DIVERGENCE BETWEEN EQUILIBRIUM AND ACTUAL PRICES OF ENERGY IN INDIAN ECONOMY

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Introduction

Energy is the lifeline of modern economies. It constitutes a part of basic infrastructure. Energy is, in fact, a ubiquitous intermediate input of all production sectors. But it also uses intermediate inpute produced by other sectors of the economy. Thus, energy producing sectors are expected to be characterized by wide-spread linkages. Modern living, from necessity to luxuries, depends greatly upon energy, specially petroleum and electricity. It promotes growth both via accelerator and multiplier. It is this vital role of energy in production, consumption and in the raising and maintaining of standard of living, and hence, quality of life that electricity, gas and petroleum are considered to be an index of the stage of development of a country. Higher the demand for energy, greater is the development stage, and higher is the quality of life. But electricity and petroleum are the most important sources of energy and energy security.

Naturally, pricing of energy resources is an important problem. It directly affects growth as well as energy security.

Fix-Flex Price Paradigms

Conventional theory of price postulates prices to be a function of supply and demand. But Hicks introduced the twin concepts of fix and flex prices on the basis of market structure and the role of stocks in the pricing process. This conceptualization also furnishes an

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explanation of the existence of recession in the midst of inflation. *Energy pricing falls in the category of fix prices*. All fix prices are determined on the basis of cost; such prices change only in response to long run but permanent change in cost. Temporary changes in cost do not affect fix prices. Stocks play a crucial role in the determination of fix prices. Excess of supply is absorbed in stock rather than leading to a fall in price, while excess of demand leads to the depletion of stock rather than causing a rise in price. Intermediate traders in the market are the stock holders but they are the takers rather than the makers of prices. These prices are also known as administered prices, since such prices are administered either by producers or administrators in case of goods produced by public enterprises in general and public goods in particular. In such cases, prices are determined by executive fiats In case of manufactures, producers fix the prices on the basis of long run cost of production (Prakash, 1981, 2004).

Fix Price Paradigm and Energy Pricing

Energy prices are mostly fixed by executive fiats since energy resources have been under the monopoly of public enterprises through out the era of planned development of Indian economy. In advanced economies, energy has been treated both as a public good and an essential part of infrastructure. In the era of globalization, liberalization and privatization of energy resources has occurred partially in the post reform period in India. Generation of electricity and its distribution have been allowed to be privatized. But electricity boards of some states have handed over only the distribution rights to the private players. Delhi is an example of this. By and large, electricity still remains in the public domain. Consequently, electricity pricing, like the pricing of other energy resources, remains in fix price zone.

The energy prices are more inflexible than other fixed prices. These prices are policy parameters, and these prices are supposed to embody high subsidy component. It is apprehended that cascading effect of high energy prices may engulf most sectors of the economy in inflationary pressures, while inflation and deficit financing have been among the major concerns of economic reforms. Then, the consideration of protection of interest

of weaker sections of society and priority sectors like agriculture also play important role in pricing energy resources. Agriculture attract special consideration in the pricing of energy. Consequently, we have three layered policy: pricing of energy for final domestic consumption, pricing of energy for commercial and industrial enterprises. In many cases, government subsidizes the energy prices directly or indirectly.

Objectives of the Study

This study seeks to determine the degree of linkages of energy producing sectors with the rest of the Indian economy. We have a thesis that higher the backward linkage of a sector, greater is its material cost and smaller tends to be its value added. Similarly, higher the forward linkages, greater is the proportion of its output used as intermediate input in other sectors of the economy. Energy resources are ubiquitous intermediate inputs. Hence, their forward linkages are expected to be high. It is the degree of forward linkage which shall depict the effect of prices of intermediate inputs on the cost of user sectors. These propositions hold true for energy sectors also. We also propose to examine the alignment of actual with equilibrium prices in order to estimate the subsidy component, if any, of energy prices in India.

