Academia Open

Table Of Content

Originality Statement

The author[s] declare that this article is their own work and to the best of their knowledge it contains no materials previously published or written by another person, or substantial proportions of material which have been accepted for the published of any other published materials, except where due acknowledgement is made in the article. Any contribution made to the research by others, with whom author[s] have work, is explicitly acknowledged in the article.

Conflict of Interest Statement

The author[s] declare that this article was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright Statement

EDITORIAL TEAM

Editor in Chief

Mochammad Tanzil Multazam, Universitas Muhammadiyah Sidoarjo, Indonesia

Managing Editor

Bobur Sobirov, Samarkand Institute of Economics and Service, Uzbekistan

Editors

Fika Megawati, Universitas Muhammadiyah Sidoarjo, Indonesia

Mahardika Darmawan Kusuma Wardana, Universitas Muhammadiyah Sidoarjo, Indonesia

Wiwit Wahyu Wijayanti, Universitas Muhammadiyah Sidoarjo, Indonesia

Farkhod Abdurakhmonov, Silk Road International Tourism University, Uzbekistan

Dr. Hindarto, Universitas Muhammadiyah Sidoarjo, Indonesia

Evi Rinata, Universitas Muhammadiyah Sidoarjo, Indonesia

M Faisal Amir, Universitas Muhammadiyah Sidoarjo, Indonesia

Dr. Hana Catur Wahyuni, Universitas Muhammadiyah Sidoarjo, Indonesia

Complete list of editorial team (link)

Complete list of indexing services for this journal (link)

How to submit to this journal (link)

Article information

Check this article update (crossmark)

Check this article impact [(*)]

Save this article to Mendeley

[(*)] Time for indexing process is various, depends on indexing database platform

Methods and Analysis of Assessment of The Level of Economic Efficiency

Umirova Gulmira Shodiboy kizi, umirovagulmira2@gmail.com, (1)

Independent Researcher of Tashkent, University of Architecture and Civil Engineering, Tashkent, Uzbekistan

(1) Corresponding author

Abstract

General Background: Economic efficiency assessment plays a crucial role in guiding strategic and financial decision-making across industries. **Specific Background:** In the construction sector, evaluating enterprise-level efficiency remains a complex task due to diverse operational factors and inconsistent application of assessment tools. **Knowledge Gap:** Existing literature offers various models such as cost-benefit analysis, efficiency ratios, DEA, and stochastic frontier analysis; however, limited studies critically compare these methods or explore their integrated applicability to real-world construction industry data. **Aims:** This study aims to analyze and compare methods for assessing economic efficiency, with a focus on construction enterprises, and to propose a robust evaluation framework. **Results:** The analysis demonstrates that different tools capture varying dimensions of efficiency, with DEA and the DuPont model offering complementary insights when applied to enterprise data. **Novelty:** The article introduces a comprehensive evaluation model that integrates quantitative and qualitative indicators, addressing methodological limitations and enhancing contextual relevance. **Implications:** Findings underscore the need for tailored assessment strategies that align with organizational objectives, and suggest future directions for refining hybrid models to support sustainable economic planning and resource optimization in industrial enterprises.

Highlights:

- Highlights comparative analysis of efficiency assessment methods.

- Emphasizes integrated use of quantitative and qualitative tools.

- Offers practical implications for strategic economic planning.

Keywords: Economic Efficiency, Construction Industry, DuPont Model, Data Envelopment Analysis, Performance Evaluation

Published date: 2025-07-11 00:00:00

Introduction

In the DuPont model, the efficiency of equity or enterprise assets is taken as the final indicator of economic efficiency. Such an analysis allows the founders of the enterprise to clearly imagine how effectively their invested capital or existing assets are used and what influences them [1]. The DuPont model has two-factor, three-factor, and five-factor forms. In order to ensure a deeper analysis in the study, it is advisable to use the five-factor DuPont model. In this model, the profitability of the enterprise's equity capital and the factors influencing it are expressed by the following functional relationship [2]:

$$ROE = TB \cdot IB \cdot ROS \cdot Ka \cdot LR \cdot 100\%. \qquad (1)$$

Here: ROE (Return on Equity) - return on equity, TB (Tax Burden) - tax burden ratio, IB (Interest Burden) - interest burden ratio, ROS (Return of Sales) - return on sales, Ka - asset turnover ratio, LR (Leverage ratio) - financial leverage ratio.

