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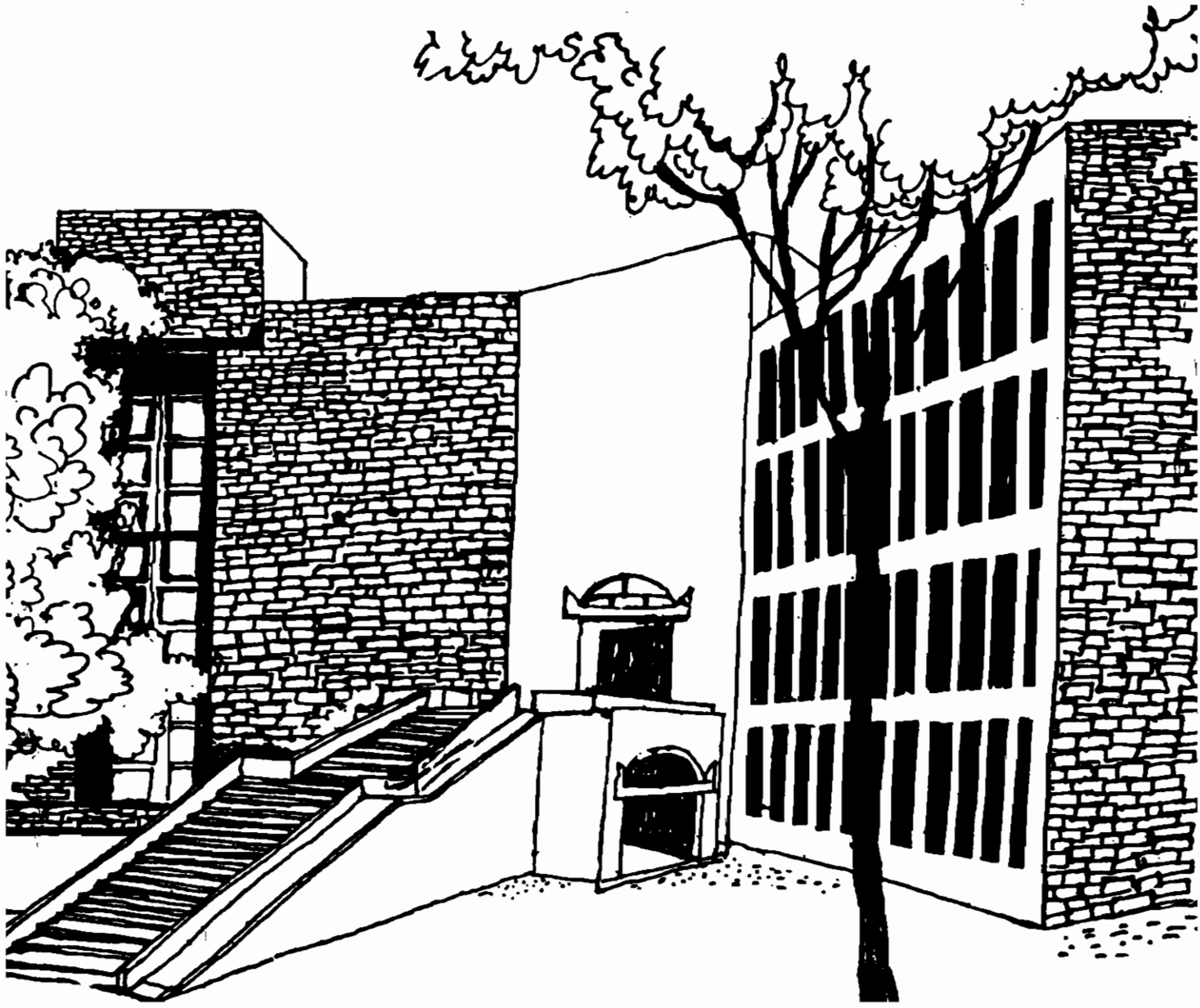

ISSUES IN MEASUREMENT OF PRODUCTIVITY IN INDIA

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Abstract

A few conceptual issues having direct bearing on deriving the estimates of input productivities at the macro/aggregative level are discussed in the Indian context in the paper. The following issues are discussed in the paper: (a) quality index of labour, (b) time spent on travel by workers to and fro workplace, (c) productivity of infrastructural inputs in the user industries, (d) productivity of factor inputs in infrastructural industries, (e) measurement bias of double deflation and single deflation methods for calculating real value added and in measuring the total factor productivity growth. It is argued in the paper that the simple assumption of equality between the wage rate and the marginal productivity of labour which is required for constructing several aggregates is not likely to be fulfilled in the Indian case on various counts. Similarly, it is also argued in the paper that input productivity estimates may be more reliable at the macro/aggregative level than at micro/unit level.

