SLACK IN THE STATE-OWNED ENTERPRISE: AN EVALUATION OF THE IMPACT OF SOFT-BUDGET CONSTRAINTS

by

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May, 1994
Revised July, 1996

Forthcoming in *INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION*

I am grateful to the Managing Editor (Prof. H. Yamawaki) and an anonymous referee for helpful comments that have substantially improved the paper.

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ABSTRACT

In this paper slack in resource utilization is estimated, using data envelopment analysis, for a sample of 67 Indian state-owned, 63 private sector and 27 foreign-owned enterprises on a comparative basis. The study is cross-sectional and carried out for the year 1991 to assess how far the operation of soft-budget constraints has had an impact on the economic performance of Indian firms, particularly operated as state-owned enterprises. Specifically, the presence of debt-capital, provided primarily by government-owned financial institutions, is strongly and negatively related to performance. The results show that if firms turn out to be all equally-efficient, then average materials costs, human capital usage costs, costs associated with other operating items and physical capital usage by each state-owned enterprise sampled can be reduced by Rs. 203 million, Rs. 201 million, Rs. 53 million and Rs. 255 million respectively. If existing levels of inputs are used efficiently, then the average addition to the value of output by each state-owned enterprise can rise by Rs. 693 million. The analyses reveal significant slack in resource utilization in Indian state-owned firms resulting from soft-budget constraints, and the implications of the existence of slack are discussed.

JEL Classification: D 24; H 32; L 32; P 42

1. INTRODUCTION

This paper reports the results of a comparative study evaluating the relative performance of Indian state-owned firms vis-a-vis private sector firms which are both domestically and foreign owned. Specifically, the study provides enterprise-level estimates of the actual amount of slack existing in the utilization of each resource for each non-efficient state-owned firm. A summation of the amounts gives an idea of the total excess resources used in state-sector firms' operations.[1] The firms studied account for a large proportion of Indian state-owned firms and the results shed light on the economic performance of firms playing a significant role in the Indian economy.

The issue studied is particularly relevant for India and other economies in transition. In terms of sheer magnitude, state-owned firms constitute a large proportion of industrial activity.[2] Hence, an improvement in the efficiency of these firms can have a direct impact on the future productive capabilities of these nations by providing higher levels of re-investible surplus. For instance, a 5 percent increase in the efficiency of state-owned enterprises, without any changes in prices or investment, would result in freeing resources of about 5 percent of GDP in Egypt, or reduce 50 percent of direct

[1] A theme running through writing on state-sector firms' performance is that of slack in resource utilization (Bhagwati, 1993). Yet, evidence on the quantum of such slack is absent, and impressions of state-owned firms' performance tend to be anecdote-based (Millward, 1988).

[2] For example, Jalan (1991) notes that in India the total investments in 250 central government-owned commercial manufacturing and trading enterprises were Rs. 1,820 billion in 1990 (Rs. 35 = U.S. $ 1). The sum amounted to almost half of the Indian GDP for one year, and the figures excluded the assets of government-owned enterprises in the banking and insurance sectors, as well as those of departmentally-owned undertakings such as railways, defense production units, postal units and the telecommunications network.

taxes in Pakistan, or fund a 150 percent increase in government expenditures on education, health, culture and science in China (Jones, 1991).[3]

Kornai (1990) suggests the idea of the soft-budget constraint as an explanation for the observed patterns of state-owned enterprises' performance. These ideas are used as the conceptual underpinning to evaluate Indian state-owned firms' performance, and the paper evaluates the soft-budget constraint idea in the Indian context. The paper unfolds as follows. In section 2 conceptual issues are discussed. In section 3 the empirical procedures are described. Performance measurement for state-owned firms is complex and purely financial indicators are not always appropriate (Aharoni, 1981; Tulkens, 1992). Firm-level performance is measured using data envelopment analysis, a technique useful for evaluating efficiency and estimating slack in resource utilization. Section 4 contains a discussion of results, and section 5 concludes the paper.

2. THEORETICAL ISSUES AND THE INDIAN CASE

An approach used to compare the performance of private versus state-owned firms is the property-rights model. Property-rights, which are the rights over the enjoyment and disposal of assets, are attenuated in government-owned enterprises because a market for corporate control is absent.

[3] There are also critical linkages between state-owned firms' performance and the rest of the economy. The state-owned sector provides many primary inputs such as electricity, steel, other metals and coal. Therefore, any inefficiency in the production and distribution of these input-goods are likely to be reflected in the prices charged to customers. The greater the inefficiency in the production of primary inputs, the greater will be the extent of inefficiency that is perpetrated in downstream industries. Marathe (1989: 188) has commented: "The question is: how serious is the problem resulting from the public sector's inability to generate surpluses on an adequate scale? It is difficult to quantify the total impact of the inefficient use of resources. The linkage effects are so pervasive and assume so many different forms that it is difficult to quantify the losses."

