What Do We Know about Productivity Growth in Indian Industry?

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If the growth in total factor productivity in the manufacturing sector during the 1980s may be used as the testing ground for our understanding of the phenomenon we must recognise that our knowledge is limited. Two equally mainstream approaches yield divergent results. Thus, there remains an unresolved issue.

WE notice that a very substantial literature, dealing in one way or the other with the issues raised there, has appeared after the publication in 1994 of our paper[1] on productivity in Indian industry. It strikes us as obvious then to enquire as to how much this has furthered the profession's understanding of the subject. To that extent this is intended to be in the nature of a purposive survey organised according to the issues that we consider are important. According to us, the issues themselves may be put down to those revolving around measurement and those that revolve around interpretation. Even as we appreciate that the methodology of measurement often circumscribes the interpretation, we give some importance to the latter aspect because we believe that where the results of the exercise are implausible as interpretations this may signal mismeasurement or poor method, for which we provide examples as we proceed. In our effort we are motivated by the belief that though the question of productivity growth in the Indian economy is of such vital importance that it should be central to our concerns the non-specialist economist in India may be excused for remarking that even where it is conceded that clear-cut results cannot be expected one might expect at least a unified survey of the field.

I
Productivity and Policy

(a) Why Do We Study Productivity Growth?

We are interested in productivity growth because it is the only plausible route to an increase in the standard of living. Productivity increases have also been recognised to contribute to economic growth. But when it is also recognised that economic growth without productivity increases can do little for raising the standard of living, we must become less interested in growth *per se* and return[2] to focusing on productivity change.

Productivity growth also comes in handy in the attempt to enhance the competitiveness of a country's exports. Productivity growth lowers labour costs and thus, *ceteris paribus*, the international price of the good concerned. This mediation of the exchange rate, however, ensures that the relationship does not hold in reverse, that is, an increase in competitiveness does not by itself translate into a productivity increase. It must alert us to the associated fact that increasing the competitiveness of a country's exports need not raise the standard of living even when it improves the balance of trade.

For both the above reasons, productivity growth has been the alleged target of much of government policy around the world. At the same time, we find that economic policy in India has tended to neglect productivity growth.

(b) Productivity Growth and Policy Regimes

One approach to the problem of enhancing productivity growth has been to relate it to policy regimes. We find this an atheoretical approach. The presumption is that a more competitive market structure is desirable, even though it is not made clear whether market structure determines the level or the rate of growth of productivity. A particular version of this approach links productivity growth to trade regimes suggesting that more open trade regimes encourage productivity growth. It is striking how poor is the empirical evidence on this.[3] The reader is referred to the evidence provided by Young[4] in his comparison of productivity growth across many countries where Singapore, among the world's most open economies, is the worst performer, forced to share this slot with India. It is interesting that not even Singapore's dirigiste political regime could save it from this fate.

While we know from the First Fundamental Theorem of Welfare Economics that a competitive equilibrium is a Pareto optimum, implying that allocative efficiency is at a maximum it cannot but be stressed that perfect competition is a state and therefore it is not clear what can be inferred about productivity growth defined as (increasing) technical efficiency, which is a process, in such a regime. Also, where productivity growth is the result of innovation consciously pursued, perhaps through R and D, it should become evident that a decline in the mark-up associated with a more competitive market structure leaves little incentive for innovation in general.

X-inefficiency has been conceived of as firm-specific inefficiency. It can result in slack due to managerial lethargy and its reduction, it is held, can be achieved by engineering entry. Entry can of course mean either domestic supply or imports, the latter implying a more open trade regime. This has been used as an argument to promote trade liberalisation in developing countries.[5] However, it has been pointed out[6] that this route to the frontier requires that managerial supply curve in effort is backward bending in income. So it seems that managers in this account are not profit maximisers, a premise that may not be agreeable to some in the profession.

