade as given.

3. MODEL

In an earlier model titled 'An Optimising Planning Model for India's Eighth & Ninth Plans' by Dhar, Rao & Goel (15), an attempt was made to solve for sectoral output levels, consumption, exports and imports given various constraints on capacity expansion, aggregate investment, sectoral consumption, exports, imports etc., the objective being to maximise income during the terminal year. This solution provided the data on the optimum amount of sectoral consumption levels that could be made available during the terminal year under given constraints. The model also provided information on sectoral consumption levels at each time period. The interest here is in only the terminal year results.

All projections in the above model were worked out using constant prices and further, no change in the pattern of income distribution is assumed. Given the target year objective of the provision of basic needs to all, the consumption levels of the poorer sections of the population are likely to increase substantially. This will create substantial gap between the aggregate income and consumption levels. This gap will again increase further, if the poorer sections of the population are expected to increase their level of savings. Hence, a combination of changes in both commodity and factor prices will be required to balance income with consumption plus savings of each income group.

The commodity prices may be either increasing or decreasing from the base year to the terminal year. However, these changes are not likely to be uniform across all sectors. Likewise, from the base year to the terminal year, the factor prices may also be increasing or decreasing for all income groups, or, increasing for some and decreasing for some other income groups. It will be necessary here to point out a peculiar feature about factor price changes. As is known, all factor prices will tend to increase during the period of growth of an economy even under the assumption of constant income distribution pattern. Hence, the factor price level during the terminal year would still be higher than its corresponding base year level, unless the planned change in factor price during the terminal year is too drastic.

It is necessary to define consumption as a function of price and income elasticities and then compare the projected consumption with the target consumption of the above optimising model (15). The model calculates the required changes in prices and incomes to minimise the gap between the target and market determined consumption obtained through the consumption function. The constraints in the model are discussed next.

3.1 : Constraints.

a. Value added constraints :

For each sector, output equals the sum of cost of all current inputs, depreciation including taxes, and net value added of all income groups at the revised commodity and factor prices.

These contraints at the original prices are written as:

$$X_j = \sum_i a_{ij}.X_j + Dep_j + \sum_k V_{jk} \qquad ....1.1$$

$$\text{for } j = 1,2,\ldots\ldots, n$$

where,

X_j = Value of output, sector j

a_{ij} = Value of inputs supplied from sector i to produce unit value of output, sector j

V_{jk} = Value added for income class k of sector j.

Dep_j = Depreciation including taxes, sector j .

The sum over i is from 1 to n, the number of sectors, and the sum over k is from 1 to m, the number of income groups.

The changes in commodity prices are assumed to be the same for all income groups, and the changes in factor prices are assumed to be the same for all sectors. The prices and income changes are to be such that the values of output levels of each sector are equal to the sum of all current input costs, depreciation and net value-added for all income groups at the new commodity and factor prices. No price change is assumed for depreciation including taxes.

Thus at the new commodity and factor prices , the transactions in 1.1 are written as under:

$$X_j\ (1+\acute{A}_j) = \sum_i a_{ij}.X_j.(1+\acute{A}_i) + Dep_j + \sum_k V_{jk}\ (\ 1 + \tilde{A}_k) \qquad ...1.2$$

$$\text{for, } j = 1,2,....,n$$