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The purpose of the present paper is to discuss a few conceptual issues which have direct bearing on the measurement of input productivity in India. The present practices of generating the estimates of relevant aggregates and deriving the input productivities need to be reconsidered. Different issues are discussed in different sections. In the first section, we discuss the issues of labour quality and the time spent on transport to and fro work-place in calculating the labour productivity. In the second section, we discuss the issues arising out of the productivity of the infrastructural inputs in the economy. The issues pertaining to the estimation of total factor productivity and technical progress and related problems of measurement of the real value addition are discussed in the third section.

I. Labour Productivity and Travel Time:

Data on labour and work force in this country are perhaps least satisfactory in terms of reliability, intensity, quality, details and frequency. This is because a large proportion of the labour force is in the unorganised sector where it is very costly to collect, collate and publish the required data frequently. As a result, we get only the simple head-count in most of the sectors without any idea of the intensity of their employment and skill levels. Any change in the intensity of employment or the skill level of the work-force adds to the residual in the growth accounting framework. In other countries where the quality of labour

statistics is far more satisfactory, the intensity of employment is measured in terms of person-days and person-hours of work. However, the question of the quality index of the work-force remains to be resolved even in such data-advanced countries because it requires conversion of the qualitatively heterogeneous work-force into qualitatively homogeneous units. Generally, the solution of taking the wage-differential to reflect the quality differential and thereby converting different qualities of labour into common or uniform units is widely used. However, this solution derived from a simple neo-classical theorem is based on three very crucial assumptions: (a) All the firms in the economy are interested only in the short-run profit maximization and all of them are in equilibrium; (b) There is a perfect labour and capital mobility without any institutional or non-institutional barriers; and (c) There is no segmentation of labour market with free and fair competition among all prevailing. Casual observations around are sufficient to realize that each of these assumptions is violated in practice. The preparation of quality index of labour is, therefore, a real challenge.

In view of all this, the question of treating the travel time to and fro the work-place as a part of the time spent for employment has not received sufficient attention. Even the data on the time spent for such travel were not readily available. With the recent Time-Use Survey being carried out on experimental basis in six states, it is possible to get some broad dimensional idea about the proportion of a worker's time spent on such work-related travel. In some part of Gujarat's sample, the travel time for the males varies between 1 hour to 2 hours per day. It turns out to be almost 15 to 25% of their actual working time in several

cases of salaried workers, casual labourers and self-employed persons. The work or employment intensity seems to differ substantially for females and younger population. In their case, even the average travel time to and fro the work-place is also much less in absolute terms as can be seen from some preliminary tabulations of the results of the Time-Use Survey for some regions. This survey, however, is not likely to be of any significant help in dealing with the problem of estimating the quality index of the work-force. We need a specially designed survey for that purpose. However, the Time-Use Survey is likely to provide useful information on the time spent on various productive/unproductive, paid/unpaid and SNA/non-SNA activities by individuals. Travel time to and fro the work-place by workers poses some questions in this regard.

For several workers, the travel time is a fully or partly compensated activity since they specifically get the travel allowance in cash or kind as a part of their salary package. In most of the cases, however, it meets only the monetary cost of their travel. In several other cases, it becomes a totally uncompensated activity carried out by the individuals on their own. In any case, the time spent on travel to and fro the work-place is not available to the society for any other alternative productive use. The supply of labour to that extent is effectively reduced. Should the travel time to and fro the work-place be added to the normal working hours of the workers for calculating their productivity needs attention. This is particularly because the proportion of time spent on such travel is considerable. Its inclusion or exclusion can seriously affect the productivity estimates. It has also some policy implications.

With economic development, the living standards of people is improving and the cost of living also increases. It is often observed that the travel time becomes an important consideration for selecting the location of the residence besides the quality of environment, cost of living, etc. Generally, there is a trade-off between the distance from the work-place and the cost per unit of quality of living. People make these choices according to their preferences and circumstances. With economic development when the traditional labour productivity measures show remarkable increase in an economy, we may find several workers preferring to travel longer distance to be able to afford the same quality of living as before. Thus, a significant part of the increase in the labour productivity could actually be illusory. This is also reinforced by the fact that routine travel for longer than a thresh-hold time does result in mental fatigue affecting adversely the quality and concentration of the actual work performed on the job. Any policy which helps reducing the travel time and/or make the travel more comfortable is likely to be a socially productive intervention. If this aspect has to be quantified and captured formally, there is a need to include the travel time to and fro work-place for the calculation of labour productivity. In terms of international comparisons also, such a measure of the labour productivity would be more useful and relevant. Even from the point of view of the employer, such a measure of labour productivity is useful because it has implication on the actual efficiency of the workers.