II
Measurement

(i) Methodology

There are two approaches to the measurement of productivity growth defined as an increase in technical efficiency. These are, in the chronological order of their development, growth accounting and the econometric estimation of the production function. The former is a deterministic method while the latter is stochastic.

(a) *Growth Accounting*

This method defines total factor productivity growth (TFPG) as the difference between the growth in output and the growth in aggregate inputs. This

residual measure can be obtained only if weights for the aggregation of the inputs are known. A unique set of weights was proposed, having been derived analytically, in Solow's celebrated paper.[7] He had demonstrated that the residual growth would become a measure of technical progress, provided the share of the value of inputs in the total revenue may be used as weights for the aggregation, under the following assumptions: (i) competitive input and output markets; (ii) firms are profit maximisers operating under constant returns to scale; (iii) technological progress is disembodied; and (iv) existence of economywide (aggregate) neoclassical production function with the standard properties. Under these conditions, the residual measures outward shifts in the production function over time. The later measurements of TFPG such as by Kendrick and Domar are only an application of this principle to specific functional forms of production functions. The next major development was due to the application of duality theory, the showing that the outward shift in the production function is equivalent to the downward shift in the cost function over time. Hence another way of estimating TFPG is as the difference between the change in total cost and the weighted change in the input prices. In other words, the TFPG measure from the production function is equal to, and opposite in sign, to the TFPG measure from the cost function.[8] With the development of the duality principle and flexible functional forms such as the translog and generalised Leontief functions and the parallel development of panel data techniques, the econometric method gained momentum in the estimation of TFPG.

(b) *The Econometric Estimation of Production Functions*

The econometric methodology has taken two routes. One route has been to estimate flexible functional forms without giving much importance to the requisite economic properties of the cost/production functions and the equilibrium conditions arising from optimisation. In such situations, the researcher assumes that the estimated function is cost or production function, as the case may be and interprets the results as TFPG as an act of faith. The second route has been to impose the properties and the equilibrium conditions and estimate the TFPG (alternatively, of course, it could be tested whether the production function is well behaved). Naturally, one would expect the estimate of TFPG to be different in the two cases.

An implicit assumption common to both the above two approaches is that technical change is disembodied. For this to be maintained in the estimation it is necessary that all inputs be measured in efficiency units. Otherwise if technical progress is in actuality embodied, in better machines and more skilled labour and the changes in quality are not incorporated, this would tend to be captured by the residual. Some researchers hold that not only is embodied technical progress important[9] but accounting for it will reduce the "measure of our ignorance" as the residual has been dubbed. This is an issue with a much wider implication than what it contains for the estimation of TFP *per se*. For, if technical progress mostly comes in embodied, rather than disembodied, form then we would require an altogether different set of policy instruments.

(ii) The Treatment of Materials

A view on the role of materials is implicit in the choice between gross production and value added as the measure of output. Since this is an issue that has been much discussed in the recent writing on productivity growth we devote some time to it.

Within the framework of production functions the value added procedure is consistent with two polar assumptions[10] about the role of materials: (i) the elasticity of substitution between materials and value added in $Y = g[F(K, L), M] = g(V, M)$ is infinite, allowing one to rewrite it as $Y = F(K, L) + M$, or $V = Y - M = F(K, L)$; and (ii) The elasticity of substitution between materials and value added is zero, materials being used in fixed proportion to output, such that $M = aY$. This model can then be written as $Y = F(K, L)$, $M = aY$, which implies that $Y - M = V = Y(1-a) = (1-a)F(K, L)$ and that the value added procedure is again appropriate so long as a is either a constant or is uncorrelated with the levels of capital and labour. This last requirement is the essence of separability, whereby the marginal product of materials must be independent of the marginal product of the other two inputs. It is now possible to see that the use of vlaue added is premised on the existence of a value added function which in turn requires separability between materials and value added. It is important, however, to see that separability is indeed the only issue. The belief that intermediate inputs must be included to capture the transmission of total factor productivity growth through intersectoral flows is mistaken.[11]

In our first paper we had worked with value added principally because we were addressing a problem in its measurement in all the hitherto existing work on productivity growth in Indian manufacturing. The question is collapsible into the question of the appropriate deflation procedure. Our re-estimation had yielded some rich results in that what may be considered intuitive in the context of changing relative price of inputs turned out to be true. Quite simply, correction for the relative price of material inputs purged the time series on productivity growth of any trace of a trend.