Brief Review of Literature

Alternative Input output models for the determination of cost based or fix prices for developed countries have been formulated by Agarwal and Goodson, Haig and Wood, and Dramis. Mathur has developed models for both British and Indian economy. Suliman has further tested Mathur's model for estimating the lead-lag structure of the process of price formation in British economy. He has combined both econometric and input output models. Prakash (1981, 1992, 1993) has developed and empirically tested input output models, complemented by econometric models of pricing. Sharma (2004) has extended models of Prakash. Keya Sengupta (1995) has used and tested with the data of agro-

linked industries as many as 13 I-O models, developed by Prakash,. Sumitra Chodhury used IO models to analyze the prices of engineering and chemical goods industries in India. Anita, and a few other scholars have used input output models for analyzing prices of different groups of manufacturing industries in Indian economy (For detailed Review, See Sharma, 2008). Econometric models for determining cost-based prices in developed countries have been worked out, among others, by Klein and Ball, Dicks Mireaux and Godley and Nordhaus. Attempts have been made to develop similar models for the Indian economy also.

An aggregative analysis, howsoever complex or sophisticated, may fail to represent adequately the structure and the interrelations underlying such price movements as have occurred in post war period. While a distinction between fix and flex prices can provide an appropriate conceptual framework, input output analysis is capable for revealing the structural features for essentially different price movements, provided that the study is sufficiently dis-aggregative. But the input output techniques will be appropriate to study fix prices alone.

According to the neo-classical theory, changes in price ensure equilibrium between the demand for and supply of goods. While the normal prices i.e. the long period price, is determined by the cost of production, in the shot run the supply of commodities is given and the price is settled at a level which clears the market. In other words, the 'market price,' that is, the short run price is determined by demand. But the Keynesian macro economics, which is essentially a short analysis, assumes all prices to be fixed. Fix prices change only if the costs of producing them also change. But in the real world, we find two types of markets. Those which can be described as fix price markets and those in which prices are determined both by supply and demand.

The prices, which are determined mainly by the cost of production, are termed Fix Prices, while those, which are regulated by changes in demand in general, are called Flex Prices. The two types of prices differ in the principles on which they are determined and in their market adjustment mechanism. The adjustment mechanism, in fact, depends upon the structure of the markets in which goods are sold. In markets, having atomistic competition, price fluctuations correct the demand and supply disequilibrium, while output adjustments rectify discrepancies between demand and supply in oligopoly

markets. But stocks play a pivotal role both in fix and flex price markets. In flex price markets, stock is accumulated or decreased I accordance with expectations. Hence, expectations play the pivotal role in flex price markets. In real life, markets for most of the industrial goods correspond roughly to fix price markets and most of the agricultural and other goods measure up to flex price markets.

In fix price markets, if demand exceeds or falls short of supply, corporate business management acts as the price taker rather than the price maker. Shortage reflects in lengthened order books and depletion of stock in the short run, and in the long run, it reflects in expansion of output rather than in rising prices. The manufacturing industries follow mainly what Hicks calls 'Fix Price' system. These prices are formed on the basis of what has been variously called ' full cost', 'cost plus', or 'cost mark up' principle. These prices are increased with the increases in costs.

It does not mean that fix prices are fixed for ever. What it implies is that the fixed prices are insulted, to some degree, from the pressures of supply and demand. If, however, the cost of production increases, the fixed prices may also show a tendency of increasing, and if their cost of production falls, they may also tend to decrease though the rise / fall might be only gradual and dis-proportionate. Another important point is that temporary or seasonal changes in costs of production are not expected to cause a change in fixed prices, since such prices depend upon 'normal costs' and not so much on the costs of the moment.

Model

We have chosen two sets of different models. Models that have conventionally been practiced in the determination of energy pricing in India and the input out put models. *But conventional models have also been converted into input output frame-work.* We have used input output framework for formulating these model. But we have formulated only one model. Other model is also an input output model.

The conventional model of energy pricing, based on actual pricing practices, capture only direct short run marginal cost. Energy producing sectors have been charging marginal

cost based price. Capital cost component is lost in the price determined by marginal short run cost of production. But marginal cost is of two types, short run marginal cost and long run marginal cost. Short run marginal cost shall include the loss of capital cost. Long run marginal cost based prices will enable the firm to recover all elements of cost, including capital cost. We have complemented the short run model by a model of long run cost. The general input output model of pricing captures both direct and indirect components of marginal/average costs. It is assumed that, in equilibrium, marginal cost equals average cost. Input output model has been used in this study to derive the estimates of long run average cost based prices.

