Evaluating the Operational Performance of Manufacturing Enterprises: An Evaluation Framework and Application to Pakistani Industry

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I. INTRODUCTION

This study has two ojectives; (i) to develop a framework for evaluating the operational performance of manufacturing enterprises,[1] and (ii) to evaluate the trend in the performance of Pakistan's vegetable ghee industry for the 1970—1980 period, with special focus on its relative performance under private and public ownerships. Section II is devoted to the vegetable ghee industry itself — its technology, development, pricing and distribution policies. In Section III a framework for performance evaluation is developed. In Section IV we evaluate in a series of steps — the performance of Pakistan's vegetable ghee industry. The final section is devoted to concluding comments.

II. THE VEGETABLE GHEE INDUSTRY OF PAKISTAN

Vegetable ghee is manufactured by hardening vegetable oils through a process of hydrogenation. The main inputs are oil, labour, packing material (tin plate), and chemicals. Oil is by far the most important input and accounts for about 80—85 percent of intermediate inputs.

The ghee industry was nationalized in September 1973 when 23 units were taken over and handed to the provincial governments which were charged with the responsibility of running them. In June 1976, the Federal Government created the Ghee Corporation of Pakistan (GCP) under the Ministry of Industries, which was

[1] Public or private enterprise's performance, but from the national economic point of view.

made responsible for the overall management and control of the nationalized ghee industry.

Prior to nationalization, the price of the output (ghee) was set by the government in consultation with the Pakistan Vanaspati Manufacturers Association, (PVMA), the umbrella organization of all the owners. The price of imported oil, which was purchased by the PVMA and provided to individual firms, was also affected by the government's tariff policies. The rate of tariff fluctuated in response to changes in international price in order to maintain stable prices for the domestic producers. Thus, when devaluation pushed up the prices of imported oil in 1972, the government responded by lowering import duties substantially.

After nationalization, the Trading Corporation of Pakistan (TCP) imports the oil (soyabean and palm) and provides it to the units through the GCP at the "issue price" — often subsidized by the government. The price of output is also fixed by the Federal Government and is the same for all the firms.

The ghee industry is particularly suitable for our purpose because, firstly, the technology of ghee production is simple. Owing to the simple nature of the technology the problems related to aggregation, quality change and output mix, which plague empirical studies of complex and multi-output firms, are minimized. Secondly, the large size of the sample — by the standards of industry studies — enhances the reliability of the results. Thirdly, since the ghee industry was nationalized in 1973-74 prior to which it operated under private ownership, it is possible to compare the performances of the same firms under private and public ownerships.

III. PERFORMANCE EVALUATION FRAMEWORK

1. Choice of Criteria

This subsection is concerned with the question of the choice of appropriate criteria for evaluating the performance of a productive entity from the society's point of view. In other words, what should the public enterprises maximize? The simple answer, of course, is 'Social Welfare'. For the purpose of this study, the measure of social welfare is the surplus generated by the firm due to its productive activities. This measure of operational performance — benefits minus variable costs — we will call publicly relevant profits or simply public profits.[2]

Public profits as a measure of enterprise performance suffer from two major limitations. Firstly, public enterprises often pursue non-commercial objectives whose benefits accrue to society but are not reflected in the size of the measured surplus. The costs, however, are in some instances dependent upon the nature of the public

[2] For a critique of private accounting profits and other popular indicators such as labour productivity and capacity utilization as indicators of public enterprise performance, see A.K. Sen [11], Leroy P. Jones [7] and Alce Nove [10].

enterprise, e.g. Regional Development Bank. The non-commercial objective may far outweigh the commercial objectives. In such an instance public profits, unless measured in shadow prices, are incapable of reflecting the enterprise's contribution to society. Fortunately for us, the firms in the ghee industry were established on purely commercial considerations by private entrepreneurs and have not been burdended with non-commercial objectives after nationalization. Secondly, it should be recognized that public profits are a measure of static operational efficiency. They are a single-period indicator and their maximization may be in conflict with considerations of dynamic efficiency. As an example, managers may spend less than optimal amounts on current expenditures with future benefits, e.g. repairs and maintenance. This problem, though insurmountable, can be minimized by developing performance evaluation systems that are based upon "composite indicators" that include, in addition to public profits, other non-duplicative indicators for dynamic efficiency.