Consequently, there is a lack of capital market discipline to which state-owned enterprise agent-managers can be subjected to by owner-principals (Boardman and Vining, 1989). The industrial organization literature (Hart, 1983; Hermalin, 1992; Kameke, 1993; Leibenstein, 1987; Majumdar, 1995; Salas Fumas, 1992; Scharfstein, 1988 Selten, 1986) explicitly suggests that product-market competition induces firm-level efficiency in resource utilization. Variations in the nature of competitive regimes firms face determine performance differentials between privately and publicly-owned firms. Forces of competition have a direct impact on the cash-flows of enterprises. Given equally-competitive conditions, private and public sector firms face similar potential to lose or make money. Since private sector managerial rent-seeking, capitalistic behavior or the exploitation of public sector firms' profits for private political gains are going to be possible only when there are adequate cash-flows, the greater the threat that forces of competition will lead to the dissipation of such potential rents, the better firms' performance is likely to be. Hence, competitive forces level performance differences between private and public firms (Boardman and Vining, 1989; Vickers and Yarrow, 1988).

Competitive forces can, however, be tampered with for institutional and political-economy reasons. The soft-budget constraint idea (Kornai, 1990) helps shed light on how institutional factors can help explain the relatively-poor performance of state-owned firms even in a competitive environment. According to Kornai (1990: 21): "the softening of the budget constraint appears when the strict relationship between expenditure and earnings has been relaxed, because excess expenditures over earnings will be paid by some other institution, typically by the state. A further condition of

softening is that the decision maker expects such external financial assistance with high probability and this probability is built into his behavior."[4]

Jalan (1991: 198), in describing how the soft-budget constraint induces slack in state-owned enterprises, writes that: "The immediate effect of the softening of the budget constraint is on the economic behavior of the enterprise. Losses do not matter, and the efficient use of resources is of no consequence, for nothing depends on it. The survival and expansion of the enterprise depends on external assistance and decisions, and not on its own capabilities and performance. This has several economic consequences. The price responsiveness of the enterprise declines, and the capacity to adjust to relative prices, interest rates and exchange rates diminishes. The unit also becomes unresponsive to technological changes and to unfavorable external conditions." Therefore, even where private and state-owned firms co-exist in environments where competitive forces are the great leveller of performance, soft-budget constraints can vitiate against the operations of competitive forces.

In the Indian context, two soft-budget constraints are material in influencing state-owned firms' performance. First, along with barriers to entry, significant barriers to exit exist (Dutta-Chaudhuri, 1990). Firms are not allowed to die, as the industrial policy ethos is to continue employment at any cost. To allow terminally-ill private firms to live, their ownership is transferred to the state-sector (Marathe, 1989). Simultaneously, rent-seeking and political patronage has bloated the employment

[4] There are several ways in which governments soften the budget constraint for public sector enterprises. Some means are the use of soft subsidies which include automatic financing of losses and cost over-runs, soft taxation whereby enterprises are allowed differential tax rates or allowed to run up large unpaid balances of tax, soft credit whereby the non-fulfillment of credit contracts are tolerated, and soft administered prices when enterprises are allowed to sell products at prices which are considerably above what are obtained in a free market.

rolls of state-owned sector firms (Bardhan, 1984). Second, state-owned firms enjoy interest-rate advantages compared to the private sector. The rate-differential is over four percent, making capital available to the firms relatively cheaper.[5]

State-owned firms' operations are principally funded by loan borrowing, unlike with a combination of equity and loan financing that characterizes private firms' capital structure. This is because the overall net worth of state-owned firms is negative, and the equity-deficit that has developed over the years is estimated at Rs. 130 billion (Jalan, 1991). This equity-deficit is absorbed by the owner, which is the state. Also, since almost all sources of long-term and short-term capital are owned by the government, state-owned firms have had access to the relatively deep pockets of the Indian state to support their activities. Applying the interest rate differential to a capital investment figure of Rs. 1,820 billion (Jalan, 1991) works out to a subsidy of Rs. 70 billion per annum in interest costs alone for the state-owned firms.

3. EMPIRICAL ANALYSES

3.1 SAMPLE AND DATA ON INDIAN STATE-OWNED FIRMS

Since 1956, when the role of state-owned enterprises in Indian industrial development was first clearly articulated, every sub-sector of Indian industry has seen their presence. Apart from defense firms, traditionally in the public domain, generation of power, the manufacture of aircraft, heavy

[5] Jalan further writes (1991: 198): "The doctrine of a soft budget constraint seems to capture the Indian reality rather surprisingly well. All the different means of softening the budget constraint on enterprises have been in operation in India, and the economic consequences have been equally apparent. The future of these enterprises, and those who run them, depend entirely and exclusively on outside forces, not on internal performance. A loss-making firm or an entire sector can not only survive but also expand with the help of budgetary subsidies, tax reliefs and preferential credits."

machinery, and equipment for rail and sea transport are exclusively performed by state-owned firms. State-owned firms also manufacture products such as aluminum and non-ferrous metals, chemical intermediates fertilizers and iron and steel. They are involved in other diverse activities such as baking bread, coal mining, commodity trading, construction, engineering consultancy, farming, handicrafts retailing, shipping, oil refining and software consultancy.

