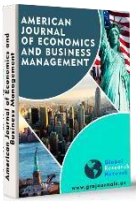

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Article

Dynamics and Analysis of Employee Efficiency in Commercial Banks of Uzbekistan

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Abstract: The effect of human capital utilization on the operational performance of banking sector can be captured using one of the most important indicators of human capital utilization and competitiveness, namely employee efficiency, which is often measured in profit per employee. Uzbekistan's digital transformation and foreign bank entry have changed operational models. However, can we say that this has made our employees more efficient? Existing studies in the literature on Uzbekistan banking sector mainly either discuss banking system wide profitability as well as stability or focus on total factors of efficiency (TE) at the bank ownership level. This research aims to analyze efficiency of employee in commercial banks of Uzbekistan by means of both ownership type comparison (state vs. private) and performance clustering using statistics and cluster analysis methods for a period of 2020–2023. Results indicate that foreign bank employees earned the highest profit per employee, while state-owned banks are always the least efficient. Private and joint stock banks yielded middling results but that improved somewhat over time. Differences between foreign and local banks were tested using ANOVA, while four different performance groups were identified with a cluster analysis from elite countries with a very high efficiency rate to extremely inefficient institutions. It is the first systematic and data-driven analysis of employee efficiency in the banking system of Uzbekistan, revealing the relationship between ownership structure and employee efficiency, as well as the effect of digital transformation. The findings highlight the need for foreign bank best practice adoption, improvement of employee training, and facilitation of technological modernization to improve employee functionality and national banking sector competitiveness.

Keywords: employee efficiency, commercial banks, net profit, cluster analysis, ownership type.

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1. Introduction

In the banking system, employee efficiency is one of the important indicators for ensuring the stability and competitiveness of financial institutions. This indicator is usually measured by the amount of net profit generated by each employee. High employee efficiency indicates that the bank is fully and rationally using human resources, the effectiveness of internal management systems, and the soundness of operational processes [1].

An increase in the profit per employee indicator not only increases the bank's profitability, but also strengthens its competitive advantage in market conditions. Therefore, bank management needs to effectively organize a strategy for working with human capital, increase investments in staff training, and introduce advanced technologies [2].

In recent years, the process of digital transformation has accelerated in the banking system of Uzbekistan. The entry of banks with foreign capital and the implementation of phased transformation programs in state-owned banks have had a significant impact on employee efficiency. In particular, the widespread introduction of digital banking services and automated technologies has made it possible to increase the amount of profit per employee.

In these changing times, regular monitoring and analysis of employee performance is of great importance. Because each bank needs to identify its strengths and weaknesses in terms of human resources and adjust its strategic development plan. At the same time, studying the best practices of foreign banks and adapting them to local conditions can yield great results in increasing performance [3].

The main objective of this study is to assess the performance of employees of commercial banks of Uzbekistan for 2020-2023, compare them by form of ownership, and divide them into groups according to the level of performance using cluster analysis. This approach allows us to develop specific recommendations for improving the efficiency of resource use in the banking sector, optimizing operating costs, and motivating staff [4].

Literature review

Employee productivity is one of the main indicators of how effectively human capital is managed in financial institutions. Huselid found that effective human resource management practices and employee productivity have a significant impact on the overall financial performance of banks. Becker and Gerhart also emphasize that improving the quality of human capital directly contributes to corporate competitiveness [5].

In international banking practice, employee productivity is often measured through "profit per employee" or "value added per employee" indicators. Banker and Mashruwala empirically found that income per employee and profit indicators are directly related to the overall profitability of the bank. Ployhart and Moliterno consider human capital as a long-term strategic advantage of the bank and note that qualified employees and effective management systems are crucial factors in the stability of the bank [6][7].

In recent years, digital transformation processes have created new opportunities for improving employee productivity. Vives argues that digital banking and fintech technologies are accelerating banking operations and enabling employees to create more value. Automated processes, artificial intelligence, and big data technologies are improving service quality while optimizing employee workload [8].

Studies conducted in developing countries show that efficiency gains in the banking sector depend not only on technological innovations, but also on improving internal management systems, training programs, and strengthening motivational mechanisms. In this regard, strategies for improving employee efficiency need to be tailored to the country's economic and institutional conditions [9].