2. Managerial Performance

In the preceding subsection we agreed upon the choice of a criterion for the operational efficiency of public enterprises: the value of the surplus or profits measured in the publicly relevant sense. The question we want to ask now is the following: Given the choice of an indicator, how do we measure the performance of a firm's management? Or to be more specific, if public profit is the agreed criterion and a firm generates public profits equal to one million how do we decide the level of the management's efficiency? Is the management good, bad, fair or what?

In general, this question cannot be answered without a benchmark or a yardstick of performance. The core of the performance evaluation exercise lies in finding out how well the firm (management) is doing relative to their potential, given all the constraints faced by the management. There are two approaches to measuring managerial performance.

The first approach would be to compare the actual level of the surplus, π_t, generated by firm i, in period t, with the maximum possible level of profits, π_t^*, given prices and endowment of fixed factors (see Table 1). This represents a measure of absolute efficiency.[3] The second approach, really the second best approach, would be to avoid the problem of measuring the level of π_t^*, the maximum level of profits, and to focus, instead, on the *trend* in managerial performance. Again, changes in public profits, $d\pi$, depend upon changes in managerial performance and changes in the vector of exogenous factors related to prices, endowments of fixed factors and the environment. In this approach actual performance π_t, in time period

[3] This is the so-called frontier approach to the measurement of efficiency. For a survey of related issues see the May 1981 issue of the *Journal of Econometrics.*

t, is compared directly with the actual performance, $\pi_t + 1$ in time period $t+1$. To isolate the trend in managerial performance, adjustments are made for changes in the factors affecting the size of the surplus, but beyond the control of the management (factors 1, 2, and 3 in Table 1).

Table 1

Classification of Factors affecting Public Profits in Current Prices

1. *Endowment of fixed factors*	e.g. Quantity of Capital; Quality of Capital
2. *Prices of outputs and inputs*	
3. *Other factors exogenous to the management*	e.g. Insufficient Demand, Disruption of Input Supplies; Power Failures; Non-Commercial Objectives.
4. *Managerial performance*	

It is the second approach adopted by us in the study because, firstly, it avoids the tricky problem of measuring some maximum level of public profits, and, secondly, because we are interested primarily in finding out the relative efficiency for the two time periods under private and public ownerships.

IV. ISOLATING THE TREND IN PERFORMANCE

The objective of this section is to estimate the trend in managerial performance and to compare relative performances in the periods of private and public ownerships. Private accounting profits are the starting point. Then a series of adjustments are made for non-efficiency-related factors affecting the observed performance to isolate the underlying trend in efficiency.

1. Private Accounting Profits

The information provided in the annual accounts of the firms constitutes the starting point of our analysis. Figure 1 and Table 2 summarize the results for the small and large samples of observations on the basis of private accounting profits — the relevant indicator of enterprise performance from the private shareholder's point of view.[4] According to private accounting profits: (i) the average level of

[4] The small sample includes the same seven firms for the entire ten-year period and is more relevant for private-public comparisons. The large sample includes all 154 observations over the ten-year period, the same eighteen firms in the last seven years.
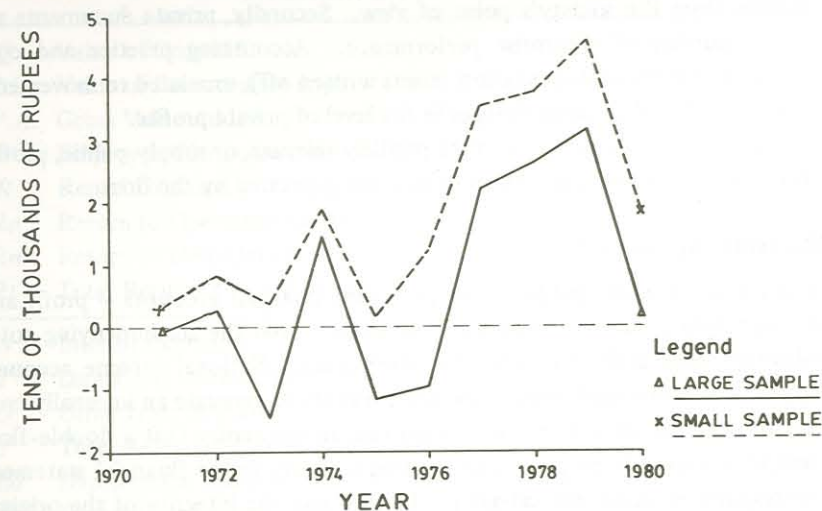
Figure 1: **Trend in Private Accounting Profits**

performance for the public period as a whole is *five times* as high as the average level of performance for the period under private ownership, the main reason for this result being the very high performance in the year 1977-78, and (ii) there is *no discernible trend* with wide fluctuations from year to year.

