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# HAS PRIVATIZATION PROMOTED EFFICIENCY IN ETHIOPIA? A COMPARATIVE ANALYSIS OF PRIVATIZED INDUSTRIES VIS-À- VIS STATE OWNED AND OTHER PRIVATE ESTABLISHMENTS

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## Abstract

*There has been still a debate about the efficacy of privatization for economic transformation of countries. Nonetheless, many developing countries including Ethiopia have privatized public owned enterprises as a manifestation of their commitment to implement the reform packages induced by multilateral institutions through the Structural Adjustment Program. The proponents for pro-privatization strongly argue that private enterprises operate more efficiently than those that are owned by the state. The main objective of this paper is, therefore, to assess the extent to which privatized industries operate more efficiently as compared to those that remain under the public domain and other private industries. A Cobb-Douglass stochastic frontier production function is estimated for the group and separately for privatized industries. The econometric result revealed that the average technical efficiency for the whole sample was about 73.4% during the period 1998/99-2001/02. Privatized industries were found relatively inefficient with a score of 69%, while public and other private industries reported 75% and 71%, respectively. It was also found that efficiency of privatized enterprises continuously declined during the same period. It is an indication, at least in the Ethiopian context, that privatization may not necessarily ensure efficiency gain. Thus, government should revitalize its hasty move towards transferring public enterprises to private hands.*

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## **I. INTRODUCTION**

Privatization has been practiced in several countries for many years. It later emerged as an economic order induced by multilateral financial institutions as part of the overall reform package of the Structural Adjustment Program. In the same manner privatization was introduced in Ethiopia in 1994 as one component of the overall reform program, which substituted central planning with market-driven economic system. Government found it necessary to revitalize the crucial role of the private sector in general and getting rid of loss making and overstaffed state owned enterprises (SOEs) in particular to curtail unproductive resource drain and promote economic development. This is based on a widely held view among proponents of the market economy that effects of property right and public-agent problems are non-existent or marginal in the private sector as against the case in the public sector. This makes it possible for the private sector to make an effective management for efficient operation of business enterprises.

However, some might argue otherwise. If adequate measures are taken to create a level ground for fair and free competition between public and private firms, and the later acquire autonomy with a challenge to determine their existence through market forces, privatization may not be necessary. The relocation might even deteriorate the conditions of privatized industries if the new owners or their managers do not have a priori experience and adequate information on how to effectively manage privatized enterprises by taking into account their peculiar conditions. Profit maximization being their prime motive, private entrepreneurs may lay off workers, whose social cost may not be bearable in countries such as Ethiopia.

Since the Ethiopian private sector is weak and fragile, there would be many gaps if government withdraws from and leaves the economy to individual entrepreneurs. Thus, the role of the state should not be limited to the provision of certain economic and social infrastructures, but go as far as investing in areas where the private sector is unable to involve due to fear of long gestation periods, huge capital requirements and less profitable in pure financial terms. It should also maintain large ventures under its disposal, the privatization of which might cause social shocks in the process of restructuring. This could create additional production capacity and employment opportunities in the economy.

Given the controversies on the need for privatization, the issue of whether it has achieved the intended result or accentuated inefficient operation of firms and causing

unintended social costs are the focuses of discussions in countries which underwent this process. The objective of this paper is also to assess, among other things, the extent to which privatized firms operate more efficiently as compared to state owned enterprises and how much are they comparable in efficiency terms to other private sector firms in the Ethiopian context.

Due to data limitations, the analysis on efficiency entirely focuses on the manufacturing sector and the main data source for this purpose is the Central Statistical Authority. One hundred twenty eight industrial establishments, which have a four year (1998/99-2001/02) uninterrupted data on key variables, have been selected for the discussion. Industries are drawn from nine industrial groups and consisted of ten privatized, seventy nine privately owned (not transferred from the public sector) and 31 public owned firms. All the industrial groups have at least one establishment from the three types of mode of ownership. The source of information for other discussions is primarily the Ethiopian Privatization Agency.

## II. LITERATURE REVIEW

Scholars define privatization in different ways. Young (1991) in Kumssa (1996) defined privatization as follows.

*..... Privatization can be defined both in its narrow and broad meaning. In its narrow meaning, it simply entails a shift of production activities or services being undertaken by the public sector to private ownership or control. In its broader meaning, it refers to a process by which the state's role within the economy is circumscribed while at the same time the scope for the operation of private capital is deliberately extended (1991:50).*

In other words, privatization, in its broader context, is the process of lessening regulations and facilitating a shift of ownership and economic management from public domain to the private sector. The second one, which is the focus of this paper, entails physical transaction of industries and there by transferring property rights from public to private.

The theoretical foundation for pro-privatization process bases on the different strands of the literature on government failure to efficiently guide the functioning of economic agents. As pointed out in Cook (1997), public-owned agencies poorly perform due to differences in the interests of bureaucrats and politicians. The principal agent theory

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also explains that due to divergence of the goals of the agent (employees) and the principal (government as an owner); there may not be an agreement between the two on the mode of operation of enterprises. It also becomes difficult for the government to make an effective monitoring due to information asymmetry. Lack of clearly defined property rights has also been considered as a major reason for weak organizational structure and managerial activities, which led most SOEs to inefficiency.

According to Porta and Silanes (1999), the critical agency conflict could emanate either of the two: managers or politicians. Managers may lack either the incentive or proper monitoring to handle SOEs. The other equally possible cause could be high political interference in the firm, which results in excessive employment, poor choice of product and location, and lack of investments. According to these theories, government should make a rational choice between those types of activities that have serious agency and property right problems, hence, that have to be transferred to the private sector, and those which should remain under the public domain such that economic efficiency would be ensured at a national level.

Naya (1990) attributed the following reasons for the privatization drive.