Two studies have raised issues concerning the use of real value added as the measure of output. In an exceptionally balanced and incisive paper Rao[12] has queried the use of the double deflation procedure in the measurement of value added. He states that double deflation introduces a bias and the possibility of negative estimates of real value added. Further, he questioned the very assumption of the existence for Indian industry of a real value added function itself. Pradhan and Barik[13] also take this view. We are entirely in agreement with them that the separability of the production function is, the condition, required for the legitimation of the use of real value added. However, we would like to record that in a paper[14] published prior to those of Rao, and therefore that of Pradhan and Barik, and apparently missed by both sets of authors, we had explicitly raised all these issues. In the process, we hope that, we also rectified the mistaken belief among some that separability is a requirement in the case of the double deflation procedure alone. In addition, as the second best practice, where the first best one entailing deflation with a chain index of the prices of inputs and outputs, we had undertaken a sensitivity[15] analysis the results of which had not altered the outcome of our tests on the trend in TFP. Finally, the deflation procedure used by us had not yielded any negative estimates of value added. On our use of value added in the knowledge of the stringent assumptions required to validate the use of this definition of output we would say that in 1994 in order to address what was then the most widely accepted result on TFP we had no other choice. The most obvious demonstration of our point regarding the serious consequence of not correcting for relative price changes would have been achieved by working with alternative measures of value added, which is what we finally did. In any case, we notice, this has had its desired effect. Surely not even the researcher working with gross output rather than value added in a growth accounting exercise would now fail to deflate the

materials bill using an index of the price of materials.

We now appear to be in a position to compare the state of the art (to measurement) with the state of our knowledge on the subject of productivity growth in Indian industry. We know the following: (i) single deflation is invalid in the presence of changes in relative prices, (ii) double deflation is superior even though the task of precisely measuring intermediate input quantities is a major one, and (iii) to make sense, a TFP index based on value added requires that a value added aggregate exists. We also have estimates of TFP according to each of these methods. This may be considered to represent the state of the art, as it were. Now if the state of our knowledge is represented by our understanding of the trends in productivity we might say that it has not progressed commensurately with the state of the art. For we could conclude that the measure derived from gross output does not make for any fresh information on productivity growth in Indian industry. On the other hand, it may be recalled that the consequence of replacing the single-deflation procedure by the double-deflation one had resulted in, a measure of real value added and productivity estimates which require us to question seriously what was till then accepted wisdom concerning productivity growth in Indian industry.[16]

While Rao had re-estimated productivity using gross output he had not actually tested for separability of materials from value added.[17] This is done by Pradhan and Barik. They report the finding that separability is rejected. The results reported by Pradhan and Barik imply that till these are contested we must work with gross output rather than value added as the measure of output. This certainly is one definite result in the area. However, exactly as in the case of Rao, the results reported in Pradhan and Barik do not require a revision of the conclusions of our very first paper.