Is performance under public ownership really five times better, and has managerial efficiency really fluctuated so widely over time? The answer is an emphatic No.

Table 2

Private Accounting Profits

	1970–73	1974–76	1977–80	1974–80
Small sample average profits*	0.50	1.06	3.52	2.46
Full sample profits	−0.43	−0.24	2.05	1.07

*In millions of current rupees.

Firstly, private accounting profits are concerned only with the returns to the equity holders, while performance evaluation from the society's vantage point is

concerned with the total returns to both equity and non-equity holders. Thus some categories, treated as cost by private shareholders, e.g. taxes, are really a distribution of the surplus from the society's point of view. Secondly, private documents are non-neutral recorders of enterprise performance. Accounting practice and conventions (e.g. treatment of depreciation, assets written off), unrelated to movements in efficiency, can therefore cause changes in the level of private profits.

The next step was thus to calculate publicly relevant, or simply public, profits as a measure of the economic surplus or quasi rents generated by the firm.

2. Public Profits in Current Prices

In order to calculate public profits, detailed financial accounts — profit and loss statement, balance sheets, fixed assets schedule — and the accompanying notes were collected from each enterprise for every year. National income accounting principles were combined with economic concepts to generate an internally consistent set of data for each firm. It is important to emphasize that a double-flow entry method was used to map each accounting category in the financial statement into a corresponding economic category. In this way the integrity of the original documents was maintained while creating a complete social accounting system.[5]

The next step in calculating public profits was to generate the production and distribution flows for each company for every year as shown in Table 3. The top half of the table describes the generation of surplus by the enterprise's activities while the bottom half of the table provides information on the distribution of that surplus. The first point to notice is the distinction between operating and non-operating income of the enterprise. The Return to Operating Assets, *Ro,* is the net contribution of the enterprise to society due to its own productive activities. Non-operating income, *Rn,* on the other hand, is not generated by the firm's own productive activities. It represents, rather, a claim of the enterprise on the surplus generated by some other productive entity. Take the case of interest arbitrage. If a public enterprise receives a loan at six percent and deposits it in an account paying eight percent, its total returns (inclusive of operating and non-operating returns) go up. Notice, however, that the act of arbitrage by the enterprise — even though it affects its financial position — in no way represents a net change in the resource availability to society. It is thus *Ro* which is the relevant concept in a study of the productive efficiency of a public enterprise.

⁵This accounting framework was first proposed for public enterprises in Leroy P. Jones and Sakong Il, "A Social Accounting System for Public Enterprises", Korea Development Institute Working Paper 7604 (1976). It is the basis for more elaborate and Computerised Performance Information Systems developed by Professor Jones for the public enterprises of Korea, Pakistan and Venezuela.

Table 3

Production and Distribution Flows

Q	Value of Output*
$-I.I.$	Value of Intermediate Inputs
$=V.A.$	Gross Value Added
$-W$	Employee Compensation
$-R$	Rental Expenses
$=Ro$	Return to Operating Assets
$+Rn$	Return to Non-Operating Assets
$=Rt$	Total Returns to the Enterprise
$-N$	Interest Payments
$-T$	Direct and Indirect Taxes**
$-O$	Other Distributions
$=E$	Total Return to Equity Holders
$-Ed$	Depreciation and Amortization
$-Eb$	Distribution Earnings (Dividends)
$-Er$	Retained Earnings
$=O$	

*All entries are in current market prices.
**If indirect taxes are deducted from output, then the value added and returns are at factor cost.

The final point in calculating public profits is to recognize that working capital held by the management is also a factor of production which enhances the capacity for generating surplus by the enterprise. It also has a real opportunity cost to society which must be deducted from the return to operating assets, *Ro,* to arrive at the quasi rent generated by the firm. Public profits then are $(Ro - r \cdot Wk)$, where *Wk* is the stock of working capital and *r* is the relevant rate of interest.

The stock of working capital for the year was calculated as the average of the enterprise's beginning and end of the year stocks of financial working capital and inventories. The information is readily available in the asset side of the balance sheet and the accompanying notes. Financial working capital included cash, demand deposits, accounts receivables, prepayments, etc., while inventories included all outputs and inputs inventories plus stores, spares, etc. The interest rate used was the average for short-term (six month to one year) deposits.[6]

⁶For greater details see Jones cited above and Abdul Hafeez Shaikh's thesis [12].