A sample consisting of 67 Indian state-owned enterprises operating in the commercial and industrial sectors, 63 comparable Indian private sector companies and 27 foreign-owned firms operating in India, which were identified as such and for which firm-level data for the year 1991 were available, is used to compute inter-se efficiency parameters. The total sample consists of 157 firms. Efficiency and slack calculations have to be comparative, so as to assess the magnitude of relative category-wise differences. The sample selection is such that the relative power of the budget-constraint idea can be evaluated vis-a-vis industrial organization postulates, since the state-owned enterprises evaluated operate as commercial entities in competition with enterprises which are either fully-owned by Indian investors or are owned by foreign investors.

There are around 250 enterprises owned by the Indian government which employ 2.3 million people (Bhagwati, 1993; Jalan, 1991). The 67 firms in the sample employ 1.57 million persons, or 68 percent of the total employed in state-owned enterprises. The sample accounts for a significant portion of activity by Indian state-owned enterprises, but explicitly leaves out trading and petroleum industry firms. Trading firms have monopoly power conferred on them by virtue of the country's import and price-support policies. The trading and petroleum-sector firms face administered price regimes, and oil sector firms operate as partial tax-revenue collectors for the government. Their exclusion leaves in the

sample of state-owned enterprises a set of firms for which output is not subject to valuation at soft-administered prices, which may be often high compared to the prices that may be obtained in the competitive market.

The data used for analysis are obtained from a publication titled *Key Financial Data on Larger Business Units* published by the Centre for Monitoring the Indian Economy in Bombay, India in July 1992. State-owned firms submit large amounts of data, both for corporate reporting purposes under the Indian Companies Act of 1956, as well for reporting to the Indian parliament. Consequently, there are a wealth of state-owned firms' data available. Comparable data for private sector firms, and particularly those which are foreign-owned, are much harder to come by in the Indian context, creating missing data problems for a number of key variables. There is also the limitation that this study is cross-sectional, principally as a result of time-series data unavailability for a full panel of state-owned, private and foreign-owned firms. Therefore, the relative impact of unfolding technical change cannot be factored in and measured.

Following prior research (Majumdar, 1996), one key output, the value of gross output, is used. To generate output necessitates consumption of several inputs, such as materials, human capital, other operating inputs and fixed capital. Four inputs are used: expenditures on materials usage, expenditures on employment costs which measures factor payments to human capital, expenditures on other operating items, and depreciation expenditures which measures the consumption of capital in the production of output. Ideally, the number of employees would be a very relevant input to use; however, private sector and foreign firms' employment data are not available since there are no

reporting compulsions in India. The inputs selected ensures comparability within the sample of 157 firms. The descriptive statistics are given in Table 1.[6]

********** Insert Table 1 Here **********

As table 1 shows, there is wide variation in the sample of firms studied. The mean output for state-owned firms is Rs. 6 billion while the standard deviation is Rs. 1 billion. The minimum figure of less than Rs. 1 billion and the maximum of Rs. 78 billion displays the range of firms that makes up this sector. Privately-owned firms are smaller; the mean output is Rs 1.5 billion, and there is less variation in output data. Foreign firms in the sample are, on average, larger than privately-owned Indian firms as the average output value of Rs. 2.1 billion shows. The data in table 1 reveal that prima-facie state-owned enterprises are human capital rich, as average human capital usage values of Rs 1.1 billion relative to average output of Rs. 6 billion show. Conversely, private firms spend, on average, Rs. 0.12 billion on human capital relative to average output of Rs 1.5 billion, while for foreign firms the average spending is Rs 0.17 billion relative to average output of Rs. 2.1 billion. State-owned firms are also greater consumers of capital, relative to private or foreign firms in the sample, as the data show, thus contributing to the high capital-output ratios for which Indian industry is reputedly notorious (Bhagwati, 1993).