The very thoroughness of Rao's study allows us to evaluate his results better. Note that Rao presents[18] estimates on a range of measures of total factor productivity. TFPG bsed on gross output and TFPG based on value added deflated by both the single and the double-deflation procedures. This allows us to at least speculate on the plausibility of the results. For instance, from the results reported we see that TFPG based on gross output is larger than TFPG based on value added (arrived at by the double deflation procedure) in both the sub-periods, 1973-74 to 1980-81 and 1981-82 to 1992-93, for which Rao estimates TFP. For the period as a whole the former measure yields a marginally lower estimate. Now, theoretically speaking, we would expect that TFPG based on gross output should be smaller in magnitude than TFPG based on value added. Productivity in the gross output and the value added formulations can be related according to the following[19] relation: $\mu = \lambda/v$, where μ = TFPG based on value added, λ = TFPG based on gross and v = the share of value added in gross output. The proportionality implied in the relation above is not conditional upon a constant value added ratio (v). However, what interests us is that since v is less than one, by definition, a shift in the gross output production function (λ) is magnified when measuring its impact on value added (μ), meaning we should expect the former to be smaller in magnitude. The expected relative magnitudes must be borne in mind when assessing Rao's study which is primarily motivated by the objective to correct an alleged 'bias' due to the use of value added.

(iii) Data

The reader may be surprised to find a section on data in a paper that does not report any fresh estimates. On the other hand, we choose to devote at least some attention to this question because we believe that even as the accuracy of the estimates of productivity growth are highly sensitive to the data base many researchers treat this matter with a lightness, at their own peril of course. It is our view that the estimates cannot be evaluated independently of the data base.

In the context of the estimation of productivity growth data-related questions surround the measurement of all the inputs into production. As far as labour is concerned, at least the Annual Survey of Industries (ASI) does give figures on employment. On the other hand, the accurate measurement of capital from ASI data does depend upon the veracity of the Hashim-Dadi estimates of the capital stock at replacement cost for Indian industry in 1960. Interestingly, some practitioners[20] are not troubled by any such concern for the issue of 'vintage' in the asset mix of firms and simply deflate the book value of assets by some investment goods deflator. The quantity of material inputs is required only when double deflation is done. Essentially this necessitates material input deflators. The data requirements are substantial but by no means insurmountable. The issues and the procedures are discussed by us extensively in several papers cited here. Indeed we are reasonably satisfied with the outcome of our efforts and find this an appropriate juncture to query the response[21] to our effort at quantifying the material input that "...compromises (have been) made..." in the construction of the deflators. If this in any way refers to the fact that the weights in the index are fixed, it would do well to remember that this is a feature of all deflators[22] and thus every deflation procedure. We must express some surprise that the research departments of major international agencies do not possess an independent view on the validity of our estimates but choose to echo, in complete disregard for a conflict of interests, the opinion of other researchers in the field. However, we recognise that the quality of the material inputs deflator is fundamental to whether we would accept the estimates based on the double deflation procedure.

While all the input and output variables can be measured from the ASI, researchers do often use balance sheet data, presumably to have access to a panel. Thus data based on company balance sheets is collated by the Reserve Bank of India and the Centre for Monitoring the Indian Economy (CMIE). However, while the CMIE data is available for purchase in the market the same is not true of the former data base. In our view, when it comes to the estimation of total factor productivity, the data from the ASI is inherently superior to company balance sheet data for the following reasons: First, while the entry on fixed assets measures the book value at historic cost in both the sources, for the researcher working with ASI data there is at least one year for which there is an estimate, from ASI data itself, of capital at replacement cost. We refer, of course, to the work of Hashim and Dadi. No such basis exists for the valuation of firm specific capital drawn from a balance sheet. The problem of measuring labour input is far more serious. Company balance sheets, of course, state the expenditure on wages and other emoluments. However, the conversion of these into labour units requires knowledge of the industrywide wage rate. Finally, the estimation of the material input does not pose any particular problem for the researcher working with balance sheet data.

Finally, there still remains an issue to be addressed. This is that even after having measured them properly what tends to get measured at all are the *stocks* of capital and labour. However, what we do need is are the *flows* of capital and labour into production. While capital is considered a fixed input even in economic theory labour is considered to be a variable one. But this is mostly invalid as an assumption. The existence of labour hoarding as a pheno-

menon must weaken the belief that labour is a variable factor. The fixity of labour and capital can bias the estimate of productivity. While it is possible to adjust the measured stock of capital for utilisation by exploiting the complementarity between capital and energy, the absence of data on the labour input by the hours worked makes it difficult to adjust the employment variable from the ASI.