In this model, the ratio of net profit to profit before tax is taken as the tax burden ratio, and the ratio of profit before tax to profit before tax and interest is taken as the interest burden ratio. These indicators have the opposite expression, and the higher their value, the lower the burden on tax and interest expenses. That is, despite the fact that these indicators are called "burden," they indicate what part of the profit remains with the enterprise after taxes and interest expenses. Sales profitability, unlike the profitability indicator of revenue from product sales, which we analyzed above, was expressed as the ratio of profit before tax and interest payments to net revenue from product sales. The asset turnover ratio is an indicator of the average net revenue from the sale of products per sum of assets [3] [4] [5].

Method

The present study employs a quantitative research design aimed at forecasting the development of industrial enterprises using statistical indicators. The approach is grounded in the analysis of historical data and the application of time series forecasting models. By utilizing statistical tools, the research seeks to identify trends, relationships, and patterns that can inform the projection of future enterprise growth, productivity, and performance metrics [6]. The study adopts a descriptive and predictive framework, which involves collecting relevant statistical indicators, analyzing them over a specific period, and applying forecasting models to generate forward-looking insights [7]. The methodology also includes model validation and accuracy testing to ensure the reliability of the results.

The study relies on secondary data collected from national and international databases, industry reports, and government publications. Specifically, data sources include [8]:

1. National Statistics Offices (e.g., Bureau of Statistics, Ministry of Industry)
2. World Bank Open Data
3. OECD Industrial Indicators
4. Company annual reports and sector performance bulletins

The time frame for the data spans from 2010 to 2024, ensuring a robust base for trend analysis and prediction. The data collected encompass a wide range of economic and industrial indicators, including [9], [10]:

a. Gross Output of Industrial Enterprises
b. Industrial Value Added
c. Capital Investments in Industry
d. Employment in Industrial Sector
e. Labor Productivity
f. Energy Consumption
g. Export-Import Volumes in Manufacturing
h. Industrial Capacity Utilization Rates

Each indicator was selected for its relevance to the financial, operational, and technological development of industrial enterprises [11], [12].

Prior to analysis, the raw data underwent several preprocessing steps:

1. Cleaning: Missing values were treated using linear interpolation or mean substitution methods, depending on the nature and distribution of the data.
2. Normalization: To ensure comparability across variables and avoid scale bias, data were normalized using z-score standardization.
3. Stationarity Check: Time series data were tested for stationarity using the Augmented Dickey-Fuller (ADF) test. Non-stationary data were differenced appropriately.

Implications for Construction Firms:

SBM & Super-SBM DEA enable more precise ranking among top firms and better handling of efficiency slacks [13] [14] [15] [16] [17].

a) Two-stage DEA methods reveal drivers of efficiency by connecting initial scores with external variables.
b) Environmental DEA models help include sustainability metrics—like waste or emissions—as undesirable outputs.
c) Benchmarking across firms is enhanced through structured peer analysis inherent in DEA frameworks.
d) Input-oriented models, combined with cost/revenue/profit-oriented DEA, support tailored efficiency evaluation aligned to company goals.

Key Performance Indicators (KPIs) with DEA to evaluate construction companies, illustrating how financial and operational metrics can be cohesively analyzed inside the DEA framework [18]. Non-radial DEA model that directly accounts for input-output slacks, enhancing differentiation among decision-making units (DMUs) [19].

Results and Discussion

The financial leverage ratio is determined by the ratio of the total assets of the enterprise to the volume of equity capital, i.e., it shows to what extent the financial "support" of the enterprise is tied to equity.

Based on the DuPont model, the results of calculations of the values of factors influencing the return on equity for 2020-2024 can be seen in Table 1 below.

