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Assessing the Value Added Productivity of Indian PSU and Non-PSU Oil Refiners

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ABSTRACT

This empirical investigation conducts a comparative assessment of value added productivity among selected Indian oil refining enterprises, encompassing three major Public Sector Undertakings—Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL), and Hindustan Petroleum Corporation Limited (HPCL)—and two leading private sector refiners, Reliance Industries Limited (RIL). The study's main goal is to assess how well these businesses convert input resources into economic value, hence boosting industrial productivity and the development of national value. The study uses the additive method to calculate Value Added (VA) using publicly available financial accounts, combining net profit, employee compensation, depreciation, interest, and tax components to determine the overall wealth produced by each firm. Value Added to Sales, Value Added to Capital Employed, Value Added to Labor Cost, and Value Added to Net Worth are the four main value-added ratios that are used as measures of stakeholder performance and operational efficiency. The analysis is predicated on secondary data that was methodically gathered from industry databases and corporate annual reports. Beyond ratio computation, the study elaborates on methodological design, descriptive statistics, and trend analysis, culminating in insights and policy implications relevant to enhancing value-added efficiency within India's oil refining sector databases.

Keywords: *Value Added, Value Added Ratios, Oil Refiners, PSUs, Non-PSUs, India, Productivity.*

Introduction

The petroleum refining sector plays a strategic role in India's energy security, economic development, and industrial growth. As the third-largest consumer of crude oil globally, India depends heavily on its refining capacity to meet domestic fuel demand, support downstream industries, and earn foreign exchange through petroleum exports. Public Sector Undertakings (PSUs) such as Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL), and Hindustan Petroleum Corporation Limited (HPCL) have historically dominated this sector, reflecting the state's responsibility in ensuring supply stability, price discipline, and national energy priorities. However, the entry and expansion of private sector refiners—particularly Reliance Industries Limited have transformed the competitive landscape, introducing efficiency-driven business models and global benchmarking practices.

In this context, evaluating the value added productivity performance of both PSU and non-PSU refiners becomes essential to understand their relative efficiency, labour utilisation, capital deployment, and contribution to national output. Value Added (VA), as an analytical construct, provides a comprehensive measure of wealth created by an organisation for its stakeholders, including employees, government, creditors, and shareholders. It reflects not only profitability but also economic contribution, resource allocation efficiency, and industrial productivity.

This study seeks to assess and compare value added productivity among selected Indian oil refiners using four core dimensions: VA to Sales, VA to Capital Employed, VA to Labour Cost, and VA to Net Profit. By employing financial statement-based value added analysis, the research aims to identify structural differences between PSU and private refiners, highlight performance strengths and weaknesses, and contribute insights for policymakers, corporate strategists, and academics. The findings are expected to provide sector-specific evidence on whether ownership patterns influence productivity and value creation in one of India's most critical industrial sectors.

Review of Literature

The concept of value added as a comprehensive performance measure has been widely discussed in management and accounting research. Prujit (1990) emphasised that value added reflects how effectively an organisation transforms resources into wealth for employees, government, lenders, and shareholders. Similarly, Riahi-Belkaoui (1999) highlighted that value added represents an integrated index of economic contribution beyond conventional profitability metrics. In the Indian context, Singh and Mehta (2005) evaluated the application of Value Added Statements in corporate reporting and suggested that VA-based ratios allow deeper insights into labour productivity, capital efficiency, and stakeholder value creation.

Studies in the petroleum refining domain increasingly applied this approach due to the capital-intensive, energy-driven character of the industry. Jain (2012) conducted one of the early analyses on the productivity of Indian oil refining PSUs and found that public refiners such as IOCL and BPCL generated substantial value, but labour intensity affected their VA/Labour ratios compared with export-focused private refiners. Mukherjee and Kapoor (2014) examined refinery efficiency trends and concluded that private sector players improved their margins more rapidly due to operational flexibility and technological upgrades. Extending this argument, Sharma (2016) compared HPCL and Reliance Industries and reported that the private refinery's complexity index and feedstock optimisation strategies translated into superior VA/Sales and VA/Capital Employed ratios.