III
Productivity Growth in Indian Industry

(i) Trends and Suggested Interpretations

We focus exclusively on the research output in the 1990s. This should in no way lead the reader to presume that we take the view that earlier work on productivity growth in Indian industry is unimportant. Indeed much of this work is innovative and pioneering in that it was done at a time when the literature was very thin, the data more difficult to come by and computing almost non-existent. The area is very well covered by Krishna[23] and we do not see how we can improve upon that survey. We review the subsequent work according to whether the estimates have been arrived at using the growth accounting methodology or by the econometric estimation of production functions.

(a) *Growth Accounting*

There are three contributions that merit attention. These are the studies by Shrivastava, Rao and Pradhan and Barik.[24] On the question of the turnaround in the 1980s the results of these studies are unanimous in not detecting an acceleration. Shrivastava reports declining productivity in the 1980s. Rao reports a statistically significant deceleration in growth of TFP in aggregate manufacturing in the 1980s according to what we designate, in our view appropriately, his preferred measure. Pradhan and Barik report[25] that "negative growth set in during 1982-92", and they report this feature for both aggregate manufacturing and for the individual industries that they study. We are led to observe that methodological refinement only strengthens the conclusion of our paper of 1994.

All statistically significant estimates of TFP growth in the manufacturing sector point to a decline in productivity in the 1980s. Within the equilibrium formulation of the growth accounting exercise, this means that there is technical 'regress'. One interpretation is that workers and managers are getting deskilled. We can think of few instances other than a war, or perhaps prolonged unemployment, which can contribute to this. Therefore, in our view, this result cannot be accepted at face value, it needs to be accounted for.

The claim that the residual of a growth accounting exercise yields a measure of technical progress is based upon the idea of an economy (or even a firm or industry for that matter) being shocked, as it were, from one production function to another. Profit maximisation ensures that there is no allocative inefficiency, ensuring that the firm is always on its frontier. With perfect competition in the product and factor markets there is never an involuntary unemployment of labour and capital. However, outside the equilibrium formulation of the growth accounting method aggregate demand shocks do matter. In such a world swings in capacity and labour utilisation can affect the residual from growth accounting, and it will no longer do to interpret it as either technical progress or, more importantly from the point of view of interpretation, as supply determined. Of course, to the extent that capacity utilisation can be supply constrained – due to infrastructural bottlenecks and input shortages – the residual could be supply determined alright but it is by no means a shift in the production function. So demand and supply constraints can alter the level of capacity utilisation and where the flow of input services is not captured the residual is affected. Armed with such knowledge we would be advised to refrain from always interpreting changes in the residual as productivity growth.

Of the very large number of researchers who find estimates of negative TFP Rao alone has considered it necessary to evaluate the result, in our view entirely appropriately. However we do not find his explanation convincing. Rao invokes Verdoorn's Law, according to which there exists a positive relation between (in this case, total factor) productivity growth and the growth of output (often at the economywide level), and produces correlations that point to a weakening of the Verdoorn relationship in the 1980s. The fact remains though that so long as there holds any direct relationship between output and productivity growth, a negative TFPG during a period of steady or accelerating growth in output (which is the case in the 1980s) cannot be ascribed to *dynamic* (dis)economies of scale which characterise the Verdoorn process.