Existing scientific studies on Uzbekistan mainly focus on the issues of overall efficiency, profitability, and financial stability of banks, and have not conducted a separate in-depth analysis of employee efficiency. Therefore, this article is unique and relevant in that it analyzes employee efficiency in the national banking system based on empirical data [10].

2. Materials and Methods

It is a quantitative study, which means the methodology of this study is based on measuring and comparing the means of efficiency of employees of commercial banks in the Republic of Uzbekistan in the years 2020–2023. One of the independent variables, employee efficiency96 was measured via net profit per employee97, a common performance indicator in banking. The data were from recipients' monthly financial reports, by type of ownership structure foreign or domestically owned (state or private) and for joint-stock commercial banks. Net profit per employee was calculated as a net profit/number of employees ratio, and descriptive statistics based on mean, median, standard deviation, minimum/maximum and quartiles were also applied to describe the

central tendency and variation of this measure. Outlier detection was performed to detect extreme values, which can have an impact on how the group performs as a whole. We used an analysis of variance (ANOVA) to test the significance of differences between bank groups and used multiple pairwise comparisons to determine the specific pairs between which serious differences existed. Moreover, a cluster analysis was also executed in the best combination of variables that grouped banks based on their similarities in profit per employee and the standard deviation of profit per employee, revealing clusters of performance from highly efficient to highly inefficient banks. In addition, due to the focus on changes over time, trend analysis was conducted for the period observed in order to investigate the effects of the aforementioned variables regarding digital transformation and foreign capital entry on employee efficiency. This diversified methodological efforts have given full coverage of an efficiency pattern and its driving forces in the case of the Uzbek banking system.

3. Results and Discussion

Employee productivity, that is, the net profit brought by each employee, was calculated based on the following formula.

Profit for Every Employee = (Net Profit)/(Number of Employees) (1)

The table below presents illustrative statistics on the amount of ford per employee based on monthly data from commercial banks operating in Uzbekistan from December 2020 to July 2023. Banks are divided into 4 groups according to their form of ownership (Table 1).

Table 1. Descriptive statistics of profit per employee

Form of ownership	Number	Average	Std.dev	Min	25%	50%	75%	Max
Foreign banks	158	250.01	404.79	-1056.74	0.00	248.54	438.75	1583.87
Joint-stock commercial banks	355	147.87	299.67	-3391.66	55.16	158.38	244.08	1063.89
Private banks	366	153.63	236.94	-1482.98	0.00	81.63	277.19	1470.19
State banks	96	130.57	126.20	-220.47	32.41	123.35	168.27	480.55

From the table data, it can be seen that the profit per employee of banks with a state share is lower than that of employees of private or foreign banks. Also, during the analysis period, employees of foreign banks attracted a higher level of profit to the bank than the average of the entire banking system. The lowest level of profit per capita was for employees of banks directly owned by the state. However, banks in this group had the lowest standard deviation. It follows that over time, this indicator fluctuated less and profit per capita in banks directly owned by the state did not undergo sharp changes [11].

The figure below shows the trend of profit per employee of banks by ownership type by month. It can be seen from the figure that foreign banks achieved the highest profit not only on average, but almost throughout the entire analysis period. This indicates that foreign banks effectively use employees to generate profit [12][13].

Private banks, which had significantly lower profit per employee at the beginning of the analysis period, improved their position in terms of profit per employee by the end of the analysis period. Since the beginning of 2023, foreign banks have achieved rapid growth in profit per employee, and a significant difference has emerged between them and banks in other groups (Figure 1).