Short Run Marginal Cost

Marginal cost equals the expenses on intermediate inputs and labor to produce one extra unit in the short run, since these constitute elements of variable cost. The short run marginal cost shall be as follows:

$$C_{sj} = \sum p_i a_{ij} \Delta x_j + w a_{0j} \Delta x_j \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, $\Delta x_j = 1$; w = wage rate; a_{0j}= labor coefficient or labor input per unit of output of good j, p_i is price of good i , and Csj is short run marginal cost.

Long Run Marginal Cost

All factors become variable in the log run. Hence, long run marginal cost includes expenses on all inputs, including inputs of capital. So we have distinguished short from long run marginal cost. However, energy producers in practice use short run marginal cost as the base of pricing, leading to the loss of capital cost. The extent of this loss may be estimated by a comparison of short and long run marginal cost. The long run marginal cost is given by the following equation:

$$C_{Lj} = \sum p_i a_{ij} \Delta x_j + w a_{0j} \Delta x_j + r \sum b_{kj} \Delta x_j \text{ …….. (2)}$$

Where Clj is long run marginal cost, r is uniform interest rate which is interpreted broadly to include all expenses involved in raising capital, both loan and equity capital, bij is i-th capital good required per unit of output of j. Since we do not have capital matrix, we have used value added per unit of output, which comprises both labor and capital costs. The following IO model has been used to estimate all equilibrium prices in the economy, irrespective of their flex or fix nature. The equation 2 has been modified as follows:

$$\upsilon_j = w_{a0j} + r \sum b_{kj} \text{ ……(3)}$$

$$p_j \propto c_j \text{ ……..(4)}$$

$$p_j = \lambda c_j \text{ ……..(5)}$$

Assuming long run equilibrium to take λ =1, and sbstituting in equation 2, we get

$$p_j - \sum p_i a_{ij} = \upsilon_j \qquad (6)$$

Generalizing equation 6, the following equation is obtained:

$p = V (I - A)^{-1}$ ……(7)

Where

P is vector of equilibrium prices, $(I-A)^{-1}$ is Leontief Inverse and V is vector of value added per unit of output. All the elements of Leontief Inverse are measured per rupee worth of final demand and all Aij, ij=1,2,3….n, elements of inverse furnish both direct and indirect requirement of good I per one rupee worth of final demand for j.

Divergence between actual and equilibrium prices is given by

$D=P^* - P$……(8)

Where P* is the vector of observed prices. These divergences may also be used to identify fix and flex prices in equilibrium and subsidy or profit. Necessary condition for fix prices is that

$P^*i \sim Pi$…….(9)

The following is the condition for prices to qualify as flex in equation 5:

Lambda < 1……(10)
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Satisfaction of condition 10 will make elements of D to have substantive values. In this study, we have focused only on energy prices.

The model has been empirically worked out from input output tables of 1998-1999 and 2003-2004 of Indian economy.

Alternative Model

An alternative IO model has been developed in which prices are classified into two groups: flex and fix prices. Flex prices are treated as exogenous to the system. But changes in flex prices affect the cost of all such fix price sectors as use flex price intermediate inputs in production. The model is outlined below.

Effect of Flex on Fix Prices

Separate estimates of the effects of change in flex prices have been obtained on cost of energy providing sectors. In input output systems, costs and prices are treated as technological parameters; so the prices are treated as technologically determined. But when we impose the conditions of fix or flex price system, the prices emerge either as policy variables in case of administered prices, or as the functions of the market in case of flex prices. Techno logical determined prices are used as the base for classification of prices into two groups.

If technological changes occur in the economy due either to innovations or adaptation and adoption of imported technology or both, physical quantities and money value of various material inputs used in production will also change. Money values of physical quantities may also change due either to forces of the market or policy. But whatever the

cause of change, it will lead to a change in the level and structure of cost of producing different goods. As long run equilibrium prices are assumed to be proportional to costs, technological changes will cause changes in prices through cost also. The production costs comprise expenses on material inputs, labour, capital, and margins of taxes, transportation, and trade. If there is change in the price of any of the material inputs or rates of wages, interest, tax, transport or trade margin, cost of production, and hence, the prices can also change independently of technical change. It is price changes of this type that we will examine first. Then, we have to adjust input coefficients matrix, and hence, its inverse for these changes in input prices. This will yield 1998-1999 inverse adjusted by changes in prices that have occurred up to 2003-2004. These new matrices shall be given by $(I-A_1)^{-1}$ and $(I-A_2)^{-1}$.