The theoretical issue here is to reconcile the equilibrium condition of wages being equal to the value of marginal product of labour (MPL). The latter is derived on the basis of the work performed on the job and the efficiency with

which it is done. To an entrepreneur, therefore, the wage reflects the productivity of the time spent on the job. To a worker, it reflects the compensation for the time spent for the job. The preliminary tabulation of the Time-Use Survey data reveals that there is likely to be a substantial gap between the two suggesting the labour market imperfections. Caution needs to be exercised for using the marginal productivity hypothesis as the basis of certain measurements and methodologies to study labour productivities.

II. Productivity of Infrastructural Inputs:

The way we are measuring the factor and non-factor productivities within the legal and social organisation of economic activities in the country, several infrastructure related investments do not become remunerative. The productivity of infrastructural inputs is neither properly recognised nor adequately evaluated. Several of these infrastructural inputs are provided publicly and several of them are considered public goods. For example, electricity, water, ports or storage are provided until recently through the public sector in India. The pricing of these facilities is, therefore, likely to be diverging from the basic principles of marginal cost and productivities. Other social objectives may also dictate their pricing decisions. Simultaneously, very often their supply is also restricted because of unremunerative prices, unattractive investments in these sectors or different national priorities for resource use. Similar are the cases of those infrastructural facilities which are considered public goods like roads, preventive health-care, drinking water, sewerage, provision of safety and security etc.

All these inputs certainly contribute to the production in the system directly or indirectly, but their productivity or efficiency is hardly ever estimated

satisfactorily. Their share in the explicit monetary costs of the production units hardly ever reflect the true input elasticities of output. This is because their supply is regulated or controlled and the price is invariably administered or governed by other considerations than profit maximizing. The methodologies used in the mature developed countries where the market forces are largely allowed to play a determining role even in such infrastructure related sectors are not, therefore, expected to capture correctly the contributions of such inputs in the less mature and developing economies like India where the role of the government is considered very different.

Sectoral studies of factor productivities are likely to mix up fully or, at least, partially the productivities of the infrastructural inputs with the concept of the residual or the total factor productivity growth (TFPG). It is clearly distinct from technological progress in the sector like manufacturing or agriculture. The quality of factor inputs in the sector and/or the intensity of their use also similarly get mixed up in the estimates of TFPG. The quality of the factor inputs and the intensity of their employment may also be influenced by the infrastructural inputs. As a result, the sectoral studies of factor productivities in developing countries like India are not likely to be reliable if they are based on methodologies relevant and popular in the mature developed economies. In fact, this problem is like to become more acute, the more disaggregated level at which the analysis is conducted keeping the level of aggregation of the inputs the same.

Improvements in drinking water availability or preventive health-care facilities, etc. are likely to result in an overall improvement in the intensity of work-force and even the efficiency with which the job is performed ultimately resulting

in the production or productivity gains. This increase should, therefore, be ascribed to the infrastructural inputs which are not directly employed or used by the production unit. In essence, the logic is the same as the one where the quality of the raw material improves (per unit of its cost) resulting in the factor productivity gains. The only possible difference is that raw material inputs are more likely to be *weakly separable* from the primary factors of production whereas such infrastructural inputs may not be. But conceptually and physically they are distinct inputs. Therefore, there are serious conceptual problems even in defining the real value added or the net factor products at the disaggregate levels (See, Sims, 1969).

We have discussed so far the issues arising out of considering the contribution of the infrastructural inputs at the level of production unit -- a firm, industry or sector. However, when we consider the factor productivities in these infrastructural sector *per se*, the situation is again far from satisfactory. In most of such sectors, say a public hospital, fire-station, drinking water supply or a primary school, the output itself is not clearly defined. The income generated in these sectors are, therefore, largely delinked with the factor productivities. Yet, the factor productivities in these sectors are measured through the factor rewards. Thus, any attempt to use the national accounts statistics to analyse the factor productivities at disaggregated level is only likely to distort the picture. At aggregate level, some of these purely allocative problems are likely to get resolved to give some "average" measurements of the factor productivities.