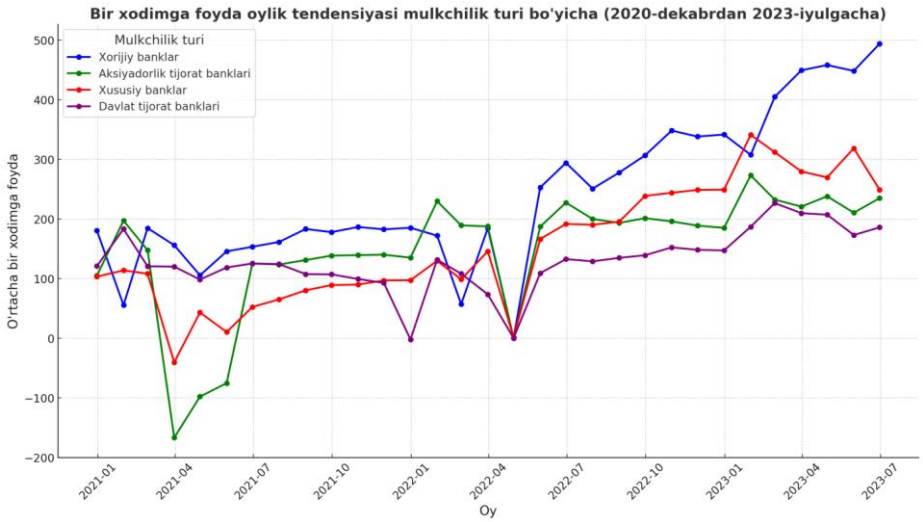

Figure 1. Profit per employee trend by month

The emergence of such a large gap with foreign banks may be due to the entry of new foreign players into the market in the form of digital banks and their faster digital transformation than domestic banks (Figure 2).

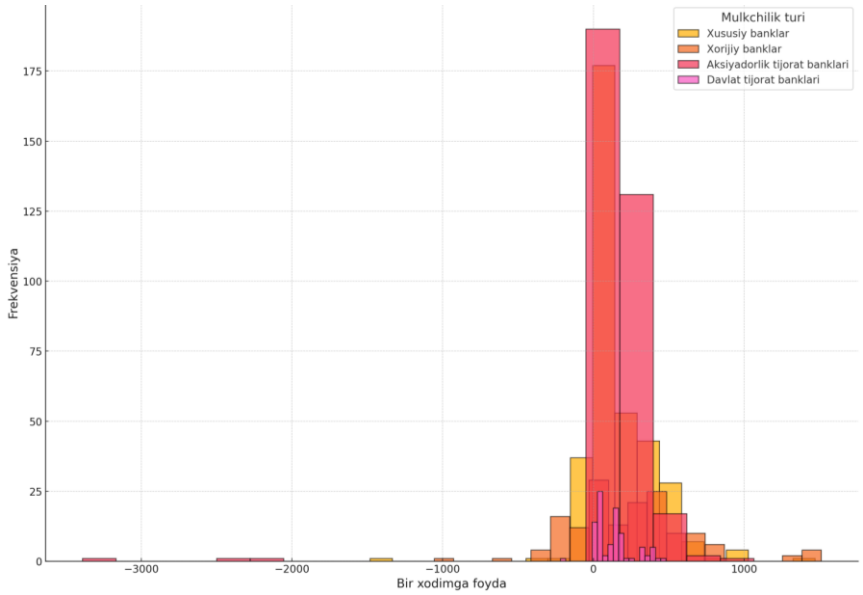

Figure 2. Profit distribution per employee

Foreign banks had the highest mean (240.4) and the highest standard deviation (392.7). This in turn indicates that different foreign banks have significantly higher variability in terms of profitability. It also indicates that different foreign banks have different operational processes in terms of efficiency. In addition, the fact that one of the foreign banks had the maximum extreme value (1510.9) shifted the mean to the right [14].

Commercial banks directly owned by the state had the lowest mean (129.3) and their variability was also relatively low (125.7). This indicates that banks in this group have been operating consistently, while at the same time recording consistently low results. Directly state-owned banks should review their internal policies, revise their cost structure and productivity improvement strategies, and use the strategies of successfully implemented foreign banks.

The observation of indirectly state-owned commercial banks has taken an extreme negative value (-3391.7), which has significantly shifted its mean to the left (shift: -7.60). This may be due to a large one-time loss or inefficiency, and requires the implementation of risk management practices to prevent such situations from recurring.

The mean of private banks (150.8) shows that the shift (0.5) is low, while presenting average performance. However, its high kurtosis (9.8) indicates that it is heavily weighted at the edges of the distribution and that there are more extreme observations. That is, not all private banks have the same operational processes and their efficiency varies. Effective financial control over banks with low performance and early assessment of potential risks should be carried out systematically.

The fact that all bank groups by ownership form have different shifts and outliers among the distribution of profit per employee means that they belong to different degrees of non-normal distribution. This, in turn, indicates that structural or market factors affect the profits of banks. We will consider these factors in the next part of the dissertation.