- (i) There is a host of empirical evidence supporting that market-based economies have done significantly better than countries with unrestrained government interventions.
- (ii) Developing countries face fluctuating export earnings, balance-of-payment problems, fiscal imbalances, diminishing inflow of external capital and protectionist policies of developed countries. They now recognized the potential contribution of the private sector in harnessing their economies and in coping up with the changes in the international economic environment.
- (iii) Public owned enterprises largely suffer from budget deficits and public debts, which have become too much of a financial burden on the state. Many countries, thus decided that the state should withdraw from economic activities that can be possibly handled by the private sector.

Gulilat (1994) indicated also the need for reducing budget deficits created by subsidizing loss making SOEs, raising additional revenue through non-tax system to finance the growing investment need of the public sector; reducing the size and improving the performance of the public sector, and facilitating the expansion of the private sector are common rationales behind privatization. The state should withdraw itself from business ventures and focus on the provision of public and merit goods

(education, health, defense, public order, etc.) the development of social overhead (transportation, communications, power system, etc.) and on the institution of a transparent legal and regulatory framework. This will facilitate the dissemination of information, stifle discretionary practice of bureaucracy, induce efficient allocation of resources, promote scientific and technological R&D activities, and consequently bring speedy development of the economy.

Despite the attempt to give theoretical rationale and empirical backing, international financial institutions are behind the move for privatization in most developing countries. According to Kumssa (1996), World Bank and IMF imposed a condition on Sub Saharan African countries to privatize their public enterprises, if they are to qualify for stabilization and structural adjustment funds. This position of the World Bank was explicitly discussed in its report entitled *Bureaucrats in Business: The Economics and Politics of Government Ownership* (1996). According to this report, only a handful of SOEs perform well but wealth anecdotal evidences suggesting that many of them do not. Private enterprises are generally more efficient. SOEs contribute to fiscal deficit, inflation and ultimately lower economic growth. The larger SOEs, the lower would be its growth. Thus, countries should consider privatization as a strategy to boost their economy.

Shapiro and Willing (1990) do not accept this gross generalization and policy implication of the World Bank. They argue that higher profitability of privatized firms has come at the expense of the rest of the society through the exploitation of market power. State-owned enterprises help to curb market failures by implementing pricing policies that take account of social marginal costs. While privatizing enterprises, the apparent positive outcome might appear to be financial profitability but workers bear the burden of restructuring through layoffs and wage cuts.

Cook (1997) argues that the propositions of property right and principal-agent theories are based on unrealistic assumptions which include the existence of efficient capital market and perfect flow of information for private shareholders, which could make effective monitoring and ensure managerial efficiency. Sub-optimal monitoring of agents by principals could occur even in countries with reasonably well functioning markets in industrialized countries. In the developing world, markets are fragmented and underdeveloped. Neither is the private sector strong. The pursuit of short-term benefit by enterprise managers, lack of viable takeover threats and lopsided shareholder distribution make performance monitoring difficult and widen the scope for free ridden opportunities.

As Chang and Singh (1997) claim public sector to be the backbone of an economy. They argue that large private sector firms, which are found in financial trouble also, get rescued or even nationalized by the government in many countries, when political costs of their redundancies and bankruptcies are expected to be large. Enterprises, which are currently making losses, may be generating foreign exchange. They may be subsidizing private sector enterprises by supplying intermediate products at a very low price. According to them, the position of the World Bank (1995) fails to take account of these attributes of SOEs.

Bayliss and Fine (1998) also reflect a similar view that the pressure to privatize comes from an unfounded belief in the superiority of the private sector, a neglect of the pre-conditions required for privatization to be successfully managed and a neglect of the broader social, political and economic environment in which privatization is located. Public enterprises are established not only to make profits but also to achieve some social objectives such as creating employment, providing low-priced goods to benefit the poor, improving the economic conditions of particular regions and the like. SOEs may deviate from profit maximization or societal objectives because of political grounds. In many developing countries, managers are often appointed to their posts based on their ethnic background, political orientation or party loyalty than their qualification or merit. Incompetent managers deter proper functioning of SOEs [Kumssa, 1996]. While market forces did not bring about the intended changes in many Sub Saharan African countries, South Korea, Japan and the East Asian tigers became successful through government intervention including subsidy to their exporting firms. The World Bank (1994) itself revealed that out of 29 Sub-Saharan countries which had adopted the structural adjustment program including privatization, the economic conditions of 11 had deteriorated and 9 others showed only a little improvement.

A pioneer study was conducted by Rebeka (2001) in the Ethiopian context aiming at comparing the technical efficiency of 25 privatized industries before and after privatization. She found a mixed result. While privatization had a positive effect of improving technical efficiency in the food processing industries, it had a negative effect the beverage, textile and leather sectors. For non-metal, wood, printing and chemical industries, privatization had neither a positive nor a negative effect on efficiency. She considered the period between 1992/93 and 1998/99. The first few years, when these industries were under government ownership, were characterized by stabilization and rehabilitation which had been highly affected due to the civil war. During this period, the industrial sector was not expected to function at its normal

swing. Situations calmed down in the subsequent years and steady state of operation was anticipated to take-off. Given this difference in the working environments during the post and pre-privatization periods, one would have expected the stabilization process could create a positive bias towards improving efficiency during the later period. Despite this expectation, many privatized industries performed less efficiently in the later period than the case otherwise.

The on going debate and contentious positions of scalars and multilateral organizations and above all the mixed empirical findings including the case in Ethiopia inspires to reexamine the effect of privatization on efficiency from another angle.

### **III. PRIVATIZATION IN ETHIOPIA: SOME REFLECTIONS**

#### **3.1 The number and Composition of Privatized Enterprises**

The Ethiopian Government launched the Privatization Program in accordance with Proclamation No.87/1994. The official objectives of privatization in Ethiopia are

- To promote the economic development of the country through encouraging the expansion of the private sector,
- To generate revenue required for financing development activities undertaken by the government,
- To change the role and participation of the Government in the economy to enable it exert more effort on activities requiring its attention.