Changes in costs, and hence, fix prices due to change in technology alone may be worked out by keeping prices constant. The price effect of technology change may be shown as follows:

$$\Delta P = (I- A_3)^{-1} V \ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Where $A_3 = A+ \Delta A$ while input coefficients matrix A is adjusted for changes in technology alone. If, for example, we adjust 1998-99 coefficients matrix for changes in prices up to 2003-04, we shall get A1 in place of original 1998-99 matrix. This will furnish clear understanding of not only the inflationary pressures but it will also enable us to differentiate between cost push and demand pull inflation in the economy.

A change in price of any one good is likely to affect the cost of production of all such sectors as use this good as an intermediate input either directly or indirectly. Then, in an effort to raise resources for financing development, government, especially those in developing countries, find it imperative to raise the rates of commodity taxation and such increase in tax rates may become even an annual routine. Sometimes rates of commodity taxes are also enhanced in the hope of mopping up some of the purchasing power in the hands of general public so that inflation could be kept down, though increased commodity taxation itself tends to raise prices in the market. Once prices start forgoing ahead, wages have to be adjusted for increase in the cost of living index in general and

food grain prices in particular. For controlling demand and thereby demand pull inflationary pressures in the economy, authorities are often tempted to raise interest rates, which makes capital finance costlier. It also raises cost of production. These different sources of changes in cost may affect price levels differently in different sectors and it might be interesting to isolate these different effects. So we assume all these to be constant.

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A model of flex-fix price inter face has not received much attention. Prakash (1981) has developed a model of this type. We outline some alternative models. We assume that there are n sectors out of which s sectors correspond to the flex price system and the remaining k sectors belong to fix price system: s + k = n.

The following model will furnish an effect of flex on fix price sectors.

$$P_m^t = W^t L(I - AM - r^t Bm)^{-1} + P_a^t (Aa + r^t Bm) \times (I - Am - r^t Bm)^{-1} \quad \ldots (12)$$

Where P_m is the vector of fix prices, W is the uniform wage rate, L is the vector of labour coefficients, r is the uniform interest rate, superscript t refers to time period, Am and A_a are the matrices of coefficients of inputs supplied to fix price sectors by fix and flex price systems respectively, B_m and B_a are the corresponding capital coefficients matrices and P_a is the price vector of flex price inputs.

If the prices of inputs supplied by the flex price sectors increase, say by ΔP_a^t, while all other prices and costs remain the same, the vector of changes in prices of the output of different fix price sectors will be given by the following relation:

$$\Delta_1 P_m^t = \Delta P_a^t (Aa + r^t Ba)(I - Am - r^t Bm)^{-1} \quad \ldots\ldots (13)$$

Corresponding to a change, ΔW^t in wage rate, W^t, the vector of changes in output of fix price sectors will be given by

$$\Delta_2 P_m^t = \Delta m^t L(I - Am - r^t Bm)^{-1} \quad \ldots\ldots (14)$$

If all the cost components change together, the new price vector will be given by

$$P_m^t = (W^t + \Delta W^t)L + (P_a^t + dP_a^t)(Aa + r^t Ba) \times (I - Am - r^t Bm)^{-1} \quad (15)$$

At this stage, we exclude the study of the effects of changes in tax rates, trade and transport margins. Besides, the model, as outlined above, does not take into account the

time shape of the price responses to changes in costs. It is probable that the price response is instantaneous as is implicitly assumed in the model; and it is equally probable that the effect of changes in costs upon price is distributed over several periods. In principle, it is possible to estimate the time-shape of reaction of prices to changes in costs that have occurred in the past over a series of time periods. But it is feasible practically to analyze only the effects of changes in immediate past. Therefore, we propose the hypothesis of one year lag structure as an alternative to the instantaneous price-cost adjustment hypothesis outlined above. On the basis of this assumption, equation (11) will be reformulated as follows:

$$P_m^t = P_m^{t-1}(Am + r^{t-1}Bm) + P_m^{t-1}(Aa + r^{t-1}Ba) + W^{t-1}L \qquad \ldots\ldots(16)$$

$$P_m^{t+1}(Am + r^{t-1}Bm) + P_m^{t-1}(Aa + r^{t-1}Ba) + W^{t-1}L \qquad \ldots\ldots \quad (17)$$

It is assumed that $r^t = r^{t-}1$ so that the increases due to changes in cost of flex price inputs and labour can be estimated in isolation of the effects of change in interest rate.