3.3 PERFORMANCE MEASUREMENT TECHNIQUE USED

Data envelopment analysis (DEA) is used to calculate firm-level efficiency and measure slack in the utilization of various resources. Charnes, Cooper and Rhodes (1978) [CCR] develop, and Banker, Charnes and Cooper (1984) [BCC] extend, the efficiency measure developed by Farrell (1957) using a

[6] A list of these firms is available on request.

fractional mathematical program, where the ratio of the weighted outputs to weighted inputs of each observation in the data-set is maximized. This approach proceeds by constructing efficiency scores for a number of observations. For each observation a single efficiency statistic, which is a ratio measure of performance as to how efficient each observation is in converting a set of inputs jointly and simultaneously into a set of outputs, is calculated.[7]

The generalized DEA model is presented by means of the following mathematical programming formulation:

$$\text{Max } e_{0,0} \qquad (1)$$

subject to

$$e_{j,0} \leq 1, \forall j$$

$$\mu_{r0} \geq \in, \forall r$$

$$v_{i0} \geq \in, \forall i$$

where the notation is: $e_{0,0}$ is the efficiency of the observation being evaluated, j = 1,....n is the index for observations, 0 being used as the index for the observation being specifically evaluated, and $r = 1,....R$ is the index for the outputs, ($y_{rj} \geq 0$ is output r of observation j), $i = 1,....I$ is the index for the inputs, ($x_{ij} \geq 0$ is input i of observation j), $e_{j,0}$is the relative efficiency of observation j when observation 0 is evaluated, μ_{r0}, v_{i0} are the output and input weights, respectively, associated with the evaluation of observation 0, and $\in$ is a non-Archimedean infinitesimal quantity.

[7] See Majumdar (1995) and Seiford and Thrall (1990) for empirical estimation of efficiency using DEA and exposition of details of the various models possible within the DEA framework.

The input (x_{ij}) and output (y_{rj}) factors are known quantities observed from the activities of the observations and the factor weights (μ_{r0} and v_{i0}) are the decision variables. Defining,

$$e_{j,0} = \sum_{r=1}^{R} \mu_{r0} \bullet y_{rj} \; / \; \sum_{i=1}^{I} v_{i0} \bullet x_{ij} \qquad (2)$$

yields the basic CCR DEA model.

In extending the CCR model, Banker, Charnes & Cooper (1984) [BCC] show that the CCR efficiency score can be broken up into a measure of scale efficiency, and another for pure technical, or managerial efficiency given the scale of operations each observation is presently at. This is achieved by assuming that variable returns to scale exist for firms and by adding a variable u_0 so that hyperplanes for each observation do not pass through the origin, unlike in the CCR model where all hyperplanes go through the origin because constant returns to scale are assumed. In the constraint set for the linear programming model, this variable is kept unconstrained in that it can take on values which are either negative (increasing returns to scale may exist), or 0 (constant returns to scale may exist) or positive (decreasing returns to scale may exist) for each j^{th} observation. Similarly, defining the relative efficiency measure as,

$$e_{j,0} = \sum_{r=1}^{R} \mu_{r0} \bullet y_{r_j} - u_0 \; / \; \sum_{i=1}^{I} v_{i0} \bullet x_{ij} \qquad (3)$$

where u_0 is an unconstrained decision variable, yields the BCC model.

The relative efficiency measure gives an indication of how well each firm is performing relative to its potential. Since the best firms have to score 1, on a scale of 0 to 1, the difference in scores gives management policy-makers an idea of the scope of improvement possible. Also, while DEA is ideal in multiple output-input situations, its usefulness for the present study is predicated by the fact that the

DEA algorithm generates a precise measurement of efficiency for each state-owned enterprise being evaluated, irrespective of the number of outputs or inputs.Within the DEA model two behavioral approaches can be factored in. A first assumption is that each firm conserves inputs; then, the algorithm evaluates minimal use of various inputs, with outputs generated kept constant. This is the input-conserving orientation. A second assumption is that each firm augments outputs; given a finite stock of inputs available, the firm seeks to maximize outputs that can be generated with these.

Each DEA model yields two sets of outputs. First, an efficiency score, on a scale of 0 to 1, is generated for each observation. Second, for all inefficient observations, in the input-conserving orientation an estimate of the optimal quantity of each input that each observation ought to have consumed if it was an efficient unit is generated. Similarly, in the output-augmentation orientation, an estimate of the output that each inefficient firm could have generated if it was rated as efficient is computed. The actual input consumed minus the target input that an observation ought to have been consumed is a measure of the slack in utilizing each resource. Similarly, the estimated output that can be generated minus the actual output generated gives an indication of the shortfall in output caused by inefficiency (Majumdar, 1996).

4. DISCUSSION OF RESULTS

4.1 BASIC EFFICIENCY RESULTS

To compute efficiencies and slack in resource usage for the sample of 67 state-owned, 63 private and 27 foreign-owned firms, the BCC algorithm is used. Initially, table 2 presents data on the relative efficiency scores generated. Efficiency results are reported for both the input-conserving and output-augmenting orientations. Data are given in table 2.