Indicators/ year	2020	2021	2022	2023	2024
Coefficient of tax burden	0.571	0.643	0.880	0.850	0.850
Percentage load factor	0.873	0.950	0.992	0.990	0.958
Sales profitability, in coefficients	0.129	0.107	0.241	0.195	0.124
Asset turnover ratio	1.645	2.716	1.915	1.256	0.240
Financial leverage ratio	1.511	1.386	1.252	0.757	1.205
Return on equity, %	**16.0**	**24.5**	**50.4**	**15.6**	**2.9**

Table 1. Factor indicators of the DuPont model and dynamics of return on equity

From the results of the DuPont analysis, it can be seen that the return on equity was primarily directly related to the factors expressing operational efficiency - sales profitability and asset turnover. In particular, the period when the highest return on equity for the enterprise was recorded, that is, in 2022, the levels of return on sales and asset turnover were also high, while in 2024, a sharp decrease in these indicators led to a significant decrease in the return on equity (up to 2.9%). At the same time, the relatively high level of the tax burden and interest rate coefficients indicates that a significant part of the profit remains at the disposal of the enterprise after taxes and interest expenses. The influence of the financial leverage ratio on the return on equity was also significant in 2020-2022. In 2023, this coefficient decreased to 0.757, which indicates the company's desire to finance its activities with more private capital. As a result, even if operational indicators remained relatively stable, the low leverage effect reduced the return on equity. In 2024, the leverage ratio slightly recovered (1.205), but due to a sharp deterioration in operational factors, it could not have an adequate impact on increasing profitability.

Based on the above analysis, it can be said that the main problem in the decline in the profitability of equity in recent years at ZENATKOR TEMIR BETON BUYUMLARI LLC is the decrease in the efficiency of operational activities. Therefore, in order to restore and increase profitability in the future, it is necessary to conduct a deep analysis of each link of operational activity and increase the efficiency of asset utilization. It is also necessary to strategically revise the capital structure, in particular the level of financial leverage, to restore profitability. The rational use of financial leverage, along with increasing operational profitability, serves as an important factor in restoring the return on equity.

Although the DuPont model allows us to express what factors influence the return on equity and what is the functional relationship between them, assessing how much the change in factors in this model affects the change in the return on equity requires economic and mathematical methods for functional relationships. In practice, there are many such methods, and logarithmic factor analysis was used to ensure a high degree of accuracy of the analysis results. The results of the analysis can be seen from the data in Table 2 below.

From the data in Table 2 above, it can be seen that the increase in the return on equity in 2021 was +8.45 p.p. The greatest influence on this positive change was exerted by the asset turnover ratio (+10.01 p.p.). However, a decrease in sales profitability (−3.89 p.p.) and the negative impact of financial leverage (−1.73 p.p.) slowed overall growth. The tax and interest burden factors had a positive effect (+2.39 p.p. and +1.67 p.p., respectively).

Indicators/Year	2021	2022	2023	2024
Effect of tax burden coefficient	+2.39	+11.26	-1.02	0.00
Effect of the percentage load factor	+1.67	+1.55	-0.05	-0.25
Effect on sales profitability	-3.89	+ 29.27	-6.31	-3.42
Effect of asset turnover ratio	+10.01	-12.55	12.51	12.51
Effect of financial leverage ratio	-1.73	-3.65	-14.91	+3.51
total change in return on equity	**+8.45**	**+25.89**	**-34.79**	**-12.67**

Table 2. Decomposition of the DuPont model indicators of changes in the return on equity, in percentage points (p.p.)

The growth of return on equity reached its highest level in 2022, equal to +25.89 p.p. Although the turnover of assets (-12.55 p.p.) and leverage ratio (-3.65 p.p.) had a significant negative impact on the change in the return on equity this year, a high level of growth occurred due to the very large positive impact of the factors of full sales profitability (+29.27 p.p.) and tax burden (+11.26 p.p.). In general, a sharp increase in the operational efficiency of the enterprise and a sharp decrease in tax expenses this year were the leading factors in the growth of the return on equity.

At the enterprise in 2023, the level of return on equity sharply decreased, decreasing by -34.79 p.p. The highest negative impact was caused by financial leverage (-14.91 p.p.) and asset turnover (-12.51 p.p.). A decrease in sales profitability also deepened the overall decline by −6.31 p.p. Only the influence of the tax and interest burden factors was practically neutral. This year, the enterprise suffered serious losses in terms of the structure of financial capital and operational efficiency. The return on equity at the enterprise decreased by another −12.67 p.p. in 2024, and the main factors that led to this were the low level of asset turnover (impact −12.51 p.p.) and a decrease in sales profitability (impact −3.42 p.p.). However, the financial leverage factor had a positive effect (+3.51 p.p.) this year. This indicates that the structure of financial capital in the enterprise has been revised and increased attention has been paid to the use of borrowed capital. The tax and interest burden factors did not have an impact or a very insignificant negative impact persisted.