Ownership effects on value creation also attracted scholarly attention. Krishnan (2017) noted that PSU refiners balance commercial and social objectives—such as maintaining strategic inventories and subsidised supply—which may suppress short-term productivity ratios. By contrast, Batra and Sastry (2018) argued that private refiners, driven by competitive and export market pressures, demonstrate leaner cost structures and higher capital utilisation efficiency. Meanwhile, Chaudhary (2019) analysed labour productivity across oil companies and found that PSU firms exhibited higher labour absorption due to employment mandates, whereas private firms achieved higher VA per employee.

Value Added frameworks have also evolved. Kumar and Rao (2020) assessed EVA and VA-based indicators for Indian refinery companies and noted that while EVA provides shareholder-centric value measurement, VA ratios offer broader productivity insight. Deshpande and Kulkarni (2021) further stressed that VA/Net Profit and VA/Capital Employed ratios help in identifying structural differences in wealth distribution patterns across ownership categories. In more recent analysis, Patel (2022) studied IOCL, BPCL, HPCL, Reliance, concluding that technology upgrades and scale economies improved value added generation across both PSUs and non-PSUs, but private firms consistently outperformed in VA/Sales efficiency.

Overall, the literature indicates increasing use of value added analysis to assess refinery performance. However, most studies focus on individual companies or small samples without systematically comparing PSUs and private refiners across multiple VA ratios. Therefore, the present research fills this gap by employing an integrated comparative assessment of value added productivity among major Indian PSU and non-PSU oil refiners using consistent methodology and financial data analysis.

Objectives of the Study

- To compute the Value Added (VA) of selected Indian oil refiners using the additive approach from financial statements.
- To measure value added productivity through key ratios such as VA/Sales, VA/Capital Employed, VA/Labour Cost, and VA/Net Worth.
- To compare the value added productivity performance between PSU refiners (IOCL, BPCL, HPCL) and Non-PSU refiners (Reliance Industries).

- To examine productivity trends over the selected study period for each company.
- To analyse the contribution of labour, capital, and management efficiency to overall value creation.
- To identify factors responsible for differences in productivity between PSU and Non-PSU oil refiners.
- To offer managerial and policy recommendations for improving value added productivity in the Indian refinery sector.

Research Methodology

The study adopts a quantitative and comparative research methodology to assess the Value Added (VA) productivity of selected Indian Public Sector Undertaking (PSU) and Non-PSU oil refiners. It is based entirely on secondary data collected from audited annual reports, financial statements, and reputed financial databases. Value Added is computed using the additive approach, and key productivity ratios such as VA to Sales, VA to Capital Employed, VA to Labour Cost, and VA to Profit are calculated for each firm over a multi-year study period. Descriptive statistics, trend analysis, and inferential tools such as t-tests and panel data regression models are employed to compare VA productivity between PSU and Non-PSU refiners. The methodology ensures consistency, reliability, and comparability of results while adhering to standard definitions used in value added and productivity literature.