To realize these objectives, government established the Ethiopian Privatization Agency by law and subsequently privatized public enterprises of different size and operating in different economic sectors. Between the period of initiating the process and 2001/2002 (Ethiopian Fiscal Year), around 223 public enterprises were transferred to the private sector. About 60 percent (or 133) of these enterprises were small firms operating in the retail trade sector. Large and medium scale industries constituted around 17% (40). Agricultural enterprises, hotels and tourist attractions sites and mining enterprises held a share of 13 percent, 8 percent and 0.4 percent respectively.



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**Table 1: Privatized Public Enterprises (1994/95 – 2001/02)**

Sector	Privatized Enterprises		Transferred to		Investors Share %	
	Number	% share	Domestic Investors	Foreign Owners	Domestic	Foreign
Manufacturing	40	17	31	9	77.5	22.5
Agriculture	31	13	15	16	48.4	51.6
Hotel & Tourism	18	8	17	1	94.4	5.6
Retail Trade	133	60	133	0	100.0	0.0
Mining	1	0.4	0	1	0.0	100.0
Total	223	100	196	27	87.9	12.1

Source: Ethiopian Privatization Agency (2002)

According to EEA (2002), the total contractual value of the 223 enterprises was about birr 3,496.3 million. Birr 2977.1 million (86% of the commitment) was settled during the same period. Regardless of having a significant share from the total number of privatized establishments, the revenue collected from retail shops was not more than 6 percent. Manufacturing industries and one enterprise from the mining sector constituted about 79 percent of the total revenue collected from privatization. The total amount of proceed collected from privatization was equivalent to 12.5% of the total investment outlay in the country during the same period. Other things remaining the same, had it not been for privatization, this amount of additional new investment could have augmented the existing capacity of the economy rather than being used merely for transfer of ownership.

**Table 2: Number of Privatized Industries**

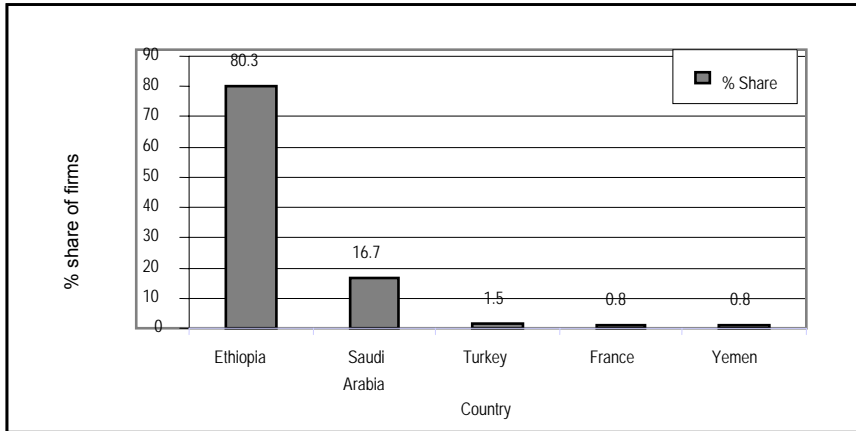
Period	No. Enterprises Returned to Previous Owners	Privatized Enterprises	% share
1994/95		12	5.4
1995/96		122	54.7
1996/97		27	12.1
1997/98		15	6.7
1998/99	5	13	5.8
1999/00	4	22	9.9
2000/01	4	10	4.4
2001/02	1	2	0.9
Total	14	223	100

Source: Ethiopian Privatization Agency, (2002).

The process of privatization has not been steady. 122 (54.7%) public firms were transferred to the private sector only in 1995/96. It took six additional years to privatize the remaining 89 (41.3%) enterprises. After the year 2001/02, no significant event has been observed.

Although FDI has its own shortcomings, it plays important roles in terms of, for instance, the transfer of technology, market access and exchange of experience in business management.

**Fig 1: Share of Owners of Privatized Firms by Country of Origin**



Source: Ethiopian Privatization Agency (2002).

The sale of public firms is one of the most important venues of entry for foreign direct investment (FDI). Most state owned enterprises, which have been ready for privatization, are found in accessible areas, with relatively developed infrastructural facilities. Albeit other attributes of these firms, privatization provides leverage over investments on the establishment of new enterprises and thus possibly attract FDI in countries such as Ethiopia where access to infrastructural services is a painstaking undertaking in terms of time and cost. Nonetheless, privatization has failed to attract meaningful FDI in Ethiopia and thus contributed little to create dynamic private sector. Ethiopian investors have held about 80% of all the privatized firms, albeit their share from the total commitment has been about 70%, or 2338 million birr.

The total FDI coming to Ethiopia through privatization was not more than 30%. Except the Saudi Arabians, in particular MIDROC that acquired relatively many firms,

and one each from Turkey and France, no tangible FDI has come to Ethiopia from the rest of the world.

### **3.2 Effects of privatization: Some insights**

It is not a simple venture to provide a clear picture and conclusive evidence on the effects of privatization in the overall economy. Nonetheless, there are some observable effects for discussion. The prime motive of private firms is profit maximization and they tend to employ lesser workforce per machine or use modern technologies, which are relatively capital intensive. It is clearly demonstrated in Table 3 below that among selected industries for this particular study, privatized enterprises and other private firms engaged lesser number of labor force per one birr worth of fixed asset as a compared to state owned enterprises.

**Table 3: Capital-labor composition of selected industries for 2001/02**

<b>Indicators</b>	<b>Privatized firms</b>	<b>Other private firms</b>	<b>Public firms</b>
Fixed asset per person engaged in birr	74980.47	108115.6	69270.77
Machinery and equipment per person in birr	28574.73	59542.86	39141.64
Share of machinery and equipment from total fixed asset	0.381096	0.550733	0.565053

Source: Own Calculation.

Nevertheless, the value of machinery and equipment employed per person in privatized enterprises was significantly lower compared to state owned enterprises. The situation was even worse in the case of asset combination. Productive assets, machinery and equipment, constituted less than 60% of the total value of fixed assets in all modes of ownership and yet it was about 38% in the case of privatized firms. Unless these industries have been labor intensive, which might be possible as it could be examined vis-à-vis other private firms, the prevailing input combination is likely to lead them to rampant inefficiency. This might have inspired privatized firms to lay-off some of their workers, such that they could balance their resource mix and become efficient.