Subtracting (16) from (17), we get,

$$\Delta P_m^t = dP_m^t(Am + rBm) + \Delta P_a^t(Aa + rBa) + \Delta W^t L \qquad \ldots\ldots \quad (18)$$

Where

$$\left.\begin{aligned} \Delta P_m^t &= P_m^{t+1} - P_m^t \\ \Delta P_m^t &= P_m^t - P_m^{t-1} \\ \Delta P_a^t &= P_a^t - P_a^{t-1} \\ \Delta W^t &= W^t - W^{t-1} \end{aligned}\right\} \qquad \ldots\ldots\ldots\ldots \quad (19)$$

Δ P'm = P'm(Δ Am + r Bm) + P'a (Δ Pa + r Ba) +WL...(20)

If we compare the prices P_j^t so determined with the observed prices P_j^{*t}, we may have them satisfy either of the two cases:

$$\frac{P_j^t}{P_j^{*t}} = 1 \text{ or } \frac{P_j^t}{P_j^{*t}} < 1 >$$

Only if the estimated prices satisfy the equality condition, can they be called fix or cost based prices. On practical considerations, a margin of 10-15 per cent over cost may be taken to be acceptable for fix prices. This criterion has been used to identify the fix and flex price sectors of the economy.

Backward and Forward Linkages as Base of Interdependence

Backward and forward linkages affect price and output both. Backward linkage shows the dependency of a given industry on other industries for inputs required for production. Hence, if the backward linkage of a sector is high, then its cost, and consequently, price will also be high; correspondingly value added shall tend to be low. High backward linkage ensures demand for output of other industries, used as intermediate inputs in the given sector prevails in the market. User industry's output depends on the supply of inputs from other industries. Similarly, the growth of output of a given industry is both directly and indirectly depends upon the growth of industries to which it supplies its output to be used as intermediate input. This makes forward linkages as important as the backward linkages. Forward linkages affect the scale of production, while backward linkages affect the level and structure of cost. Besides, backward and forward linkages relate to the intermediate demand, which accounts for a high proportion of total output of most of the sectors of the economy. This makes consideration of linkages relevant in the context of prices, specially the fix prices.

Forward Linkages

The demand for output of the producer industry depends partly on intermediate and partly on final demand. Similarly, as the industry an industry's output grows, the industries supplying their output as inputs to it will also grow in order to maintain a balance between supply and demand. Naturally, any change in the price of output of producer industry affects the industry using that good as an input both directly and indirectly. The rise in cost enhances price of output of all industries that draws inputs from the given industry.

It is this facet of interdependency between cost, price and growth through linkages that determines the degree of inter-industry relations. This has prompted us to estimate these linkages of the four energy sectors.
There have been alternative methods of computation of linkages. .Rasmusen methods have been quite popular among researchers for some time in India and abroad. Then, Prasad used Yatopolaus method to depart from tradition, while Prakash developed his own methods of estimating linkages. He propounded a new concept of Residentiary Linkages and moved the linkage theory from static to dynamic framework. We have preferred Prakash model in order to over come the limitations of other models/methods. *He distinguishes static from dynamic linkages on the one hand, and partial (estimated from A matrix) and total linkages (estimated from inverse) on the other.* We have used the inverse for the estimation of linkages. The following is the model of linkages:

Total Static Backward Linkage has been estimated as follows:

$$LjBS = \sum_{n} Aij$$

$$i = 1$$

Similarly, Total Static Forward Linkage has been estimated as follows:

$$LjFS = \sum_{i=1}^{n} A_{ji}$$

Then, Total Linkage Effect is calculated as the average of the two linkages:

$$LjTS = 1/2\ n\left(\sum_{i}^{n} Aij + \sum_{j}^{n} A_{ji}\right)$$

The above models estimate linkages form input output tables of 1998-99 and 2003-04. And inter-temporal and intersect oral comparison is made in order to highlight the base of cost and price differentiation of energy sectors.