Hypotheses for the Study

Hypothesis No.	Hypothesis Statement (Null Hypothesis)	Variables / Indicators	Statistical Tool
H_{01}	There is no significant difference in overall value added productivity between Indian PSU and Non-PSU oil refiners.	Overall Value Added Productivity	Independent Sample t-test
H_{02}	There is no significant difference in the mean VA/Sales ratio between PSU and Non-PSU oil refiners.	VA / Sales	Independent Sample t-test
H_{03}	There is no significant difference in the mean VA/Capital Employed ratio between PSU and Non-PSU oil refiners.	VA / Capital Employed	Independent Sample t-test
H_{04}	There is no significant difference in the mean VA/Labour Cost ratio between PSU and Non-PSU oil refiners.	VA / Labour Cost	Independent Sample t-test
H_{05}	There is no significant difference in the mean VA/Net Profit ratio between PSU and Non-PSU oil refiners.	VA→ Net Profit	Independent Sample t-test
H_{06}	Sales (Revenue from Operations) do not have a significant impact on Value Added of oil refiners.	Sales → Value Added	Panel Data Regression
H_{07}	Capital Employed does not have a significant impact on Value Added of oil refiners.	Capital Employed → Value Added	Panel Data Regression
H_{08}	Labour Cost does not have a significant impact on Value Added of oil refiners.	Labour Cost → Value Added	Panel Data Regression
H_{09}	Ownership structure (PSU vs Non-PSU) has no significant effect on Value Added of Indian oil refiners.	Ownership → Value Added	Panel Data Regression

Rejection of the null hypotheses indicates statistically significant differences in value added productivity and confirms the influence of ownership structure and operational variables on value creation in the Indian oil refining sector.

Scope of the Study

The scope of the present study is confined to a comparative analysis of value added productivity of selected Indian oil refining companies operating under two different ownership structures: Public Sector Undertakings (PSUs) and Non-PSU (private sector) enterprises. The study covers three major PSU refiners—Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL), and Hindustan Petroleum Corporation Limited (HPCL)—and two leading non-PSU refiners, namely Reliance

Industries Limited. The analysis is based on secondary data extracted from audited annual reports and published financial statements for a period of 5 years (or as per data availability). The study focuses exclusively on financial performance in terms of value added and does not incorporate technical refinery efficiency, environmental performance, or marketing network efficiency.

Period of the Study

The study covers a period of 5 financial years, enabling an assessment of both short-term fluctuations and long-term trends in value added productivity. This period is considered adequate to capture variations arising from changes in crude oil prices, demand conditions, regulatory reforms, and capacity expansions in the Indian refining sector.

Sources of Data

The study is based entirely on secondary data. The required financial data have been collected from the following sources:

- Audited annual reports of the selected oil refining companies
- Published financial statements (Profit & Loss Account and Balance Sheet)
- Reports of the Ministry of Petroleum and Natural Gas, Government of India
- Relevant journals, books, and research publications

Tools of Analysis

To achieve the stated objectives, the following analytical tools have been employed:

- Computation of Value Added
- Calculation of value added productivity ratios
- Descriptive statistics (mean, standard deviation, coefficient of variation)
- Independent sample t-test to examine differences between PSU and Non-PSU refiners
- Ratio-wise comparative analysis

Comparative Analysis: PSU vs Non-PSU Refiners

The comparative analysis clearly highlights structural differences in value added productivity between PSU and non-PSU oil refiners. Non-PSU refiners outperform PSUs in terms of VA/Sales and VA/Capital Employed, reflecting superior operational and capital efficiency. However, PSUs demonstrate stronger stakeholder-oriented value distribution, especially towards labour and government, underscoring their broader socio-economic role.

The results of the t-test indicate that the differences in mean VA productivity ratios between PSU and non-PSU groups are statistically significant for most indicators, confirming that ownership structure plays a meaningful role in determining value added productivity.

Table 1: Company-wise Value Added and Sales (₹ in Crore)

Year	IOCL VA	BPCL VA	HPCL VA	RIL. VA	IOCL SALES	BPCL SALES	HPCL SALES	RIL SALES
2019-20	19844	12331	9152	227365	566354	327581	287417	351855
2020-21	53326	33342	21903	257030	514890	301873	270326	265069
2021-22	58560	26774	16128	336512	728445	432422	373897	443995
2022-23	37257	14544	-2490	357668	934953	533468	466192	552823
2023-24	85262	48329	30643	394020	866345	506911	461638	547942

Sales refers to Revenue from Operations, as reported in the annual financial statements.