According to EPA (2002), the number of employees of privatized enterprises was 15370 before they were transferred to private hands. This figure has declined by 12% and became 13537 as of July 2002. Had not they created job opportunities for 896 new workers, the number of their workers could have been lower by 2729 (18%).

Controversial views might arise on this outcome. Most of the reduction was from the manufacturing sector.

**Table 4: Manpower Situation of Privatized Enterprises**

Sector	Transferred workers when privatized	Workers, July 2002	Difference	
			in number	in %
Agriculture	760	603	-157	-20.7
Manufacturing	14036	12474	-1562	-11.1
Hotels	170	145	-25	-14.7
Trade	334	241	-93	-27.8
Mining (Water )	70	74	4	5.7
Total	15370	13537	-1833	-11.9

Source: Ethiopian Privatization Agency (2002).

One could argue that maintaining an optimal combination of labor and capital through reducing the number of workers has a long-run societal benefit over and above its direct effect on improving efficiency of privatized firms. Although measures taken by privatized firms might affect some workers in the very short-run, larger number of people would benefit from the spill-over effect of their efficient operation in the long-run.

Conversely, some might argue that there is no any guarantee of compensating the social cost that some workers have been paying in terms of losing their livelihood. The prevailing trend is rather dim. The additional number of job opportunities that have been created in the medium and large scale industries could by no means compatible to the demands of the growing urban job-seekers leave alone contributing towards changing the lopsided economic structure in terms of creating gainful employment to the bulk of disguisedly employed labor force in the rural areas [CSA, Various Years].

Curbing budget deficit either through avoiding loss making enterprises or generating revenue from the sales of public enterprises is one of the rationales for privatization. As a policy, government avoided incentives to public firms in the form of financial subsidy. There is no gain that the country could anticipate by curtailing resource drain towards loss making public firms through privatization. In terms of generating revenue, privatization proceeds accounted about 10-21% of non-tax revenue and about 4 – 8% of the overall government revenue, excluding grants.

**Table 5: Government Revenue and Expenditure (1995/96 – 1999/00)**

	1995/96	1996/97	1997/98	1998/99	1999/00
<b>Revenue</b>					
Total Revenue (excluding grants) (TR)	6966.2	7878	8400	9453	10084
Non Tax Revenue (NTR)	2242.9	2519	3139	3862	3637
Privatization Proceeds (PP)	0	347	312.5	800	650
PP as % of NTR	0	13.77	9.955	20.72	17.87
PP as % of TR	0	4.405	3.72	8.463	6.446
<b>Expenditure</b>					
Current	5582.2	5717	7095	10127	13747
Capital	3705.4	4300	4265	4430	3426
Total	9287.6	10017	11360	14557	17173
Budget Deficit	-1225	-636	-1687	-3341	-5365

Source: National Bank of Ethiopia; Quarterly Bulletin, (Vol. 17, No.1, 2002).

Nonetheless, against greater expectations, the budget deficit has been increasing particularly since 1997/98. During this period, border conflict and other factors might have negatively contributed for the budgetary imbalance. Although it is difficult to segregate the amount of revenue that government got from privatized firms through taxes, one could safely argue that the privatization process has contributed little to shape the fiscal structure of the country.

### **3.3 Model Specification and Estimation Procedures**

A Cobb-Douglas stochastic frontier production function would be estimated both for the entire sample and separately for privatized firms through the ordinary least squares (OLS) and maximum likelihood (MLE) estimation. Cobb-Douglas production function is selected merely because of its simplicity and appealing characters of its coefficients for interpretation.

Aigner, Lovell and Schmidt (1977) proposed a Cobb-Douglas type stochastic production function for cross section analysis of the form

$$\ln(y_i) = x_i\beta + v_i - u_i, \quad i=1, 2, \dots, N. \quad (3.1)$$

where  $y_i$  is the logarithm of output for the  $i^{\text{th}}$  firm,  $x_i$  is  $(k+1)$  row vector, representing input quantities,  $\beta_i$  is a  $(k+1)$  column vector of unknown parameters to be estimated,

and  $v_i$  represents the conventional error term capturing random or exogenous positive and negative shocks attributed to weather, strikes, luck, unspecified input variables, etc.  $V_i$  are assumed to be i.i.d with  $N(0, \sigma_v^2)$  independently of the  $u_i$ s.  $u_i$  is a non-negative random variable, associated with technical inefficiency and assumed to be i.i.d exponential or half-normal random variable.

Based on the works of Aigner, Lovell and Schmidt (1977), Pitt and Lee (1981), and Battese and Coelli (1992) propose a stochastic frontier production function for panel data having the usual stochastic error term, exogenous to the system and one that represents firm level technical inefficiency effects. The later is to be distributed as half-normal or truncated normal random variable and assumed to systematically vary over time. The generic representation of the model is:

$$\ln(Y_{it}) = X_{it}\beta + V_{it} - U_{it}, \quad i = 1, 2, \dots, N; \quad t = 1, 2, \dots, T; \quad (3.2)$$

where

- $Y_{it}$  is the output of the  $i^{th}$  firm at the  $t^{th}$  time period;
- $X_{it}$  denotes a (1XK) vector of (transformed) input values and other associated variables;
- $\beta$  is a (KX1) vector of unknown scalar parameters to be estimated;
- $V_{it}$  are the usual random errors, measuring the positive and negative effects of exogenous shocks, assumed to be i.i.d with  $N(0, \sigma_v^2)$  independently of the  $U_{it}$ s; and
- $U_{it}$ s hold non-negative values which are assumed to account technical inefficiency in the model.