An ANOVA test was performed to check whether the amount of profit per employee differs statistically significantly by the ownership form of banks. According to the test results, the ownership form plays a statistically significant role in the difference between the means and they are not statistically equal (F-statistic 4.48, p-value 0.002). This test does not reveal which ownership forms have a large difference or which ones are equal to each other. To check these cases, 6 pairs were created from 4 bank groups according to the ownership form and the difference between them was tested for statistical significance. The table below presents the results of this test and the pairs (Table 2).

Table-2. Comparative analysis of banking groups

Couples		Difference	p-value
Joint-stock commercial banks	State commercial banks	-17.18	0.96
Joint-stock commercial banks	Foreign banks	93.93	0.00
Joint-stock commercial banks	Private banks	4.33	1.00
State commercial banks	Foreign banks	111.11	0.02
State commercial banks	Private banks	21.51	0.92
Foreign banks	Private banks	-89.60	0.01

According to the test results, the amount of profit per employee in banks with a state share is not statistically different. That is, they are statistically equal to each other. The same situation was observed with private banks and banks with a state share. In other words, the profit generated by each employee working in local banks is not statistically significantly different. However, it has been empirically proven that the profit generated by an employee working in foreign banks is statistically significantly higher than the profit generated by his colleague working in local banks, regardless of the form of ownership [15].

Without dividing the banks into groups by form of ownership, a cluster analysis was performed based on their profit per employee and their variation. Banks were divided into 4 clusters based on these indicators. The horizontal axis shows the profit per employee of banks that are close to each other, regardless of the form of ownership. The vertical axis shows the names of the clusters (Figure 3).

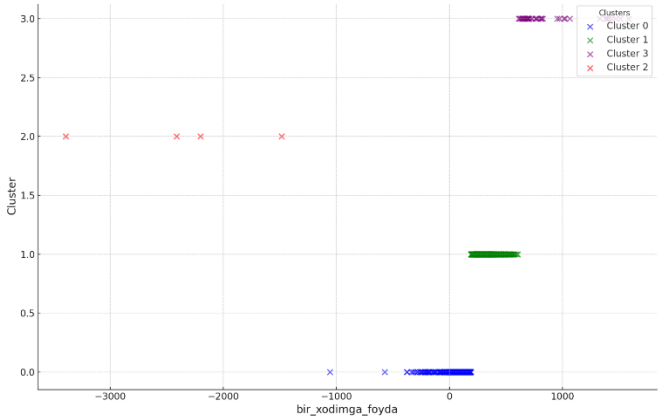

Figure 3. Clustering of banks by profit per employee

Cluster analysis is a method of dividing data into groups (clusters) based on their similarity. Each cluster contains data that is more similar to each other than to other clusters. This method is widely used in data segmentation to identify and analyze values that are close to each other.

The purpose of cluster analysis is to segment banks based on profit per employee. This allows us to identify:

- Which banks are performing well.
- Low-performing groups and outliers.
- Develop specific strategies for each cluster.

The clusters were also analyzed according to the ownership structure of banks. The importance of such analysis is that they play an important role in understanding the behavior of clusters. The figure below shows the share of banks in each cluster by ownership structure. It can be seen from the figure that private banks are present in a significant proportion in all clusters, which indicates that their operational processes are different. Indirectly state-owned banks are also present in all clusters, although their share is lower in the elite. Although foreign banks dominate the high-yield cluster, they also show some variability. Directly state-owned banks are mainly located in the first cluster, called the medium-yield cluster, and their share in the high-yield cluster 1 is very low (Figure 4).