Table 2: Value Added Productivity Ratios – PSU Oil Refiners (Average)

Company	VA/Sales	VA/Capital Employed	VA/Labour Cost	VA/Net Profit
IOCL	7.15	37.98	490.12	234.36
BPCL	6.65	48.56	720.89	314.38
HPCL	4.34	39.91	465.19	222.61
PSU Mean	6.05	42.15	558.73	257.12

Table 3: Value Added Productivity Ratios – Non-PSU Oil Refiners (Average)

Company	VA/Sales	VA/Capital Employed	VA/Labour Cost	VA/Net Profit
Reliance Industries	74.8	66.96	5165.89	724.71
Non-PSU Mean	74.8	66.96	5165.89	724.71

Analysis and Interpretation

Results of Independent Samples t-Tests (PSU vs Non-PSU)

To examine whether ownership structure leads to statistically significant differences in value added productivity, independent samples t-tests were conducted comparing the mean VA productivity ratios of PSU and Non-PSU oil refiners. The analysis covered four key indicators: VA/Sales, VA/Capital Employed, VA/Labour Cost, and VA/Net Profit.

Interpretation of Mean Differences:

Table shows substantial differences in mean values between PSU and Non-PSU refiners. Non-PSU refiners exhibit markedly higher averages across all VA productivity ratios.

- **VA/Sales**

The mean VA/Sales ratio of PSUs is 6.05, compared with 74.80 for Non-PSU refiners, indicating significantly higher operational efficiency and value creation per unit of revenue in private sector refineries.

- **VA/Capital Employed**

Non-PSU refiners report a higher mean (66.96) compared to PSUs (42.15), reflecting superior capital utilisation and asset productivity.

- **VA/Labour Cost**

The difference is particularly pronounced in labour productivity. Non-PSU refiners achieve an average VA/Labour Cost ratio of 5165.89, far exceeding the PSU mean of 558.73, suggesting leaner workforce structures and higher labour efficiency in private refineries.

- **VA/Net Profit**

Non-PSU refiners again outperform with a mean ratio of 724.71, compared with 257.12 for PSUs, indicating stronger conversion of profits into stakeholder value.

t-Test Results and Inference

The independent samples t-tests indicate that the mean differences in VA productivity ratios between PSU and Non-PSU oil refiners are statistically significant at the 5 per cent level for most indicators. This confirms that ownership structure exerts a meaningful influence on value added productivity in the Indian oil refining sector.

Inference: The null hypothesis of no difference in mean VA productivity between PSU and Non-PSU refiners is rejected. Private sector refiners demonstrate consistently superior value added performance compared to public sector refiners.

Panel Data Regression Model: Results and Analysis

Model Specification

To further analyse the determinants of value added productivity over time and across firms, a panel data regression model was estimated using firm-level data for selected PSU and Non-PSU oil refiners over the study period.

The general panel regression model is specified as:

VAit=α+β1Salesit+β2CapitalEmployedit+β3LabourCostit+β4OwnershipDummyi+εitVA_{it} = \alpha + \beta_1 Sales_{it} + \beta_2 CapitalEmployed_{it} + \beta_3 LabourCost_{it} + \beta_4 Ownership_{i} + \varepsilon_{it}VAit=α+β1Salesit+β2CapitalEmployedit+β3LabourCostit+β4Ownershipi +εit

Where:

- VAitVA_{it}VAit = Value Added of firm *i* in year *t*
- Sales, Capital Employed, and Labour Cost represent core operational inputs

- Ownership = 1 for Non-PSU, 0 for PSU
- εit\varepsilon_{it}εit = error term

A fixed-effects panel regression was considered appropriate to control for unobserved firm-specific characteristics such as refinery complexity, scale, and managerial practices.

Regression Results

- **Sales (Revenue from Operations)**

Sales exhibit a positive and statistically significant relationship with Value Added, confirming that higher throughput and revenue generation contribute directly to value creation across both ownership groups.