$V_{it}$  and  $U_{it}$  are the two components of the commonly observed error term in econometric specifications,  $e_{it}$  and thus  $\sigma_e^2 = \sigma_v^2 + \sigma_u^2$ . The variance share of the technical inefficiency term from the total variance is represented as

$$\gamma = \sigma_u^2 / \sigma_v^2 + \sigma_u^2 \quad (3.3)$$

Technical efficiency for  $i^{th}$  firm in the  $t^{th}$  time period is defined by,

$$TE_{it} = \exp(-u_{it}) \quad (3.4)$$

There are two different views about the possibility of changing values of technical inefficiency with time. Some assume that weaknesses that are attributable to firms are inherently persistent in their very nature and the resultant technical inefficiency of firms remains constant. Time-invariant technical inefficiency effects are:

$$u_{it} = u_i, \quad i = 1, 2, \dots, N; t = 1, 2, \dots, T \quad (3.5)$$

Nonetheless, firms are not dormant. They could change their mode of input use management with time. Accordingly, Battese and et al (1998) defined technical inefficiency effects as a function of time. The relationship is expressed as:

$$u_{it} = \{\exp[-\eta(t-T)]\}u_i, \quad i = 1, 2, \dots, N; t = 1, 2, \dots, T \quad (3.6)$$

$U_i$  are assumed to be i.i.d as the generalized truncated normal random variable,  $N(\mu, \sigma_u^2)$  and represent technical inefficiency effects for  $i^{th}$  firm in the last period of the panel. Equation 3.6 expresses technical inefficiency effects of the firm for earlier periods as the product of technical inefficiency effects of the last period and the value of the exponential function,  $\exp[-\eta(t-T)]$ . If the parameter  $\eta$  has a more than zero value,  $-\eta(t-T)$  would be greater than zero and subsequently the exponential function provides a value greater than one. In such cases, technical inefficiency effects in earlier periods would outweigh the case during the last period of the panel,  $u_{it} > u_i$ . If the value of  $\eta = 0$ , technical inefficiency effects of  $i^{th}$  firm do not vary over time,  $u_{it} = u_i$  and if  $\eta < 0$ , then  $u_{it} < u_i$  implying technical efficiency declines over time [Ibid, 1998].

On the basis of these theoretical foundations, a Cobb Douglas specification of stochastic frontier production function of selected medium and large scale industrial enterprises for the period 1998/99 -2001/02 is represented below in equation (3.7).

$$y_{it} = \beta_0 + \sum_{j=1}^3 \beta_j x_{jit} + v_{it} - u_{it}, \quad (3.7)$$

where  $i = 1, 2, \dots, N$ , representing industrial enterprises, and  $N=148$  and  $t = 1, 2, 3, 4$ , representing the time period between 1998/99 to 2001/02, and  $j = 1, 2, 3$  denote explanatory variables incorporated in the equation. Variables,  $y_{it}$  and  $x_{jit}$  denote log of output and factor inputs respectively.

Based on Battese and et al (1998), the model assumes time variant technical inefficiency effect. The probability distributions of both  $v_{it}$  and  $u_{it}$  are as described above.  $\beta_j, \eta, \mu, \sigma^2, \sigma_v^2$  and  $\sigma_u^2$  are parameters to be estimated.

The log values of the following variables are considered to represent output and input in equation (3.7).

1. *Gross Value of Production ( $GV_{it}$ )*: Output of a certain enterprise could be expressed either in gross value of production or value added. Production is the result of the interplay of labor, raw materials and fixed assets, where as value added attributes all efforts to capital and labor only, disregarding the possible effects of the quality and quantity of raw materials used. Thus, in this study gross value of production is found to be a more reasonable measure of output. It is also less affected by measurement errors as compared to value added.
2. *Wages and Salaries ( $WS_{it}$ )*: Labor is a heterogeneous input not only in terms of biological make-up but also education, work experience and other similar attributes. Wages and salaries are presumed to better consider such differences and represent the extent of labor input use.
3. *Fixed capital ( $FC_{it}$ )*: It represents those assets of enterprises with a productive life of one year or more. It shows the net book value at the beginning of the reference year plus new capital expenditure minus the value of sold and disposed machineries and equipment and depreciation during the reference year.
4. *Inputs ( $Imp_{it}$ )*: Inputs include the value of principal and auxiliary raw materials by the firm.

On the basis of the MLE estimates of the Cobb-Douglass production function results technical efficiency would be estimated and comparison will be made within the different groups of firms. Specialized econometric software on stochastic frontier



estimation with the name Frontier 4.1, which was designed by Battese and Collie (1994), will be developed.

The proper way of assessing efficiency changes due to privatization would have been a before and after approach. However, the two periods are entirely different. The period prior to privatization was characterized by political instability and unfavorable condition for proper functioning of the manufacturing sector. If one goes back some six to seven years in search of a normal period, he will find a totally different political setting and economic policy regime. As a result, comparing efficiency of enterprises under different policy and working atmosphere would not give a correct picture. Beyond this, it would be a very costly and impractical venture to collect firm level data for the period of some 15 years back from now. Short of this limitation, the model and the estimation procedures are expected to shade some light on how privatization plays in improving efficiency of industrial enterprises.

#### **IV. ECONOMETRIC RESULTS**

##### **4.1 Production function**

Table 6 below lists OLS and MLE estimates for parameters of the Cobb Douglas production function. The OLS specification assumes that the difference in output among firms is entirely attributed to external shocks and there are no technical efficiency effects, or the one-sided error term is not included in the model. In this average response model, all the parameter estimates are found to be statistically significant.

According to Coelli et al (1998), OLS estimates of the input coefficients ( $\beta_1$ ,  $\beta_2$  and  $\beta_3$ ) are unbiased but the intercept term  $\beta_0$  and the variance parameter (sigma squared) are biased. Sigma squared in the Frontier 4.1 estimation procedure is  $\sigma_e^2$ <sup>1</sup>, which is different from  $\sigma_v^2$ . Thus, it is possible to discuss the economic implications of the remaining parameters except the intercept and the variance parameter.