In the financial statements of ZENATKOR TEMIR BETON BUYUMLARI LLC for the analyzed period, the balance of finished goods in the warehouse at the beginning and end of the reporting period for all years was equal to zero. This indicates that the products manufactured at the enterprise in the corresponding years were fully sold in the same year, and the enterprise mainly produces and sells them

based on orders. Therefore, for analysis, the indicator of net revenue from the sale of products was taken as the annual volume of products manufactured at the enterprise. The volume and dynamics of this indicator were analyzed according to Table 1.

To assess the impact of changes in labor productivity, capital productivity, and capital intensity indicators on production volume, the following functional relationships were used, which are widely used in economic analysis between them:

$$Y = L \cdot LP = K \cdot KP = L \cdot KP \cdot KL. \qquad (2)$$

YLLPKKPKL Here, - the volume of output, - the number of production personnel, - labor productivity, - the volume of fixed capital, - return on capital, - the degree of capital availability.

Factor analysis, carried out on the basis of the above multiplicative relationships, showed that labor productivity (Fig. 1.a) and capital turnover (Fig. 1.b) were the main factors determining the degree and direction of change in the volume of products manufactured at the enterprise. In 2021, an increase in labor productivity by 86.3% led to an increase in production volume by 84.7% points, while capital productivity increased by 32.0% and contributed to the growth of production volume by 37.8%. In a 66.7% decrease in production volume in 2024, the contribution of labor productivity was 68.6% points, and the contribution of capital turnover was 66.8% points. Due to the low rate of change in the number of workers, the influence of this indicator on the change in production volume was very small in both negative and positive directions.
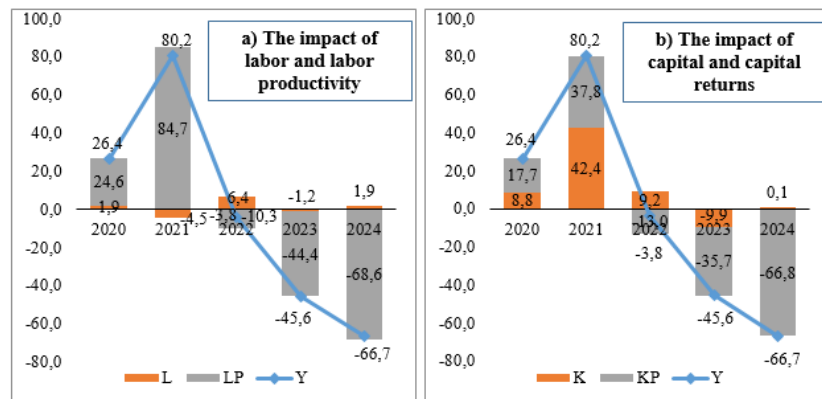

Figure 1. Decomposition of changes in the volume of manufactured products by labor and capital factors, in %

The three-factor function of production volume (2) above (number of workers, return on capital, and level of capital equipment) allows simultaneously assessing the influence of labor and capital factors on the change in this indicator. The analysis conducted in this regard showed that the level of capital equipment in 2020-2022 was positive, including a very high contribution to the growth of production volume in 2021, equal to 46.9% points. This indicator had a negative impact in small percentage points in 2023-2024 (Figure 2).
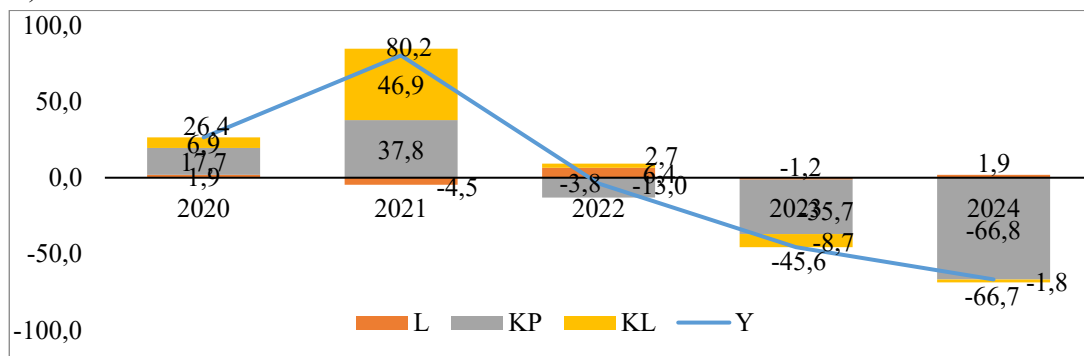