********** INSERT TABLE 2 HERE **********

For the 67 state-owned firms, the average efficiency score under the input-conserving (output-augmenting) orientation is 0.878 (0.886). The standard deviation is 0.136 (0.128) and the minimum score is 0.460 (0.462). The maximum score in both cases is 1.00, suggesting that in the total sample of 157 firms a number of state-owned firms are the frontier-definers, even for a sample of firms which includes private and foreign-owned enterprises in India. That some Indian state-owned enterprises are outstanding performers is acknowledged (Jalan, 1991), and firms such as Bharat Heavy Electricals, Maruti Udyog and the Steel Authority of India Ltd., which are known to out-perform their private-sector and foreign sector counterparts, are some of the state-owned enterprises which are frontier-definers in the sample.

For private firms the average efficiency score is 0.896 (0.895), while the standard deviation is lower at 0.087 (0.087). The minimum score is 0.695 (0.709), denoting lesser variance in private sector firms' performance, relative to state-owned firms. Private sector firms are, on average, superior in performance relative to state-owned enterprises, thus validating assumptions underlying the soft-budget constraints approach to evaluating private versus public sector firms' performance. The 67 state-owned and 63 private sector firms evaluated operate in similar competitive environments. In theory, the existence of competitive market forces faced by state-owned and private firms should eliminate performance differences arising from the misalignment of property rights in state-owned enterprises. In practice, the institutional environment in India has not permitted such forces to work, resulting in lower state-owned enterprise efficiency.

Foreign firms are also included in the sample, and their average efficiency score is 0.944 (0.946). The standard deviation is 0.062 (0.059), signifying that variations in efficiency patterns are much lower. The minimum score of 0.820 (0.830) also indicates that the range of inefficiency in the foreign-owned sector is much lower, when compared to the inefficiency that exists in both the private and the state-owned sectors of Indian industry. While the issue of whether foreign firms do perform better than domestic firms, whether these domestic firms are privately-owned or state-owned, is an important contemporary issue given that transition economies are wooing foreign capital. There is a literature, reviewed in Caves (1982), which postulates that because of the possession of superior capabilities foreign-owned firms are likely to perform better than their domestic counterparts. The results, prima-facie, indicate that these postulates, relating foreign firms' capabilities to performance, do seem to hold, at least in the Indian context. Nevertheless, further detailed and separate empirical investigation is warranted.

4.2 A TEST OF THE SOFT-BUDGET CONSTRAINT IDEA

The existence of a soft-budget constraint in the form of the State's deep pockets supporting non-performing state-owned firms has been made by Jalan (1991). A direct empirical test of this issue can be carried out by regressing the log of the DEA efficiency score on a variable capturing the debt-equity position of the sample of enterprises studied. The variable is constructed using information from the same data-base as that used for all the other variables. India is a nation where leverage by firms is very high, since the government has stepped in as a provider of loan capital to all shades of enterprises, to start them on a scale that the mere investment of personal and market-raised equity would not permit in a developing country. Consequently, compared to Western norms, Indian debt-equity ratios

may seem exceedingly high, and for the state-owned firms it is 110:1, while for the private sector and foreign-owned firms in the sample it is 8:1 and 5:1 respectively.

That a debt-equity ratio of 110:1 for the sample of state-owned enterprises is phenomenally high, by any absolute or relative standard, is an understatement, and reflects the enormous amount of capital that has been sunk into firms in the state-owned sector. Government not only makes periodic infusions of equity capital in the enterprises that it owns, but budgetary provisions are made annually, as a taxation charge on the people of India, so as to support enterprises periodically with loan support when their finances turn precariously shaky. Given exit barriers for firms in general, and the existence of a source of subsidy which is going to be available when times get tough, managers in such an environment are unlikely to feel pressures for attaining superior performance. Therefore, it is not surprising that the coefficient of the variable measuring the debt-equity ratio is negatively related to efficiency, and highly significant with a t-statistic of 5.14 ($p < 0.000$).

4.3 SLACK IN INPUT UTILIZATION

The basic premise of the soft-budget constraint argument is that state-owned enterprises face a relatively pressure-free environment which encourages slack in resource utilization. The DEA algorithm permits precise estimates of slack (or wastage because of inefficient use) in the use of each input for each firm that is evaluated. These estimates are calculated based on the input-conserving algorithm. The computation of slack, under the input-conserving DEA model, is based on the premise that if every firm were to be an efficient, frontier-defining firm, then it could reduce its consumption of each input by the slack amount or quantity without any corresponding loss of efficiency. The data on relative slack for the sample firms are given in table 3. Table 3 shows the average proportion that slack

bears to the optimal input consumption that ought to have been consumed by the inefficient firms, for each of the four inputs and for each of the three types of firms.