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<sup>1</sup>  $\sigma_e^2 = \sigma_\mu^2 + \sigma_v^2$

**Table 6: Econometric Result of the Whole Sample: Error component frontier  
(Version 4.1)**

The model= Cobb Douglass Stochastic Frontier Production Function, Number of observations 128, Time-4				
Estimates	OLS		MLE	
	Coefficients	t-ratio	Coefficients	t-ratio
$\beta_o$	0.83579866	3.8300742	0.91009564	3.5656013
$Inp_{it}$	0.62731639	24.13003	0.62913575	22.310099
$FC_{it}$	0.08422477	3.8694702	0.085560387	10.803086
$WS_{it}$	0.3214025	11.24422	0.30142061	4.0296018
Log likelihood function	-522.80248	-498.22271		
LR test of $u_{it}$		49.159534		
$\sigma_e^2$	0.4548278	1.2146050	4.029618	
$\gamma = \sigma_u^2 / \sigma_v^2$		0.72009076	9.0819527	
$+ \sigma_u^2$				
$\mu$		-1.8704287	-2.22684243	
$\eta_{it}$		0.01709415	0.4102291	

Source: Own computation.

The coefficients of factors of production reveal the responsiveness of output due to a one unit change in the use of a respective factor input. It appears that the most critical factor of production is raw material input. On the average, a one unit change in the raw material usage brings about a 0.63% change in the level of output. The responsiveness of output to changes in the level of fixed asset is extremely low. It is due to the fact that most medium and large scale industries operate by far below their production capacity and in most cases than not the supply of raw materials and access to market critically determine what and by how much to produce under the prevailing situation of the industrial sector in Ethiopia. Although most industries operate with obsolescence machinery and equipment, the role of fixed capital as a

limiting factor could only be manifested in the failure of industries to produce standard quality outputs, and not on the quantity. Nonetheless, quality assurance is also the most important prerequisite for tradable goods producing sectors such as industry to survive and prosper under the globally competitive environment. Labor had a modest contribution to output.

The estimate of  $\gamma$  is statistically significant implying that technical inefficiency effects had non-zero impact on the operation of industries. The value of the coefficient for  $\gamma$  is very high indicating that firm level attributes or technical inefficiency effects have had more impact than external shocks on the functioning of the selected industries.

We also conduct a one-sided generalized likelihood-ratio test (LR) to confirm whether or not there were apparent technical inefficiency effect and determine the estimation procedure (MLE or OLS) that better characterize the underlying production function of the selected industries. LR has a mixture of chi-square distribution,  $\frac{1}{2}\chi_0^2 + \frac{1}{2}\chi_1^2$  (Collie, 1995). The null hypothesis,  $H_0: \gamma=0$ , the model is equivalent to the OLS average response function, without  $u_{it}$ . The test statistic is calculated as:

$$LR = -2\{\ln[L(H_0)/L(H_1)]\} = -2\{\ln[L(H_0)] - \ln[L(H_1)]\} \quad (4.1)$$

where  $L(H_0)$  and  $L(H_1)$  are values of the likelihood function under the null and alternative hypothesis respectively. The critical value for the test of  $\alpha$  level of significance is equal to the value of  $\chi_r^2(2\alpha)$ , where r is number of restrictions. The Frontier 4.1 gives a value of 49.2 for likelihood ratio (LR) test for the one-sided error. The corresponding critical value for the test is 7.81. Accordingly, we reject the null hypothesis  $H_0: \gamma=0$  in favor of the alternative that  $H_1: \gamma>0$ . The result demonstrates that firm level differences in management, work ethics and similar attributes significantly influence the extent to which enterprises efficiently utilize their factors of production. As a result, under the given policy setting and external environment, industries were producing different level of output even if they used equal value of factors of production.

## 4.2 Technical Efficiency Comparison

Selected industries were operating on average at about 73.4% of their potential during 1998/99-2001/02. This rate appears to be higher than the rate of average capacity utilization of all medium and large scale industries as reported by Central Statistical Authority during the same period. This is due to the fact that frontier production function specification by its very nature gives a score of hundred percent for the firm that produces the maximum output within the given amount of resources. In other words, the model may consider a firm the most efficient among selected industries although it may not operate at its maximum level of designed machinery capacity. Thus, the level of inefficiency reported from other firms is measured by the distance that they deviate from the level of operation of the reference firm.

**Table 7: Pooled Data (Four Years)**

Technical Efficiency Statistical Values	
Statistical indicators	Technical efficiency
Maximum	0.957000
Mean	0.733955
Minimum	0.125000
Range	0.875000

Source: Own Calculation.

There has been a significant efficiency difference among sample industries. The range in technical efficiency between the most efficient firm operating on the frontier line and the most inefficient firm was 87.5%. Given the prevailing tense market competition that industries face with imports of other countries, there could be little chance for firms operating at the bottom of the frontier to survive. Although external conditions may not be the same in practice due to the leading party's vested interest as the owner of some establishments, and possible positive bias from the side of the government towards public enterprises, this much efficiency gap could not have any strong economic justification for a firm operating with profit maximization motive. Thus, such firms should realize how much they have been left behind due to their firm specific weaknesses and strive to make-up output shortfalls without committing additional resources.

**Table 8: Mean Technical Efficiency for the Period 1998/99-2001/02**

Period	Technical Efficiency
1998/99	0.728836
1999/00	0.732195
2000/01	0.735734
2001/02	0.739055

Source: Own calculation.

Mean technical efficiency was not significantly changing during the period, despite a slight improvement from time to time. The average technical efficiency was within the range of 72 and 74%. The coefficient of  $\eta_{it}$  in the MLE production function is found to be positive but statistically insignificant. This also implies that technical efficiency did not show a statistically significant change over time during the study period.

A comparative analysis of privatized enterprises vis-à-vis public enterprises reveal a result contrary to the predictions of the neoclassical economists and the World Bank position that privatization could enhance efficiency.

**Table 9: Average Technical Efficiency by Mode of Ownership**

Sector	Privatized enterprises	Other Private Firms	Public firms
Meat and vegetable processors	0.599875	0.623833	0.904
Edible oil	0.338	0.620154	0.649857
Flour and flour products	0.80975	0.700882	0.770036
Malt liquors and malt	0.837	-	0.685813
Spinning, wearing and finishing	0.7865	0.784737	0.768982
Wearing apparel except fur	0.59225	0.789469	0.77425
Soap, detergent and petroleum jelly	0.739	0.683475	0.7205
Plastic	0.84675	0.737846	0.675375
Articles of concrete and cement	0.6455	0.775944	0.815938
Average	0.688292	0.714542	0.751639

Source: Own calculation.