The results of the performance evaluation on the basis of public profits in current prices are summarized in Table 4, while Figure 2 display the trend for this indicator.

Table 4

Public Profits in Current Prices

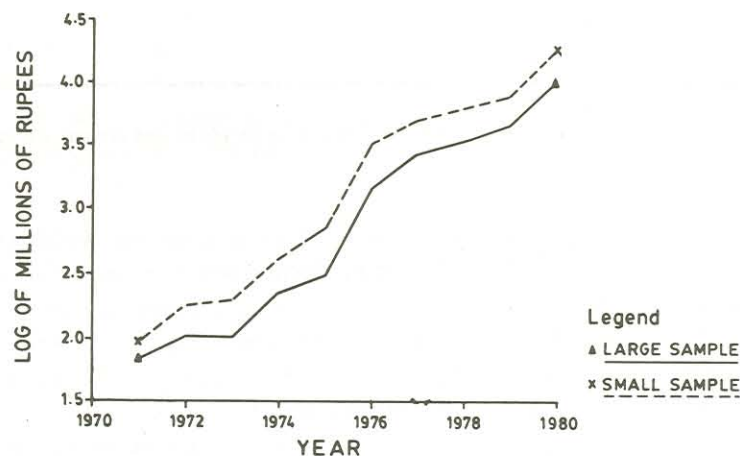|	1970—73	1974—76	1977—80	1974—80
Small samples average profits*	8.87	21.36	51.22	38.42
Full samples average profits	7.45	15.29	39.45	29.10

*In millions of current rupees.

Figure 2: Trend in Public Profits in Current Prices

What is the effect of this conversion from private to public profits on the trend and relative performances under private and public ownerships? (1) The level of average performance under public ownership as a whole is *four times* as high as the level of average performance under private ownership. (2) Much of the erratic fluctuations in the trend are explained away by this adjustment. *The trend is continuously upwards* with a higher rate of growth after nationalization.

Why is it that Private profits fluctuate widely from year to year while public profits do not? The reason will become clear by looking at Table 5 which reconciles the difference between private and public profits.

Table 5

Reconciliation of Public and Private Profits

Name	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Public Profit*	628	751	790	1049	1198	2342	3072	3395	3851	5464
+Work Cap.	61	59	79	106	195	262	277	296	319	344
—Net Oth. Inc.	17	3	−64	6	7	28	21	26	17	31
—Interest	68	87	113	103	227	270	244	228	229	299
—Depreciation	68	80	80	56	79	70	64	62	68	76
—Ind. tax	504	556	627	707	1099	2222	2577	2828	3208	5206
—Direct tax	56	46	110	141	89	146	231	297	314	172
—Other Dist.	19	18	25	9	23	22	31	41	54	63
=Prvt. Profit	−8	27	−149	144	−118	−98	221	262	315	21

*In tens of thousands of rupees

The main source of discrepancy is the treatment of indirect taxes, which constitute a private cost but are a transfer from the society's point of view. Once indirect taxes are adjusted, the trends in accounting and public profits become roughly similar.[7]

3. Public Profits in Constant Prices

Public profits in current prices change in response to not only changes in efficiency but also changes in prices — in addition to other non-efficiency-related factors. To the extent that prices are exogenously determined and are beyond the control of the management, their effect on enterprise's performance should be adjusted to understand the real changes in efficiency.[8] The next step was the calculation of public profits in constant prices.

Using 1975-76 as the base year, firm-specific price indices were calculated for output and different categories of inputs. These price indices were used to deflate

[7]Although much of the divergence between accounting and public profits, at the industry level of aggregation, vanishes after the adjustment for indirect taxes, there are still important differences between accounting and public profits, especially at the level of the individual firm.

[8]The situation is somewhat more complicated if the public enterprise is a monopoly with the power to set prices. For a discussion of the issues involved see J. Finsinger and Ingo Vogelsang [6] and Pankaj Tandon. "The incentive effects of the Jones performance evaluation system on price-setting managers" (mimeo) Boston University, 1983.

the corresponding categories in current prices to arrive at the values of output, inputs and public profits in constant prices. The chosen procedure of price indexing was Divisia with constantly changing weights. The Divisia index has the desirable properties of an index and constitutes an improvement upon the Paasche and Laspeyre's indices. The discrete approximation of the Divisia index is:

$$Ln \ (P_t/P_{t-1}) = \sum_j s_j \ Ln \ (P_{jt}/P_{jt-1})$$

where $s_j = 1/2 \ (s_{jt} + s_{jt-1})$, and $s_{jt} = P_j q_j / \sum_j p_j q_j$ in period t.