********** INSERT TABLE 3 HERE **********

Panel (a) in table 3 indicates that the average slack in the consumption of materials for all the 67 state-owned firms is 27.92 percent; in other words, firms have consumed 27.92 percent excess materials to generate their output levels. There are firms with a slack of 0. These are the frontier-defining efficient firms. The maximum slack in material consumption among the state-owned firms is 117.19 percent, suggesting that the firm in question consumes well over double the needed amount of materials that it ought to, to generate the output it does. Panels (b) and (c) show similar computations for the private and foreign-owned firms respectively. For private firms the average excess materials consumption is 17 percent, while for foreign-owned firms it is 11 percent. State-owned firms excess materials consumption is, therefore, on average one-and-a-half times more than that of private sector firms, and over double that of foreign firms.

With respect to factor payments for the use of human capital, the sample of Indian state-owned enterprises incur, on average, 47.60 percent more expenditures than they need to incur to generate the levels of output that they do, and there is the egregious case of one enterprise which incurs 217 percent more expenditures than what it should be incurring. Comparative data show that the average excess payments for human capital usage in the private sector is 21 percent, while in the foreign-owned sector it is 13 percent. That there is slack in all sectors of Indian industry, state-owned, private or foreign-owned, is not in doubt. A glance at the data in table 3 also reveals that among the four inputs state-owned, private and foreign-owned enterprises have the highest average slack with respect to human

capital utilization. With respect to human capital usage, however, the Indian state-owned sector is twice as bad, at the very least, compared to the other sectors. Sanctity of employment is high in the state-owned sector which is coupled with a labor policy making terminations impossible, and these can be factors contributing to the excesses in payments being made for the usage of human capital.

Usage of other operating items refers to expenditures on selling, distribution and administrative overheads. The average proportion of slack with respect to the usage of other operating items is similar to that of materials usage. However, analysis of slack in the usage of physical capital is germane, given that the sample of state-owned enterprises studied is extremely capital intensive compared to the private and foreign-owned firms in the sample. The average slack in fixed capital usage is 29.45 percent for the state-owned enterprises, and, after the level of slack in human capital usage, is the next highest revealed level of slack in the utilization of any of the inputs. Thus, labor and capital are the two inputs most mis-utilized by the Indian state-owned sector. The private and foreign-owned sectors are less profligate, and the level of slack in fixed capital usage is no worse than that of slack in the usage of any of the other inputs.

Some reasons are posited as to why usage of fixed capital may be as revealed. Economic historians have pointed to the trading orientation of much of Indian industry (Bagchi, 1972; Ray, 1979). A commodity ethos has simultaneously pervaded the state-owned sector since many enterprises were set up to correct for potential market failures in specific industries (Jalan, 1991). Ray (1979) has noted that managers in Indian industry tend to regard technology as a commodity to buy. To regard technology, as embodied in plant and machinery, as any other commodity-type asset to merely purchase fails to recognize the critical role of embodied knowledge in enhancing output, and short-

shrift is likely to be given to fixed capital assets. Such predilections are reflected in the relative profligacy with respect to fixed capital utilization in the state-owned sector. Conversely, foreign firms bring in technology utilization capabilities into another country (Caves, 1982), and the data showing that the sample foreign firms do have relatively low slack in fixed capital usage, compared to domestic firms, bears out the proposition.

While the results so far give an idea of the relative extent of slack, the absolute magnitude of slack is also estimated. The quantity of slack, or the value of excess inputs consumption by the sample firms are shown in table 4.

********** INSERT TABLE 4 HERE **********

In table 4, for each of the sets of firms, the total values of excess inputs consumed, with respect to each of the inputs, as well as details of the average value of excess consumption of inputs by firms in the sample are given. The 67 state-owned firms in the sample have over consumed Rs 8.53 billion worth of materials, have made payments to unproductive human capital of Rs. 8.45 billion, consumed excess of other operating items to the tune of Rs. 2.25 billion and have consumed Rs. 10.70 billion of capital assets without any productive outcomes. The total of excess inputs consumed, for all four inputs, by the 67 state-owned firms is Rs. 30 billion. If 67 firms in the sample consume excess resources to the tune of Rs. 30 billion annually, then the state-owned enterprises in India are probably consuming in total, say, at least Rs. 50 billion in inputs unproductively. Similar details for the 63 private sector and 27 foreign-owned firms in the sample are given in the table for readers to review.

Table 4 also shows that, on average, each sample state-owned enterprise spends, unproductively, Rs. 203 million on materials, Rs. 201 million on human capital, Rs. 53 million on other

operating items, and Rs. 255 million as fixed capital consumed. The point has already been made that the private and foreign-owned sectors are not fully-efficient themselves; for example, with respect to human capital usage, sample private sector and foreign-owned firms do incur excess expenditures of Rs. 13.5 and 15.1 million respectively. These firms are generally smaller, as table 1 data have shown. Nevertheless, the average size differential of the sample state-owned firms is four times vis-a-vis private sector firms in the sample, and three times vis-a-vis foreign-owned firms, while the average excess spending by state-owned firms is fourteen times that of private and thirteen times that of foreign-owned firms.