As it could be observed from Table 8, public enterprises reported a mean technical efficiency of 0.75. On the other hand, privatized and other private firms were operating 31% and 29% far behind the frontier level of output. Some could argue that most private owned firms are newly established infant industries, and may require a learning period to acquire adequate managerial, entrepreneurial, technical and labor

skills, and secure sustainable market access in the face of the prevailing competitive market environment. For the last 20 to 30 years, the dominant mode of ownership has been the public sector and yet the industrial sector remains quiescent. Neither the optimism for the greater private sector to bring changes in the process of industrialization has been realized. The last ten years could have been a sufficient period for the private sector at least to cope with the low state of performance of the public sector, if not operating better.

Under such conditions, it would be ambitious to expect privatized firms to be more efficient as compared to those industries that still remain under the public domain. The t-test for equality of means demonstrates that the difference in the mean technical efficiency between privatized firms and public enterprises reported during the period 1998/99 – 2001/02 was found to be statistically significant. In like manner, the same test indicates that they operated in a statistical significant difference in the level of efficiency of other private enterprises [See, Annex 1].

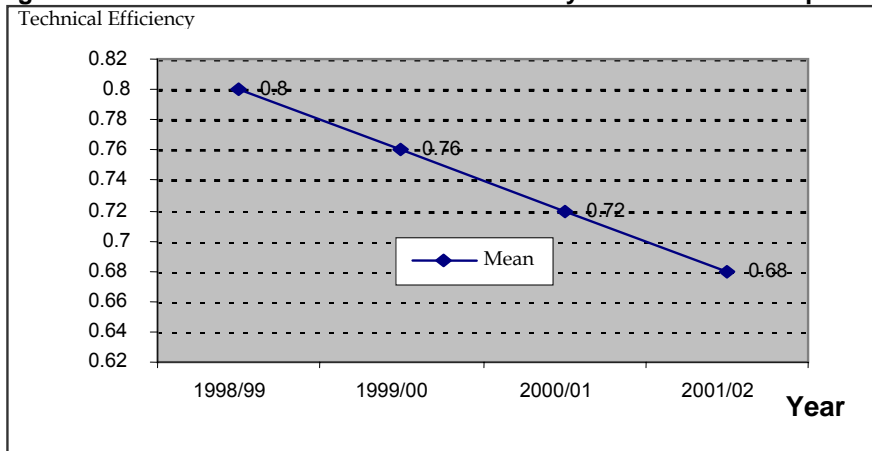
One major explaining factor could be the obsolescent or moribund nature of machinery and equipment that most privatized industries acquired during the transfer of ownership and the subsequent loss of output due to significant down time. This situation could be captured by the capital labor ratio and the share of machinery and equipment from the total fixed asset as represented in Table 3 above. Both ratios were the lowest in the privatized industries as compared to firms operating in other modes of ownership. The other reason might be the period required before new owners could reorganize and bring these industries to full swing operational status. All the privatized firms considered in this study were operating at least for four consecutive years under the new mode of ownership. Four year is a long period to make changes in the composition of factors of production and reorganize the whole system to enhance the level of efficiency of these enterprises. Instead labor lay-off was considered by many privatized enterprises as a strategy to create an optimal input combination. This strategy might have rather caused adverse selection whereby productive and experienced workers lose their jobs and substituted by less or non-experienced workers. The ultimate effect of this move could be declining in efficiency of these industries.

However, public industries were not efficient in all industrial groups. Privatized enterprises were operating more efficiently in the manufacture of flour, wearing apparel except fur, soap, detergent and perfumes and plastic. There could not be any tangible justification as to why privatized industries became more efficient in these

areas while they were very much unproductive in the areas of meat and vegetables processing, spinning, wearing and finishing, edible oil, and manufacture of concrete and cement.

Having observed invariable mean efficiency for the whole sample and the lowest record from the side of the privatized firms, it would become imperative to assess what was going on among privatized firms. With the intention of examining the trend of efficiency of privatized enterprises, a separate production function was estimated through Frontier 4.1. As it is indicated in Annex 2,  $\gamma$  is statistically significant and the coefficient holds a value of more than 0.90. This is a clear indication of how considerable were technical inefficiency effects or firm level weaknesses in affecting operation of privatized firms. The trend variable  $\eta_{it}$  was also statistically significant at 10% level of significance, and it has a negative value signifying a declining trend in technical efficiency among these enterprises. Definitely one could not be certain whether this declining technical efficiency had started in these enterprises before privatization. In any case, privatization has failed to demonstrate its capacity of mitigating this problem. The extent of efficiency loss over the period could be clearly observed in Figure 2 below.

**Figure 2: The Trend of Mean Technical Efficiency in Privatized Enterprises**



The lower level and declining trend of technical efficiency in the privatized industries tends to imply that efficiency gain as a rationale for privatization may not be valid in the context of Ethiopian industrial sector. Under the existing situation, public

enterprises justify their existence through superior efficiency besides playing societal roles in terms of cushioning the workforce from possible lay-off in the face of rampant unemployment. It also entails the need to cautiously assess the capability of new owners to effectively manage enterprises before hand-over. Post privatization follow-up and support should also be strengthened. The existing post privatization activities of the government has not exceeded more than collecting and analyzing information about the performance of privatized industries. Nonetheless, these industries still require attention and support from the side of the government both from efficiency and societal benefit grounds.