In our case the outputs were grouped under 'Ghee' and 'Others'. Ghee price index was used for 'Ghee' and soap price index for 'Others'.

Oil is the single most important intermediate input and accounts for approximately seventy to eighty percent of all intermediate inputs. The other groups of intermediate inputs were packaging material and 'others'. The oil price index was a weighted average of the 'issue price' — the price at which firms receive imported oil — and the price of cotton seed oil. The packaging material price index was calculated from the monthly statistical bulletins of the Government of Pakistan. For 'Others' the general price index was used.

The number of employees was used as the basis for calculating employee computation in constant prices after 1975. Before 1975 an industry-wide index was used for deflating the wage bill.[9] The general price index was used for deflating the rental expenses.[10]

The consequence of making adjustment for changes in prices are as follows.

(1) The average level of public profits (in constant prices) for the period under public ownership is *twice* that of the average level under private ownership (see Table 6). Performance under the private-ownership period — though still inferior to public

Table 6

Public Profits in Constant Prices

	1970–73	1974—76	1977–78	1974–80
Small sample profits*	21.57	31.46	46.47	40.03
Full sample profits	19.00	23.57	36.35	30.87

*In millions of constant 1975-76 rupees.

[9] See [1].

[10] For further details on constant pricing procedures, see Abdul Hafeez Shaikh [12].

ownership — shows an improvement once prices are adjusted. This result is suggestive of relatively unfavourable prices during the period under private ownership.

(2) A closer look at Figure 3 reveals three phases, first, growth from a very low base under the first phase of public ownership, then stagnation in the first phase of public ownership and then a spectacular growth after 1977, the period under the Ghee Corporation.
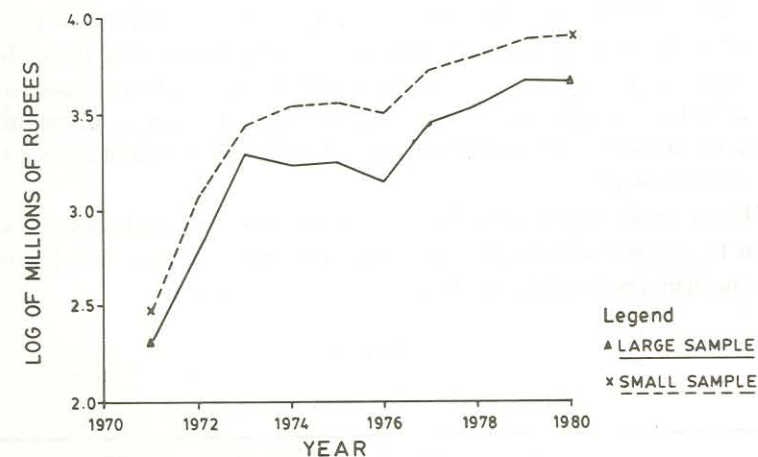

Figure 3: **Trend in Public Profits in Constant Prices**

4. Public Profitability in Constant Prices

Public profits, in constant prices, can change (increase) not only due to a change (increase) in technical efficiency, but also due to changes in the endowment of fixed factors. According to the criterion of public profit at constant prices, performance has been superior under public ownership, and has improved over time. It can be argued that in an industry like ghee where demand is increasing and capacity is being increased — passively — in response, profits will rise simply because of an expansion of volume. In this situation, how should the management of a firm be evaluated?

The answer may depend upon the nature of the institutional arrangements and the particular focus of the study. If investment decisions are within the powers of the management, then, clearly, the act of responding to increased demand by expanding scale in itself represents one form of efficiency, for which the management should be applauded. If, however, changes in capital stock are outside the

domain of the management decision-making, as they usually are in public enterprises, then the management should be evaluated on the basis of how much surplus is generated, given the size of (or changes in) the stock of the fixed factor.

It can be argued, however, that even when investment decisions are within the control of the management, there are two measures of managerial performance, a broad (dynamic) one inclusive of the Investment Division, and the other, a narrow (static) one that focuses on operational performance in the short run, given the stock of the temporarily fixed factor.