There is however one route to a possibly negative residual even as the economy is growing. This is in the presence of decreasing returns to scale. We are of course referring to the static case here, the increase in costs as output increases. So it is not entirely inconceivable. In any case, we have found that there is an unfounded tendency to disbelief when estimates turn in evidence of less than accelerating TFPG in the 1980s.[26] This is surprising when, in fact, it should be obvious that faster output growth can come about equally through faster input growth.[27] We also have international evidence on faster growth of output and negative growth of TFP.[28]

While evaluating the finding of a negative TFPG in Indian manufacturing industry we need to recognise that cost minimisation might not be such a good model of the reality. Indeed allocative inefficiency might well be a fact of life in Indian industry. Actually, Pal and Datta are very precise on this: "A large part of the registered manufacturing sector being under the public sector with administered product prices and the employment (both of capital and labour) policy not being particularly related to the criterion of profit maximisation the presumption of a primary (*sic*) level of allocative efficiency seems invalid. For various reasons (e g. lack of freedom of exit) the allocative efficiency may not be the hallmark of the private sector also.[29] We find this a very convincing representation of the reality but find ourselves short of clues when looking for the possibility that allocative efficiency declined in the 1980s for this would have to be the case if we are to account for a decline in TFP from this source.

(b) *Estimates Based on Estimation of Production Functions*

Pal and Datta estimate production functions, for nine major industry groups and the aggregate thereof, using two measures of what they suggest is double-deflated value added. We refrain from commenting on the measure of real value added used in their study, which leaves something to be desired, focusing solely on their estimates of TFP. In a sample split into the 1970s and the 1980s they look for evidence of higher TFP in the second period. They find acceleration in productivity growth in the case of estimates from one measure and deceleration in productivity growth in the case of estimates from the other measure of value added for (their) aggregate (of nine) manufacturing (industries). Perhaps it is for this reason that they conclude that their "...findings are not unambiguous".[30] Apart from this study all the other results from the estimation of production

functions point to a faster rate of productivity increase in the 1980s. Indeed it is striking that this obtains even as the researchers concerned use different measures of output. Thus Ahluwalia has used value added, based on single deflation, while Shrivastava estimates a gross output production function. Indeed it is interesting that these two studies are based on different data bases. The first is based on a time series for aggregate manufacturing from the ASI while the latter is based on a panel of firms from the RBI. As for interpretation, the authors of both these studies put the acceleration down to the liberalisation of the policy regime in the 1980s.

(c) *The Findings Contrasted*

By projecting an apparently divergent trend in the growth of productivity according to the two approaches used by the concerned researchers, we have avoided taking a view on the strengths and weaknesses of the econometric approach and its implementation by the particular researchers[31] or the measurement issues particular to their estimates.[32] In other words, we have scrupulously projected the results as originating from equally valid procedures, partly because our own estimate using the growth accounting method is still in play so to speak. If a comparison is to be made, the estimates from the growth accounting method should be compared with econometric estimates where the equilibrium conditions have been imposed in the estimation and the production function is well behaved.

We must introduce two caveats to the conclusion that we observe divergent trends. First, the conclusion assumes that the variables are measured without error. As we have mentioned already this concern extends in particular to inputs. Secondly, the very conclusion also depends upon the precise identification of productivity growth, even as the data may be measured without error. By identification we mean that the residual is purged of any likely effects due to returns to scale, the utilisation of inputs, and the presence of imperfect competition. It is conceivable that once the necessary adjustments are made there may be no trend in the growth of productivity observable for the period that we are considering here.

IV
Conclusion

If the growth in productivity in the 1980s may be used as the testing ground for our understanding of manufacturing productivity growth we must recognise that our knowledge is limited. As we have pointed out here, there remains an unresolved issue. This is that two equally mainstream approaches to estimation yield significantly different results. While growth accounting points to a decline in productivity growth in the 1980s, the estimation of production functions yields an increase. This is puzzling. Until the superiority of one set of results over the other is conclusively established, we cannot claim to know much about the growth of productivity in Indian manufacturing. We hope to have indicated in the course of this brief survey that this is no simple task, for the criterion adopted must encompass economic theory, methodology, measurement, data and interpretation.