III. Real Value Added and TFPG:

Total Factor Productivity (TFP), as of now, is widely accepted as the most comprehensive measure of the overall efficiency of resources available. Operationalization of the concept makes more sense at the aggregate level than at the disaggregate level. The rate at which TFP grows over time has significant importance since it is often loosely equated to the rate of technical progress or the rate of improvement in the system's efficiency of the resource-use. Effects and implications of major policy changes are often traced and evaluated in terms of this parameter and its behaviour over time. The correct measurement of various aggregates involved in estimating TFPG, therefore, assumes considerable importance. In the context of the Indian manufacturing sector, there has been some controversy about the behaviour of TFPG before and after 1980 pointing towards the issues in measurement of real value added and related aggregates (See, Balakrishnan & Pushpangadam, 1994; Dholakia and Dholakia, 1994; B-P, 1995; D-D, 1995; B-P, 1996, etc.).

The debate is essentially arising out of an effort to question the hypothesis of acceleration in TFPG after 1980 in the Indian manufacturing sector by explicitly recognising the role of declining raw material prices (See, B-P, 1994). In this context, B-P (1994) have essentially used the theoretical framework provided by Bruno (1984). Although Bruno (1984) has effectively demonstrated and even estimated the substantial bias introduced by the use of the standard double-deflation method for four developed countries, B-P (1994) use the standard double-deflated value added with inappropriate input price indices for their study. On several strong assumptions more applicable in the case of mature developed

countries. Bruno (1984) has derived the bias of the double-deflated value added. The sign of the bias is determined by the product of growth rate of the relative price of materials and the difference between unity and the relative price of material inputs at different points of time. During the period of monotonic change in relative price of material inputs, the bias is always negative or downward. However, if the relative prices of material inputs are moving non-monotonically (i.e. increasing and then decreasing or vice-versa), the bias could be positive or negative in the case of the double-deflated value added. It is also possible for us to compare the bias of the single deflation method within Bruno's (1984) framework with the bias of the double deflation method derived by him. This is because, in his framework, the real income (Y) is essentially the single-deflated value added by the definition he uses.

On the comparison, we find that the bias of double-deflated value added is likely to be a proper fraction of the bias of the single-deflated value added when the elasticity of substitution between materials and value added is less than unity which is empirically more probable. Thus, under most simplifying assumptions and with correct price indices for the intermediate inputs, the double-deflated value added appears to be less problematic than the single-deflated value added. However, the Indian reality of the pre-liberalization phase does not lend to several of the simplified assumptions required to derive these results. Under the regime of administered prices and quantitative controls on several material or intermediate inputs, the basic requirement of equality of input-shares with the respective input elasticities of the output is not fulfilled. As a result, the magnitudes of the biases involved in the estimates of real value added through

double deflation and single deflation methods become unknown and largely unpredictable. Moreover, the reliable estimates of input price indices for the manufacturing sector including the ASI sample sector and unregistered sector are not available due to the problem of finding appropriate weights. This introduces one more source of error in the estimates with double deflation but not in the single deflation method. Moreover, Sims (1969) observes, "double-deflation is invalid in the presence of technical change of most sorts. Because real value added is a residual in the double deflation technique, the technique attributes all increase in output due to technical advance to value added. ---- But if technical change has any form other than this purely "value-added-augmenting" form, the double deflation method breaks down". This is one more limitation of the standard double-deflated value added concept for its possible use in estimating the TFPG at sectoral level. Considering all these limitations, a balanced choice of the method for calculating the real value added to derive the estimates of TFPG needs to be made.

On the other hand, our national accounts statistics are based on a curious mix of the two methods. In the agricultural sector, it follows a double-deflated value added method and in all other commodity producing sectors, it follows the single deflation method (See CSO, 1989). There is hardly any logic for doing this. However, in order to get the estimates of real value added at sectoral level, we also have one more option suggested by David (1962). He reminds that "value added coin has a factor payments side" so that we can think of using expenditure type deflation procedures even at an industry level to ensure consistency at aggregative level. He suggests that "income originating could be

deflated directly with an index reflecting the prices which the factors of that industry paid in making their final demand purchases". This method entails a huge statistical task of generating appropriate deflators for every industry. However, in the case of double deflation method also a similar task is involved in generating firm-wise price indices for intermediate inputs; and if we have to avoid biases, generating these indices with constantly shifting base and continuously varying weights.

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