It is obvious from the trend in public profits at constant prices that the industry, under public ownership, has responded to increased demand consistently, but there is no way of deciding how the industry would have responded under private ownership. A fairer comparison would, therefore, be to focus on the narrower definition of efficiency — static operational efficiency — or public profits, adjusted for changes in the capital stock.[11] This indicator we will call public profitability at constant prices.[12]

Having made adjustments for changes in prices and scale, we are now in a position to evaluate changes in managerial efficiency. Table 7 and Figure 4 summarize the main results of the public profitability calculations.

Table 7

Public Profitability at Constant Prices

	1970–73	1974-76	1977–78	1974–80
Small sample average	0.48	0.77	1.13	0.98
Full sample average	0.40	0.75	1.15	0.98

The main conclusions related to our primary hypothesis remain unchanged. They may be re-stated: (i) the average *level* of public profitability is at least twice as high for the period under public ownership (1974–80) as it is for the period under private ownership (1970–73) and (ii) the *trend* in public profitability reveals

[11] We have used a 'gross' measure of capital stock. For a discussion on the relative merits of the capital stock and the rated capacity of the firms as indicators of scale, see [12].

[12] Public profitability may overestimate or underestimate true changes in efficiency if the following conditions are not met: unconstrained demand for the individual firms, constant returns to scale, and additions in the denominator — capital stock — of firms making losses — negative numerator — in two successive periods. For a fuller development of these arguments and a synthesis between public profitability and economic efficiency see Shaikh, [12]. Shaikh has also argued that in the case of the Pakistan's ghee industry for the sample period of the study, the conditions listed above are not violated.

three phases — high growth rate from a very low base under private ownership, stagnation under the provincial governments (1974–76), and a period of steady improvement under the Ghee Corporation (1977–80).[13]
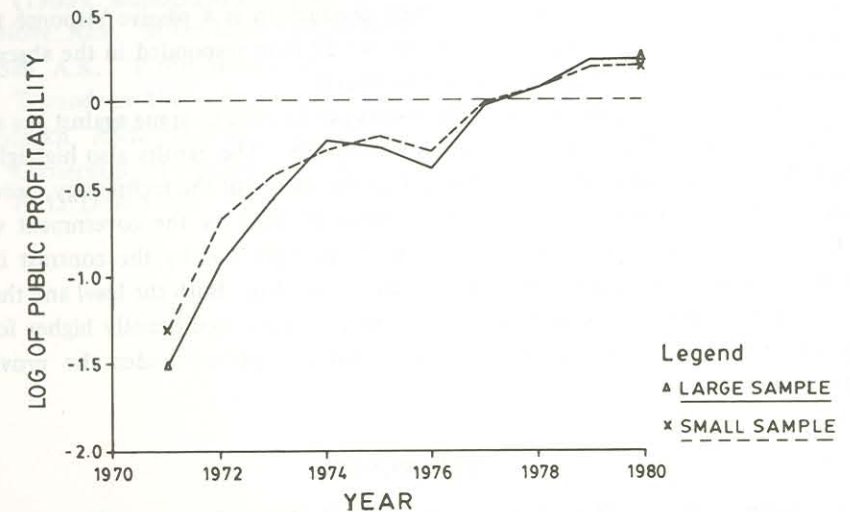

Figure 4: Public Profitability in Constant Prices

V. CONCLUDING COMMENTS

We have attempted a careful and detailed anlaysis of the operational performance of Pakistan's vegetable ghee industry during the ten-year period 1970–80. Our particular focus has been on the trend in performance and relative efficiency under the two ownership periods.

It was found that in terms of the growth rate of public profitability in constant prices the period of our study could be divided into three phases, each coinciding with a different external control structure: high rate of growth from a very low base under private ownership, stagnation under the provincial governments and impressive growth from a relatively high base under the Ghee Corporation. In terms of the average level of public profitability in constant prices, the performance in the period

[13] The results are based upon averages. However, for statistical testing of hypothesis on relative efficiency see [12].

under the public ownership was significantly better than the performance in the period under private ownership.

True managerial performance under private ownership was probably better than that suggested by our results for several reasons. Firstly, there was uncertainty in the supply of inputs during some years of the private period. Secondly, deliberate under-reporting of operational performance for purposes of tax evasion. Thirdly, it can be argued that some of the increased production is a passive response to the shifting demand. How the private sector would have responded in the absence of nationalization is something that cannot be tested.