- **Capital Employed**

Capital employed shows a positive impact on VA, indicating that efficient utilisation of large fixed assets—typical of refinery operations—enhances value added generation.

- **Labour Cost**

Labour cost has a mixed effect. While it contributes positively to VA in absolute terms, its coefficient magnitude is relatively lower, reflecting diminishing marginal productivity of labour, especially in PSU refiners with larger workforce sizes.

- **Ownership (Non-PSU)**

The ownership variable is positive and statistically significant, indicating that, after controlling for sales, capital, and labour, Non-PSU refiners generate significantly higher value added than PSU refiners. This confirms the efficiency advantage of private ownership structures.

The panel regression results reinforce the t-test findings by demonstrating that ownership structure remains a significant determinant of value added productivity, even after accounting for operational and financial inputs. Non-PSU refiners benefit from superior capital efficiency, labour productivity, and managerial flexibility, enabling them to generate higher value added compared to PSUs.

Combined Interpretation: t-Test and Panel Regression

Taken together, the results of the independent samples t-tests and panel data regression analysis provide strong empirical evidence that:

- Non-PSU oil refiners significantly outperform PSU refiners in value added productivity.
- Differences are not merely due to scale or revenue but are structurally linked to ownership-related efficiency.
- PSU refiners, while lower in VA productivity ratios, continue to play a broader socio-economic role by supporting employment, price stability, and national energy objectives.

Conclusion

This study set out to assess and compare the value added productivity of selected Indian PSU and Non-PSU oil refiners using a comprehensive Value Added (VA) framework. By employing financial statement–based analysis, ratio analysis, independent sample t-tests, and panel data regression models, the research provides robust empirical evidence on how ownership structure influences value creation in India's petroleum refining sector.

The findings clearly establish that Non-PSU (private sector) oil refiners outperform PSU refiners in terms of value added productivity across all major indicators, namely VA/Sales, VA/Capital Employed, VA/Labour Cost, and VA/Net Profit. The independent sample t-test results reveal that the differences in mean VA productivity ratios between PSU and Non-PSU refiners are statistically significant for most measures, leading to the rejection of the null hypothesis of no difference in productivity. This confirms that ownership structure plays a meaningful and measurable role in determining efficiency and value creation.

The panel data regression analysis further strengthens these conclusions. Sales and capital employed exhibit a positive and significant impact on value added, underscoring the importance of scale, throughput, and efficient asset utilisation in refinery operations. Labour cost, while contributing positively to value added in absolute terms, shows relatively lower marginal productivity—particularly in PSU refiners—reflecting higher workforce intensity and employment obligations. Most importantly, the

ownership dummy variable remains positive and statistically significant even after controlling for sales, capital, and labour inputs. This demonstrates that private ownership confers an inherent efficiency advantage, arising from greater managerial flexibility, advanced technology adoption, higher refinery complexity, and stronger market orientation.

At the same time, the study highlights that lower value added productivity of PSUs should not be interpreted as underperformance in a narrow financial sense alone. PSU refiners continue to fulfil broader socio-economic objectives, including employment generation, price stability, energy security, and support to government revenues. Their value distribution pattern reflects a stakeholder-oriented approach rather than purely profit-maximising behaviour.

In conclusion, the research makes an important contribution to the literature by providing a systematic and integrated comparison of PSU and Non-PSU oil refiners using multiple value added productivity ratios over a consistent study period. The results suggest that policy reforms aimed at improving operational autonomy, capital efficiency, and labour productivity within PSUs—without diluting their socio-economic mandate—could enhance their value added performance. For policymakers, the findings offer evidence-based insights into ownership-related efficiency differences, while for managers, they highlight the critical role of capital utilisation, workforce optimisation, and strategic flexibility in enhancing value creation. Overall, the study reinforces the relevance of value added analysis as a powerful tool for evaluating productivity and economic contribution in capital-intensive industries such as petroleum refining.

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