Figure 2. Three-factor decomposition of changes in the volume of manufactured products, %

Based on these analyses, it can be concluded that the high efficiency of labor and capital resources at the enterprise before 2021 disappeared in subsequent years until 2024. Despite the decrease in sales volume, the number of production personnel has not been reduced. A sharp decrease in the return on capital led to a decrease in the total volume of production due to a decrease in labor productivity.

Of course, the full utilization of the enterprise's production potential is also largely dependent on changes in market demand for the enterprise's products. During the period of 2022-2024, the volume of products of "ZENATKOR TEMIR BETON BUYUMLARI" LLC, specializing in the production of reinforced concrete structures and finished concrete products in the Jizzakh region, decreased only in 2022 and increased by an average of 38.1% in 2023-2024. The market share of the enterprise's own products in the Jizzakh region increased from 17.7% to 32.1% from 2020 to 2022, while in the last two years the market share sharply decreased to 3.0%. These circumstances indicate that in the Jizzakh region, in the sector of products of "ZENATKOR TEMIR BETON BUYUMLARI" LLC, market competition is intensifying, and this enterprise is lagging behind in competition. This, in turn, means the need to implement measures aimed at increasing the effectiveness of marketing and competitive policy at the enterprise. In particular, it is advisable to form strategies for product prices and quality based on entering new market segments, analyzing the actions and capabilities of competitors. Also, the order-based production model, which provides flexibility and accuracy for the enterprise, remains ineffective under conditions of unstable order flows. To fully utilize its potential, the enterprise must form a stable customer base, implement a system of planned monitoring of the load or downtime of production capacities, and diversify the product composition. In addition, the production of quickly delivered universal parts (for example, reinforcement frames, molds) based on orders in conjunction with production practice, the creation of the possibility of prompt response to orders by creating and storing stocks of additional products, serves to increase the efficiency of current production practice.

Conclusion

In conclusion, the assessment of economic efficiency is a vital process that supports informed decision-making and strategic planning across various sectors. This study highlights that no single method universally applies to all contexts; therefore, selecting appropriate assessment tools based on specific organizational needs and industry characteristics is crucial. Combining quantitative techniques like Data Envelopment Analysis and cost-benefit analysis with qualitative insights enhances the accuracy and relevance of efficiency evaluations. Furthermore, integrating multiple methods can provide a more comprehensive understanding of economic performance and resource utilization. Future research should focus on refining these methodologies and developing hybrid models that better capture the complexities of economic efficiency. By advancing assessment tools, organizations can optimize resource allocation, improve competitiveness, and contribute to sustainable economic growth.

References

[1] Vazirlar Mahkamasi, "Iqtisodiy Faoliyat Turlarini Tasniflashning Xalqaro Tizimiga O'tish Chora-Tadbirlari To'g'risida," Qaror 275, 24 Aug. 2016. [Online]. Available: https://lex.uz/docs/-3019918

[2] A. A. Firoozi, A. A. Firoozi, D. O. Oyejobi, S. Avudaiappan, and E. S. Flores, "Emerging Trends in Sustainable Building Materials: Technological Innovations, Enhanced Performance, and Future Directions," Results in Engineering, vol. 24, 2024, Art. no. 103521, doi: 10.1016/j.rineng.2024.103521.

[3] J. X. Lu and C. S. Poon, "Recycling of Waste Glass in Construction Materials," in New Trends in Eco-Efficient and Recycled Concrete, Woodhead Publishing, 2019, pp. 153–167, doi: 10.1016/B978-0-08-102480-5.00006-3.