In spite of the qualifications, the results can be used to argue against the inevitability of lower efficiency under public ownership. The results also highlight the fact that it is not ownership *per se* but rather the nature of the technology, prevalent institutional arrangements and specific policies adopted by the government which affect performance. This fact is dramatically brought out by the contrast in the performances during the two phases of public ownership. Both the level and the rate of growth in public profitability in constant prices are significantly higher for the period under the Ghee Corporation than for the period under the provincial governments.

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the financial markets. Balance-sheets may also be deliberately distorted by private management to report lower profits for purposes of tax evasion. This produces a lot of diversity among firms with regard to their financial structures and makes the exercise of relative-performance evaluation quite unmeaningful unless these factors are fully taken into account. As an example, consider two firms A and B which may be showing identical profits but operating from different financial positions. Thus, firm A's performance may be based on weak foundations because of, say, low reserve strength. Consequently, if this is not taken into account, performance evaluation on the basis of profits alone will involve an upward bias in the case of firm B. Besides reserve strength, there are a large number of factors which are of crucial importance from the viewpoint of the short-term or long-term health of an enterprise.

While making a comparison of performance of different firms, one has also to take into account the practice of 'window-dressing' with the help of which managements can hide the real state of affairs. This involves, for example, writing back past provisions to profit-and-loss account to the profit statement to disguise an adverse turn in operations, under-provision for doubtful debts, liabilities or repairs, etc.

Similarly, the arbitrariness of depreciation charge is a disturbing element in inter-firm comparisons. Firms follow different accounting standards in respect of depreciation. As a result, the profits of two firms may be substantially different despite similar underlying profitability and the same total depreciation charge over the asset's life.

There is some confusion about the use of the terms profits, profitability and efficiency, which convey entirely different meanings but which have been used by the author identically (e.g. page 17). Profitability is generally understood as a ratio (profits to assets, equity, etc.) while profit is an absolute figure. If we adjust an absolute figure (public profits) by an absolute figure (adjusted public profits) we get another absolute figure (adjusted public profits) and not a ratio (profitability). Thus, it is not clear what the figures in Table 7 are. On the same page, to explain what measure of capital stock has been used for adjustment of public profits we are referred (footnote 12, page 37) to an appendix which does not exist.

There is also a need to explain in greater detail a number of other things which have been discussed in the paper. For example, the sampling procedure that determines the 'small' and the 'full' samples is not very clear from the footnote on page 19. Why the small sample is more relevant for private-public comparison is also not explained. If the results of the small sample alone are relevant for performance comparisons then on what grounds can the results based on this sample (consisting of 7 firms only) be generalized for the Ghee Industry as a whole unless these firms are fairly representative of the industry.

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Comments* on

"Evaluating the Operational Performance of Manufacturing Enterprises: An Evaluation Framework and Application to Pakistani Industry"

Of crucial importance to public policy is the question of how firms operating under different forms of ownership can be ranked in terms of productive efficiency. To answer this question it is necessary to investigate whether differences in enterprise efficiency vary systematically with the type of ownership. By looking into these questions, this study has made a valuable contribution to the literature about the effects of ownership on economic performance of manufacturing enterprises in Pakistan. The results do not show any evidence of inferior performance of the ghee industry during government ownership. As such, they are contrary to the predictions of the property-rights literature, which stem from the notion that since efficiency is essential for the survival of private firms, private ownership is inherently more efficient than public ownership.

However, because of weaknesses in the methodology, the results of the study have to be interpreted with caution. One source of weakness is the difficulty with which the effects of property rights can be effectively isolated from the influence of regulated markets. If this is not done, the efficiency differentials would reflect a combination of the effects of property rights and market structure. Profits will not tell you what they are supposed to, as they will be a function of the market structure as well. On pages 5–7 of the paper it has been mentioned that while the ghee industry did not face a free market during the period under consideration, the form and degree of market regulation varied over time. It is, therefore, not very clear how much of the efficiency differentials could be attributable to the form of ownership and how much to differences in market regulation.

My second comment relates to the choice of the criterion for measuring operational performance of enterprises. The use of financial criteria derived from balance-sheets, profit and loss statements, etc., cannot yield meaningful results, in particular when making a comparison of performance across enterprises. This is because balance-sheet structures offer a wide scope for discretionary behaviour on the part of the management and change sharply over time, depending on the behaviour of