4.4 SLACK IN OUTPUT GENERATION

The output-augmenting DEA algorithm helps estimate slack in output generation. For each inefficient firm, an estimate is made of the total value of output it could have generated given its existing consumption of inputs if it was rated as efficient. These estimates help in gauging the shortfall in output generation that inefficiency causes. Details are given in table 5.

********** INSERT TABLE 5 HERE **********

Panel (a) reports relative results: the proportion of increased output that could be generated by the inefficient firms with their current inputs if they were efficient. State-owned firms could increase their outputs from current levels by over 25 percent. Private sector and foreign-owned firms could do so by 17 and 11 percent respectively. Panel (b) shows the actual value of output shortfalls caused because of inefficiency. The total amount of output shortfall for the 67 state-owned firms in the sample is Rs. 29 billion, while the corresponding values for private and foreign firms are Rs. 7.6 billion and Rs. 2 billion respectively.

The average output value shortfall statistic per firm is also interesting and relevant. State-owned firms' output fall short, on average, by Rs. 693 million, while the corresponding values for private and foreign-owned firms are Rs. 162 million and Rs. 132 million respectively. For state-owned firms, these shortfalls are over four and five times larger than that of private and foreign firms. These numbers closely correspond to the actual size differential of four and three times respectively between state-owned and private and foreign firms. Nevertheless, if the sample state-sector firms' average output shortfall is aggregated, the total output losses caused by these firms' inefficiency could easily touch Rs. 75 billion and is massive.

5. CONCLUDING COMMENTS

The research reported in this paper has evaluated resource utilization patterns for a sample of 67 state-owned enterprises in India. These firms employ 1.57 million out of a total of 2.3 million persons employed by central government-owned state enterprises, and their performance was compared with a sample of 63 privately-owned Indian firms and 27 foreign firms operating in India. In comparison with private sector or foreign-owned firms operating in India, the state-owned firms studied are shown to be relative mis-utilizers of both human and physical capital.

All the firms analyzed operate in equally-competitive environments. Therefore, if competitive forces are supposed to eliminate performance differences between public and private sector firms, as literature suggests, such is not the case in India. The postulates of industrial organizational literature used to evaluate performance differences across ownership categories, therefore, have to additionally take into account institutional forces which influence firms' behavior. A way to include institutional

factors in the analyses is to consider how soft-budget constraints also impact relative performance differences between firms.

In developing countries like India state-owned enterprises account for a bulk of industrial activity. Privatization is not a panacea for improving state-owned enterprises' performance if other institutional reforms, which eliminate soft-budget constraints, are not simultaneously carried out. In India, two institutional factors have been key in generating soft-budget constraints. The primary factor affecting firm-level behavior has been protection from corporate death. Private firms are not allowed to die; they become state-owned enterprises instead. This factor has been coupled with the secondary factor of cheap capital funded by the state which also owns the premier financial institutions in India.

Consequently, the wastage in resource utilization is very high, relative to comparable private sector and foreign-owned firms. For example, in generating existing output levels the sample state-owned firms consume excess resources to the tune of Rs. 30 billion annually. Conversely, with the capital, manpower and other operating assets already in place, improvements in efficiency can increase annual output by Rs. 75 billion. The magnitude of waste analysis reveals is extremely large and ill-affordable by any country. The value of the resources that have been wasted over time does not bear thinking about. Two policy recommendations follow immediately. The first is the design of an appropriate exit policy for firms which allows the closing-down of non-viable businesses, tempered, of course, by appropriate social-policy design. The second is the elimination of the cost-of-capital subsidy to state-owned enterprises.

This research has not been confined to the public sector alone, while ignoring Indian private sector or foreign-owned firms. For the privatization doctrine to be strengthened, there is need to

examine firms in the private and the public sector jointly. While the soft-budget constraint idea applies to private and state-owned firms alike, private firms face sets of pressures which have alternate behavioral implications. The differential impacts of these shed light on the comparative economic outcomes possible with different institutional regimes, and generate insights which policy makers can base their decisions on. For example, the results indicate that privatization can turn out to be relatively successful in the Indian context, since greater firm-level efficiency and lower consumption of inputs is associated with private enterprises. Similarly, the entry of foreign firms into India ought to be encouraged, since these are likely to be relatively superior performers, and the downstream productivity-spillover consequences of such entry decisions can be quite significant for an command-economy in transition such as India.