Results of Empirical Analysis

Results of empirical analysis have been organized sequentially in the following order: First we consider backward, forward and average linkages of 1998-1999 and 2003-04 in order to estimate (i) each linkage separately for both the years, and (ii) change in each type of linkage from base to terminal year. This will facilitate an evaluation of the contribution of linkages, especially the backward linkage to cost, and a comparison at two points of time.

At the second stage, we estimate and identify the fix and flex price sectors on the basis of the model developed for the purpose. Secondly, we estimate the model focusing on the impact of interface of flex and fix prices on the prices of four energy producing sectors. But we are reporting prices of only energy sectors, though any one interest in results of other sectors may get the same from the authors. Thirdly, we compare the twin sets of prices for two years covered by the study. Lastly, we determine the subsidy component of energy prices at both the points in time in order to assess the change in the same. It will enable us to assess the policy impact in the era of globalization.

Linkages of Energy Sectors

The following are the estimates of linkages of all four sectors in 1998-99:

Sectors

	Coal and Lignite	Electricity	Petroleum Product	Crude Petroleum and Natural Gas
Backward	1.540176	2.289414	2.086367	1.250330
Forward	4.331323	11.329902	3.585697	1.250330
Averages	2.983548	6.809658	2.836032	2.748687

Grand Average = 7.665025

Note: Crude Petroleum and Gas have been combined in the IO table. But these are separated in 2003-04 table.

The following inferences may be drawn from these results:

(i) All three linkages are the least for Crude Petroleum and Natural Gas sector. This result seems to arise from the fact the products of this sector involve fewer stages of manufacturing or processing processes as compared to other sectors. This pattern of linkages may be expected to be reflected in cost and hence prices of these sectors ;

(ii) The same pattern holds for forward and average linkages;

(iii) Forward linkages of all sectors are much higher than the corresponding backward linkages;

(iv) Petroleum follows electricity in the magnitude of backward linkages. However, Coal and Lignite has the second highest forward linkage, pushing petroleum to third rank.

Linkages in 2003-2004

The following table reports the estimates of linkages for 2003-094.
Sectors

Coal and Lignite	Natural Gas	Crude Petroleum	Electricity	Petroleum
Backward 1.5397	1.3746	1.6239	2.2528	2.2341
Forward 4.2004	1.9212	6.766	8.965	8.4147
Av .2.87005	1.4979	4.19495	5.6089	5.3244

Grand Average = 7.85848

A perusal of the above table leads to the following inferences:

(i) Electricity has the highest backward linkage, followed by petroleum;
(ii) Gas has the least value of backward linkages among energy sectors;
(iii) Forward linkages and the averages of two linkages follow the same pattern;
(iv) As expected, forward linkages of all five energy sectors
are greater than the corresponding values of backward linkages;
(v) For electricity and petroleum sectors, forward linkage index is 4 or more times the corresponding backward linkages of these sectors. This lends credence to our thesis that these two energy resources are almost universal intermediaries in Indian economy. Energy security of the economy thus crucially depends upon these two sectors.
It may, however, be noted that coal & lignite and gas, besides being independent energy resource, are also used as intermediate inputs in the generation of electricity. So the above linkage pattern should not be taken to consider these relatively less important. On the basis of these results, the cost, and hence, equilibrium prices of electricity and petroleum it may be predicted to be greater than the prices of other 3 energy sectors. Popularity of electricity, among other things, may be accounted by its relatively clean nature, though generation of thermal power may be as much environment damaging as the direct use of coal and lignite as an energy resource.

Inter Temporal Comparison of Linkages

Sector wise changes in linkages from 1998-99 are discussed here under:

Electricity:

Backward linkages of electricity have increased nominally, which suggests that (i) technology has remained invariant; and (ii) cost, and hence, prices are not expected to change substantially. But forward linkages have risen in 2003-04 more than twice the level in 1998-99. It shows that dependence of other sectors on electricity has greatly deepened. It represents the increasing demand for output of this sector. Increasing demand implies the rapid growth of this sector.