In addition to their internal weaknesses, privatized enterprises suffer from several external constraints as other industries do. According to the Central Statistical Authority (1994), more than 40% of privatized enterprises reported market related problems in terms of failure to compete or absence of demand for their products as the most severe constraint. Some other (27%) privatized industries considered shortages of raw materials as the single most detrimental bottleneck. Working capital shortage and frequent machinery breakage were also equally harmful to the remaining others. Given the very short period of the private sector resurgence, those who bought these enterprises were either operating in the service, merchandize businesses and small industrial venture or emerging entrepreneurs. Hence, they might not have developed their technical and managerial capabilities to effectively direct their industries under the prevailing competitive environment.

## **V. CONCLUSION**

The industrial sector has been traversing through policy turmoil for more than a decade. In the 1970's and 1980's, the country embarked upon state-controlled economic development policy, involving central planning and a large public sector. The transition from market-oriented economic system to directive system of management was swift and it was carried out through nationalization of large and medium private enterprises while holding back new private entrants in the sector. It took quite a long time to drain off resources from other areas, rehabilitate and guide nationalized enterprises to the right path. These enterprises were able to expand at the cost of the private sector participation.

Since the first half of the 1990's, the tide has completely turned its direction. The country has been liberalizing the economy and undergoing privatization. The theoretical basis for the growing plea of multilateral financial institutions and the



government for privatization is mainly the neoclassical economic thought, which presumes the private sector to ensure superior efficiency. For this purpose, government should not intervene in the economy. Nonetheless, many scholars argue on the contrary. Neither has there been conclusive evidence to support a free market without government having a role to play.

Given this situation, one would then raise whether or not privatization has achieved the intended result in the last couple of years in the Ethiopian condition? More importantly, have privatized industries become more efficient as compared to those enterprises, which are still under government control? This paper tried to address this issue by estimating a stochastic frontier Cobb-Douglass production function and technical efficiency indices involving privatized, public and other private industries and examining whether efficiency has grown over time in privatized industries in particular.

Econometric findings reveal that the average level of technical efficiency for the whole sample was about 73.4% during the period, 1998/99 – 2001/02. Contrary to the expectation, privatized industries were operating with the lowest level of efficiency among the three modes of ownership. They reported a score of 69% where as state owned and other private industries were able to operate at a level of 75% and 71% of the frontier level of output. This difference was found to be statistically significant. A separate production function for privatized enterprises demonstrates that mean technical efficiency of these firms was consistently declining during the same period.

Certainty, it would be very difficult to give tangible reasons for such differences. As it has been already observed, the average value of machinery and equipment employed per labor was found to be the lowest in privatized industries and either was the case with respect to the ratio of machinery to total fixed asset. This could roughly indicate that privatized enterprises were operating with morbid machinery and equipment and there has been little effort to augment this short fall in the input and asset composition during the period under consideration. Indeed, most privatized industries were transferred to local entrepreneurs, who were either operating largely in the service or merchandize business or have been emerging in the last few years. Consequently, they have not adequately developed their technical and managerial capabilities to effectively manage their industries in the face of the fiercely competitive market environment. As a result, most of these industries suffer from marketing problems and raw material shortages over and above other industries do. On the

other hand, the country was not able to attract sufficient FDI such that it could improve the technological and managerial capabilities of privatized industries.

Albeit the existing empirical evidence is not conclusive enough to suggest any strong recommendation, one could fairly suggest the following implications. From the findings, it has been learnt that privatization does not necessarily improve efficiency and government should revitalize its position in this respect. It requires to critically assessing the entrepreneurial capabilities and future plans of potential buyers with respect to rehabilitation of machinery and equipment and institution of proper management system before selecting the best bidder on financial grounds. The post privatization activities of the government should also be strengthened to the extent of supporting new owners in terms of augmenting their capabilities of creating access to markets, raw materials, and upgrading technologies. The monitoring mechanism should also have an enforcement mechanism to realize plans that the new owners submitted while offering their price.

Unless the possible effects of hesitation to respond for the growing appeal of multilateral financial institutions and the interests of foreign investors for the changing structure of ownership towards the private sector is not formidable, there will not be a strong economic rationale not to keep up those industries under state control, possible mismanagement of which could cause significant economic and social costs due to privatization.

In general, the private sector is emerging and it is not at the stage of being left to the mercy of the market. It requires active government intervention and support to ensure economic efficiency at a national level. Thus, government should continue strongly working in ensuring an enabling environment for a vibrant private sector and curbing negative effects of market failure in getting access for the required services. Meanwhile, maintaining and investing on areas that are not affordable to the capacity and interest of the private sector but likely to have a catalyst role in creating dynamism in the overall economy should not be overlooked.

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**Annex 1: Equality of Mean Technical Efficiency Test Results**

Independent Samples Test: Between Privatized and Other Private Firms					
	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	Degrees of freedom	Sig. (2-tailed)
Equal variances assumed	5.82633	0.016295	-2.21873	354	0.027139
Equal variances not assumed			-1.89376	45.79136	0.064584
Independent Samples Test: Between Privatized and Public Enterprises					
Equal variances assumed	4.615943	0.032916	-3.06306	194	0.002502
Equal variances not assumed			-2.78666	54.40788	0.007318

**Annex 2: Econometric Results of the Sample for Privatized Firms**

Output from the program Frontier (Version 4.1)				
Error component frontier (See Battese and Coelli, 1992 )				
The model= Cobb Douglass Stochastic Frontier Production Function, Number of observations 10, Time-4				
Estimates	OLS		MLE	
	Coefficients	t-ratio	Coefficients	t-ratio
$\beta_o$	11.520060	1.991305	0.41374021	0.55700675
$Inp_{it}$	0.83856379	16.943379	0.83699758	17.574014
$FC_{it}$	-0.0764266	-2.028974	-0.02072868	-0.5620128
$WS_{it}$	0.22571338	3.0168370	0.25129431	3.2323297
Log likelihood function	-19.790380		-140.45546	
LR test of $u_{it}$			11.489667	
$\sigma_e^2$	0.17499506		0.993532290	0.33774193
$\gamma = \sigma_u^2 / \sigma_v^2 + \sigma_u^2$			0.92279764	4.0134952
$\mu$			-1.2165667	-0.18737699
$\eta_{it}$			-0.2003022	-1.9347748