Notes

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1 See Balakrishnan and Pushpangadan (1994).
2 Recall that the absence of productivity growth was identified by Krugman (1994) as the reason for the slowing down of the economy of the Former Soviet Union and the basis for his prediction that the so-called east Asian miracle would fade sooner or later. Krugman's view has been questioned, for details of which see Drysdale and Huang (1997).
3 See Tybout (1992).
4 See Young (1994).
5 See Nishimizu and Robinson (1984).
6 See Corden (1974).
7 See Solow (1957).
8 See Morrison (1992).
9 See Hulten (1992).
10 See Grilliches and Ringstad (1971).
11 See Syrquin (1987). Syrquin's contribution is to demonstrate that "...where intermediates are present, technical change in M (an intermediate input) affects X – the purchasing sector – primarily through prices. It may get transmitted into the profits of sector X but will not appear as TFPG there" (op cit, p 22). This is important to note, for it is alleged that the value added specification that it rules out materials augmenting technical progress. For instance, Rao (1996: 2929) is of the view "Indeed, one might argue that TP is a complete index of productivity because it accounts for material input conversion efficiency besides efficiency in value added." Since Syrquin (1987), we know that this is a red herring.
12 See Rao (1996).
13 See Pradhan and Barik (1998).
14 See Balakrishnan and Pushpangadan (1996).
15 See Balakrishnan and Pushpangadan (1995).
16 Considering this, it is surprising to find researchers even bothering to estimate productivity using value added arrived at by the single deflation procedure. See Gangopadhyaya and Wadhwa (1998) for an example.
17 We find Rao's argument that TFP derived from gross output is superior because it entails one less *a priori* restriction on the production function untenable. Occam's principle, which he invokes, relates to deductive reasoning in philosophy, but we are here dealing with testable propositions about representation, in this case of production functions.
18 See Table 3 in Rao (1996a).
19 See Syrquin (1987) for the derivation.
20 See Pal and Dutta (1995).
21 See IMF (1995) and UNIDO (1995).
22 Except when a chain index is used.
23 See Krishna (1987).
24 See Shrivastava (1996), Rao (1996a and 1996b) and Pradhan and Barik (1998).
25 Pradhan and Barik (1998, p M-29). The authors emphasise that TFP growth in the Indian manufacturing sector has fluctuated, as is indeed suggested by the title of their paper. While this is entirely supported by the evidence they present we would like to point out, in addition, that their results for aggregate manufacturing show that the level of productivity in the second half of what is almost a thirty-year span commencing 1963 is consistently higher than in the first half. We state this because of our view that in the discussions on productivity in the Indian economy excessive concern for the rate of growth has blinded us to the issue of the level of productivity. Moreover it is a vital input into the assessment of the role of policy regimes.
26 The researcher reporting non-acceleration of TFPG in the 1980s is often met with incredulity based on a presumption that since output growth had accelerated then so must have the productivity growth. Interestingly, our data does not record faster rate of growth of output! Actually, when subjected to statistical testing, neither does our time series on value added show a deceleration as has been implied by Ahluwalia (1994) with a view to an alleged evaluation of the plausibility of the double deflation procedure. This behaviour of the series on output and value added is to be seen as part of the problem of reconciling differences in the behaviour of some aggregates pertaining to the manufacturing sector as estimated from the Annual Survey of Industries, the Index of Industrial Production and the National Accounts Statistics.
27 See Young (1994) which provides this as an explanation of the east Asian phenomenon.
28 See Tsao (1985) and Park and Kwon (1995) where the combination of rapid growth and negative TFP growth is reported for the economies of Singapore and South Korea, respectively.
29 Pal and Datta (1995), pp 136-37.
30 Pal and Datta (1995), p 140.
31 See Rao (1996a) on the assumptions necessary for the identification of the production function in the presence of cross section data and on the level of the econometric practice in at least one study of productivity growth in Indian industry.
32 Such as that Ahluwalia's output measure is real value added based on single rather than double deflation or that Shrivastava's estimates are based on financial data.

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