Petroleum Products:

Backward linkages of the sector have also increased nominally by 0.23 points. This should have not affected the prices significantly. But forward linkages of the sector have risen more than twice over 1998-99. The rise is similar to that of electricity. Increasing forward linkages of these two show ever rising demand for energy in Indian economy which is concomitant of rapid growth. In fact, growth of Indian economy has been substantially accelerated in twenty first century. This indicates the need for increasing attention to the development of energy resources in the economy.

Coal and Lignite:

Both backward and forward linkages have risen nominally. So we do not expect cost to change on this count. We may, therefore, expect the prices to have remained stable on this count.
The above discussion has paves the way for the analysis of energy prices at both these points in time.

Sector Wise Equilibrium Energy Prices

Sector wise cost based/equilibrium prices of both short and long run are discussed hereunder.

Coal and Lignite

The cost based long and short run equilibrium prices of coal and lignite are Rs. 1.65 and Rs 1.5. This is the cost incurred by the producer in short and long run to satisfy one rupee worth of final demand. Hence, there is a loss or subsidy component both in short and long runs of Re.0.50 and Re. 0.65. The long run deficit in price is more than that in the long run. The loss has either to be subsidized by the government or the producer has to bear it. Most of the enterprises being publicly owned, the government has to bear the subsidy burden in order to make it availably cheaply to the producers as an intermediate input or raw material. This is treated as a public or basic good which partly explains higher subsidy component in the long run. It is also possible that as deeper and deeper mining is to be done, the long run cost tends to rise in case of mining products.

Natural Gas

The short and long run cost based/equilibrium prices of natural gas are Rs. 1.54 Rs. 1.05 respectively. Hence there is subsidy component of Re. 0.05 in the long run, while the short run subsidy component is as high as Re. 0.54. Natural gas is used as an input to produce LPG for domestic consumption, CNG for commercial purposes and electricity for both domestic and commercial purposes. But it is in the joint sector. No private player will ever bear the loss in the long run. Hence, it has to be subsidized by the government.

Crude Petroleum

The short and long run cost based equilibrium price of crude petroleum are Rs. 1.5 and Rs. 2.27. Incidentally, long run cost in this case exceeds the short run cost. It may partly

be explained by the import dependence of the economy for this energy resource, though the country produces crude, but it falls short of requirement. Hence, the cost of imported crude varies with international prices. Therefore, producers are either subsidizing to incur a loss of Rs.1.27 per rupee worth of final demand for protecting the consumer. In this case, oil companies are bearing the losses. They many times appeal to the government to revise the sale prices in order to cut their losses.

Petroleum Products

The short and long run cost based equilibrium prices of petroleum products are Rs. 0.456 and Rs. 2.85 respectively. Incidentally, short run cost is lower than the long run cost. But there is subsidy component of Rs. 1.85.

Electricity

Long and short run cost based prices are Rs. 2.84 and Rs. 0.89 respectively. This sector has also followed the pattern of petroleum products in so far as the short run cost is lower than that of long run. Both these are the most commonly used energy resource in India. But the government has been subsidizing heavily both these sectors.

Conclusions

- All energy sector prices belong to administered prices and providing subsidy.
- Out of 130 sectors 53 sectors having flex prices and 77 sectors are based on fix prices.
- Forward linkages are higher than backward linkages of all energy sectors. It refers that economy is much dependent on energy sectors. But energy sectors are comparatively less dependent on the economy.

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The Chairman,
Organizing Committee,

Dear Sir,
Thank you very much for communicating acceptance of my paper, jointly authored with Dr Shalini Sharma: Divergence Between Equilibrium and Actual Prices of Energy in Indian Economy. As things stand today, I, as the main author of the paper, shall present the same in one of the parallel sessions. You will receive the communication about the presentation of paper by me from Dr Shalini Sharma also, the other author of the paper.

My application for grant has already been submitted, but till that time acceptance of the paper was not received. So I did not attach the same paper along with the application. I am mailing it now. I request you to kindly get it attached to the application.

Thanking you

Yours sincerely,

Rekha sharma
Ph.D. Scholar, Bimtech,
Greater Noida

CC:Chairman, Scientific Committee