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Table 1: Descriptive Statistics (Rupees Million)

Variable	Mean	Standard Deviation	Minimum	Maximum
Panel (a): Sample of 67 State-Owned Enterprises				
Gross Output	5960.4	10304.0	62.0	78196.3
Material Usage	2347.1	4891.4	0.0	36857.4
Human Capital Usage	1104.2	1806.9	21.8	10074.7
Usage of Other Items	433.7	828.2	1.0	6070.4
Capital Usage	1817.8	3193.8	10.6	21744.4
Panel (b): Sample of 63 Private Sector Enterprises				
Gross Output	1524.7	1896.5	70.2	8448.7
Material Usage	835.3	1074.3	11.3	6079.4
Human Capital Usage	124.9	181.0	3.3	1006.7
Usage of Other Items	347.5	512.9	12.7	2803.4
Capital Usage	66.0	129.3	1.0	708.9
Panel (c): Sample of 27 Foreign-Owned Enterprises				
Gross Output	2173.1	3130.6	112.8	15163.5
Material Usage	1426.0	2187.4	10.8	10253.7
Human Capital Usage	168.8	200.9	5.2	761.3
Usage of Other Items	365.4	526.7	10.7	2704.7
Capital Usage	31.4	46.2	0.3	191.9

Table 2: Efficiency Scores Generated by the DEA Algorithms

Score	Mean	Standard Deviation	Minimum	Maximum
Panel (a): Sample of 67 State-Owned Enterprises				
Input Conserving Score	0.878	0.136	0.460	1.000
Output Augmenting Score	0.886	0.128	0.462	1.000
Panel (b): Sample of 63 Private Sector Enterprises				
Input Conserving Score	0.896	0.087	0.695	1.000
Output Augmenting Score	0.895	0.087	0.709	1.000
Panel (c): Sample of 27 Foreign-Owned Enterprises				
Input Conserving Score	0.944	0.062	0.820	1.000
Output Augmenting Score	0.946	0.059	0.830	1.000

Table 3: Estimates of Slack: Relative Amounts (Percent of Optimal Input)

Input	Mean for Inefficient Enterprises	Minimum	Maximum
Panel (a): Sample of 67 State-Owned Enterprises			
Materials Usage	27.92	0.00	117.19
Human Capital Usage	47.60	0.00	217.03
Usage of Other Items	27.92	0.00	117.21
Capital Usage	29.45	0.00	117.19
Panel (b): Sample of 63 Private Sector Enterprises			
Materials Usage	17.02	0.00	43.74
Human Capital Usage	20.91	0.00	74.89
Usage of Other Items	18.23	0.00	43.73
Capital Usage	17.03	0.00	43.74
Panel (c): Sample of 27 Foreign-Owned Enterprises			
Materials Usage	11.53	0.00	21.83
Human Capital Usage	13.23	0.00	26.60
Usage of Other Items	11.53	0.00	21.84
Capital Usage	11.56	0.00	21.84

Table 4: Estimates of Slack: Actual Amounts (Rupees Million)

Input	Total Amount	Mean for Inefficient Enterprises	Minimum	Maximum
Panel (a): Sample of 67 State-Owned Enterprises				
Material Usage	8524.1	202.9	0.0	629.5
Human Capital Usage	8448.3	201.1	0.0	1303.1
Usage of Other Items	2224.6	53.0	0.0	253.7
Capital Usage	10697.2	254.7	0.0	1346.2
Panel (b): Sample of 63 Private Sector Enterprises				
Material Usage	4228.1	90.0	0.0	327.3
Human Capital Usage	634.1	13.5	0.0	61.7
Usage of Other Items	1976.9	42.1	0.0	449.1
Capital Usage	241.3	5.1	0.0	31.1
Panel (c): Sample of 27 Foreign-Owned Enterprises				
Material usage	1078.8	71.9	0.0	182.7
Human Capital Usage	225.8	15.1	0.0	57.4
Usage of Other Items	388.4	25.9	0.0	84.0
Capital Usage	49.5	3.3	0.0	14.9

Table 5: Estimates of Output Shortfall

Panel (a): Relative Amount (Percent of Actual Output)

	Mean for Inefficient Enterprises	Minimum	Maximum
Sample of 67 State-Owned Enterprises	25.45	0.00	116.61
Sample of 63 Private Sector Enterprises	17.09	0.00	41.10
Sample of 27 Foreign-Owned Enterprises	10.95	0.00	20.46

Panel (b): Actual Amounts (Rupees Million)

	Total Amount	Mean for Inefficient Enterprises	Minimum	Maximum
Sample of 67 State-Owned Enterprises	29121.9	693.4	0.0	2854.4
Sample of 63 Private Sector Enterprises	7634.7	162.4	0.0	624.4
Sample of 27 Foreign-Owned Enterprises	1982.0	132.1	0.0	350.6