[4] R. Alyousef, W. Ahmad, A. Ahmad, F. Aslam, P. Joyklad, and H. Alabduljabbar, "Potential Use of Recycled Plastic and Rubber Aggregate in Cementitious Materials for Sustainable Construction: A

Review," Journal of Cleaner Production, vol. 329, 2021, Art. no. 129736, doi: 10.1016/j.jclepro.2021.129736.

[5] I. Y. Umarov, Q. Muftaydinov, and D. K. Sarimsakov, "Strategic Management and Sectoral Performance in the Food Industry: A Time-Series Econometric Study Using Elasticity-Based Modeling," International Journal of Accounting and Economics Studies, vol. 12, no. 2, pp. 138–146, 2025, doi: 10.14419/1vmamp02.

[6] N. S. N. Arman, R. S. Chen, and S. Ahmad, "Review of State-of-the-Art Studies on the Water Absorption Capacity of Agricultural Fiber-Reinforced Polymer Composites for Sustainable Construction," Construction and Building Materials, vol. 302, 2021, Art. no. 124174, doi: 10.1016/j.conbuildmat.2021.124174.

[7] W. Al Zoubi, M. P. Kamil, S. Fatimah, N. Nashrah, and Y. G. Ko, "Recent Advances in Hybrid Organic-Inorganic Materials With Spatial Architecture for State-of-the-Art Applications," Progress in Materials Science, vol. 112, 2020, Art. no. 100663, doi: 10.1016/j.pmatsci.2020.100663.

[8] P. B. Johnson, "Application of Regression Models for Predicting Industrial Enterprise Performance," Journal of Applied Statistics in Industry, vol. 60, no. 2, pp. 175–189, Feb. 2019.

[9] B. O. Tursunov, "Korxona Faoliyatini Boshqarishni Takomillashtirishda Ishlab Chiqarish Omillaridan Samarali Foydalanish," Ph.D. dissertation abstract, Tashkent, 2019, pp. 11–12.

[10] E. K. Chirkunova, "Teoreticheskie Osnovy Innovatsionnogo Upravleniya Problemnym Ob"yektom," Ekonomika i Upravlenie Sobstvennost'yu, no. 3, pp. 25–48, 2014.

[11] N. I. Rustamov, "Sanoat Tarmoqlarini Ichki Imkoniyatlaridan Samarali Foydalanish Asosida Rivojlantirish," Ph.D. dissertation abstract, Tashkent, 2018, pp. 7–11.

[12] A. M. Kadirov, "Sanoat Korxonalarining Iqtisodiy Barqarorligini Ta'minlash Mexanizmlarini Takomillashtirish," Ph.D. dissertation abstract, Tashkent, 2019, p. 11.

[13] A. S. Camanho, M. C. Silva, F. S. Piran, and D. P. Lacerda, "A Literature Review of Economic Efficiency Assessments Using Data Envelopment Analysis," European Journal of Operational Research, vol. 315, no. 1, pp. 1–18, May 2024.

[14] X. Hu, "Data Envelopment Analysis for Performance Measurement in the Construction Field: A Systematic Review," Engineering, Construction and Architectural Management, ahead of print, 2024.

[15] I. M. Horta, A. S. Camanho, and J. M. Da Costa, "Performance Assessment of Construction Companies Integrating Key Performance Indicators and Data Envelopment Analysis," Journal of Construction Engineering and Management, vol. 136, no. 5, pp. 581–594, 2010.

[16] X. Hu and C. Liu, "Profitability Performance Assessment in the Australian Construction Industry: A Global Relational Two-Stage DEA Method," Construction Management and Economics, vol. 34, no. 3, pp. 147–159, 2016.

[17] R. J. Dzeng and J. S. Wu, "The Cost Efficiency of Construction Industry in Taiwan," Open Construction and Building Technology Journal, vol. 6, no. 1, pp. 8–19, 2012.

[18] K. Tone, "A Slacks-Based Measure of Efficiency," European Journal of Operational Research, vol. 130, no. 3, pp. 498–509, May 2001.

[19] S. Kumbhakar and C. A. Lovell, Stochastic Frontier Analysis, Cambridge University Press, 2000.