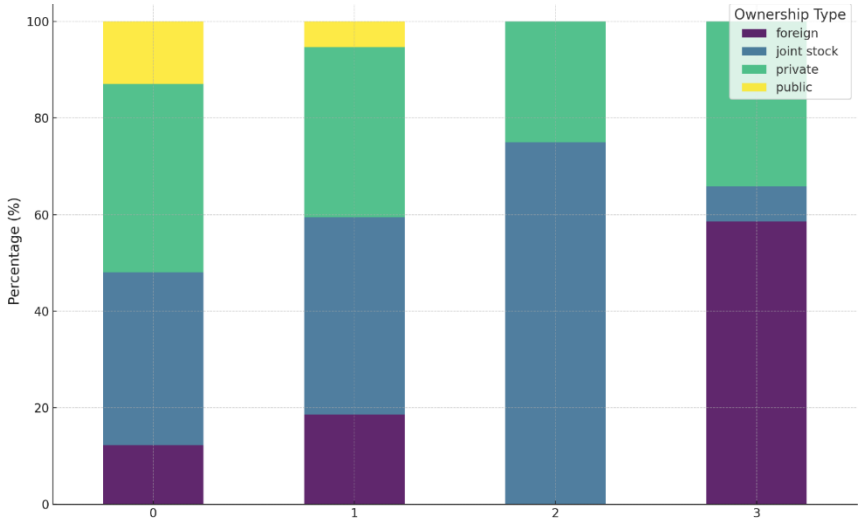

Figure 4. Cluster analysis of employee profit generation by bank ownership

Cluster 0: Moderately effective activity

This cluster includes all banks by ownership type. However, the majority are private banks (39%) and indirectly state-owned banks (36%). Profit per employee in this cluster is moderate (average: 43.7, standard deviation: 105.5), and volatility is significantly high. Foreign banks are also present in this cluster, and their value is negative. Private and indirectly state-owned commercial banks will need to standardize operational processes to increase efficiency and reduce volatility in this indicator. Also, improving staff skills and introducing technological change will lead to an increase in the efficiency of profit generation by employees.

Cluster 1: High-performance activities

This cluster is comprised of indirectly state-owned banks (41%), private banks (35%), and foreign banks (19%). Banks in the cluster are highly productive, with a high average profit generation (336.9) and relatively low variance (standard deviation: 100.1). Implementing operational processes from high-performing banks across other banks will

lead to more efficient banking systems. Allowing banks in this cluster to expand while maintaining quality and consistency will lead to more efficient banks. Banks in this cluster should implement strategies to retain and motivate high-performing employees.

Cluster 2. Extremely inefficient activity

The number of observations in this cluster is only 4, of which three belong to banks indirectly owned by the state, and the remaining one belongs to private banks. Highly inefficient activities are characterized by high losses (mean: -2372.1) and high variation (standard deviation: 787.6). It is necessary to find the root of inefficient activities and take measures to prevent their recurrence in the future. It is necessary to determine whether the causes are poor management, external shocks, or inefficient operational processes. In such cases, it is necessary to develop strategies for restoring the banks' activities, reducing costs, and restructuring. In addition, it is necessary to properly establish risk management and compliance control policies. In addition, it is necessary to identify inefficient processes by conducting management control and auditing operational processes.

Cluster 3. High-performance elite

This cluster is composed mainly of foreign banks (59%) and private banks (34%). This cluster has a very high profit per employee (mean: 887.2) generation, with a manageable level of variation (standard deviation: 297.7). Banks in other clusters should replicate the operational processes of banks in this cluster, expand investment in cutting-edge technologies, and increase the use of innovative financial instruments. Banks in this cluster can attract more customers and investors, and can quickly capture segments with low banking services.

4. Conclusion

The results of the analysis showed that there were significant differences in the efficiency of employees of commercial banks in Uzbekistan in 2020–2023. While employees of foreign banks generated the highest profits, banks directly owned by the state had the lowest efficiency. Private banks and banks indirectly owned by the state showed average results, but in some periods there was a positive increase in efficiency.

The entry of digital banks and the activities of financial institutions with foreign capital played an important role in increasing employee efficiency. These banks achieved high efficiency through rapid digital transformation, the introduction of innovative technologies and the optimization of service processes. On the other hand, it was observed that the level of human capital management and operational efficiency in local banks was not the same.

Based on cluster analysis, banks were divided into four groups according to their efficiency level: average efficient activity, highly efficient activity, extremely inefficient activity and highly efficient elites. This classification can be useful in reallocating resources, improving operational processes, and expanding effective practices in the banking sector.

Recommendations:

1. Improving the efficiency of state-owned banks - modernization of internal management systems, strengthening employee motivation and training programs.

2. Technological modernization in private banks - widespread introduction of advanced technologies, increasing operational efficiency through automated systems.

3. Using the experience of foreign banks - adapting the operating models and human capital management methods of highly efficient foreign banks to local conditions.

4. Expanding digital services - optimizing service processes, expanding the customer base through online platforms, and reducing employee workload.

5. Creating a continuous monitoring system - increasing interbank competition by regularly measuring employee efficiency, introducing internal and external comparison systems.

These recommendations serve to effectively use human resources in banking activities, improve service quality, and improve financial results.

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