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FULL LENGTH ARTICLE

# Increasing the Income of Commercial Banks in Uzbekistan

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## ABSTRACT

Commercial banks are a key component of the financial system, and they play an important role in mobilizing savings and supporting economic growth. Understanding the structural changes in bank income is of great significance for understanding the profitability and financial stability of commercial banks. Therefore, the main aim of the present study was to examine factors affecting income growth in commercial banks in Uzbekistan ($N$ = number of participating banks) by conducting both expert assessments ($n$ = number of experts) and bank-level analyses ($n$ = number of bank observations) focusing on income generation. To identify and quantitatively assess key factors, this study aimed to examine income sources in commercial banks and their relative changes based on financial indicators and expert judgments, using AHP and SEM. Financial data were collected, expert judgments were obtained, and statistical analyses were conducted. Both the relative importance of income growth factors (by AHP) and the relationships among financial indicators (by SEM and path analysis) were examined. Since no more than limited evidence could be found on the combined use of AHP and SEM in Uzbekistan, results indicated differences in the relative importance of income growth factors rather than equal contributions when each factor was assessed. The results showed that income growth was significantly and positively associated with lending activities and non-interest income. In both AHP and SEM analyses, most financial factors showed rather small differences in their relative contributions and produced varying effects, suggesting that income sources were of different importance and should be managed with appropriate strategies. The income changes found in this study are highly consistent with the importance of effective financial management, which indicates that the diversification of revenue sources has an important influence on the profitability changes of commercial banks.

**Keywords:** Commercial banks ▪ Income growth ▪ Revenue diversification ▪ Bank profitability ▪ Financial risk management ▪ Analytic Hierarchy Process (AHP) ▪ Structural Equation Modeling (SEM)

## 1. INTRODUCTION

[1] first used empirical analysis to examine revenue diversification in South Asian banks and found that some measures of bank performance were significantly worse than others indicating the possible relationship between income diversification and financial stability. The higher the frequency of digital banking service use is, the stronger the customer engagement is, which supports the growth of non-interest income [2,3]. From a financial management perspective, income diversification is not only a necessary period of banking development, but also a period of increased financial complexity caused by the expansion of revenue-generating activities [4]. According to the revenue diversification approach, bank profitability is regarded as the result of an interaction between interest income and non-interest income, sources of financial returns [5,6,7]. Moreover, if credit risks are not effectively managed, financial losses may occur, such as reductions in interest income and even deterioration of bank profitability [8,9]. The limitation of the above approaches is the different financial

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indicators, which are not always suitable to compare, and the high sensitivity of profitability measures. Due to changing market conditions as well as increasing financial risks, however, researchers also point out that excessive dependence on income generated from activities beyond traditional lending might result in financial instability [10,11,12].

Therefore, improving the analysis of income sources, credit risk management, and revenue diversification strategies are of great importance to commercial bank profitability and financial stability. The empirical analysis findings confirmed a significant relationship between revenue diversification and bank profitability especially with non-interest income suggesting that income structure may be an important determinant of financial performance [13,14]. The performance of commercial banks can be improved through digital transformation, and both operational efficiency and financial innovation are shown to be important in banking development, which suggests that income growth seems to be associated with two main factors, namely, technological development and income diversification [14,15]. In addition to empirical studies on bank profitability, Rakhmatillaev [1] conducted financial analysis and compared bank-specific determinants to identify factors that influence profitability for state-owned commercial banks. Additionally, the researchers compared interest income as traditional bank revenue and provided empirical information about non-interest income diversification [2,3]. Since revenue diversification after the global financial crisis was first examined in different banking markets, empirical findings in the banking literature have been reported as context-dependent evidence [4,5,6]. The limitation of the above research is the different sample characteristics, which are not always applicable to Uzbekistan, and the high variation of banking systems. Since no results of combined AHP and SEM analysis are presented in the cited studies of Uzbekistan's commercial banking sector, these have additionally been conducted either on individual financial indicators or on specific banking activities.

Moreover, because most of the empirical research is conducted in foreign banking markets or on individual determinants of profitability, it is relatively fragmented and not comprehensive enough. In order to make a meaningful contribution to banking profitability research, the present study focuses on income growth following both expert-based prioritization and structural relationship analysis. With this in mind, bank-level data were used in this study to examine the relationships between income sources and financial performance, and then to identify and assess the relative effect of income diversification. Given that digital banking services are more frequently used in commercial banks, findings on operational efficiency as well as non-interest income might be of greater importance for banking sector development. Therefore, understanding how the relative contributions of different income sources changed is of great significance for understanding commercial bank profitability in Uzbekistan. To provide a comprehensive assessment on the factors affecting commercial bank income using quantitative methods, this study took the financial indicators of commercial banks in Uzbekistan and examined their relationships based on the Analytic Hierarchy Process (AHP) and the Structural Equation Modeling approach (SEM). This study combined the research methods of AHP and SEM, which can conduct a systematic assessment of income growth factors with expert judgments, and it can provide empirical evidence for the previous banking profitability studies. These approaches are also supported by expert assessments as part of financial decision-making. This study combined the quantitative methods of AHP and SEM, which can conduct a detailed examination of income growth factors with statistical relationships, and it can provide additional evidence for the previous empirical research.

## 2. METHODS

Regarding the distribution of commercial banks across Uzbekistan, there were differences in banking activities, as shown in the regional banking statistics, including commercial banks in Tashkent city (the capital), commercial banks in Tashkent region (the surrounding region), commercial banks in Samarkand region (central Uzbekistan), commercial banks in Fergana region (eastern Uzbekistan), and commercial banks in Bukhara region (western Uzbekistan).

During the study period, there were several commercial banks in Uzbekistan, some of whom had expanded their banking services with corresponding increases in income, and the level of income diversification was relatively high, which was higher than the level observed in banks relying mainly on traditional lending. Most of the variables used in this study come from commercial banks' financial statements, while expert judgment data comes from questionnaires completed by banking specialists. From the perspective of the financial performance of the banks, the sample includes both the commercial banks whose income growth was positive and those whose income growth was not. For conducting structural equation modeling in the present study, data of selected commercial banks were selected from the banking sector of Uzbekistan. A total of bank-level financial observations in Uzbekistan from the selected commercial banks across the study period, which is considered the main source of empirical evidence, were included in the analysis. Since the selected banks were considered not to differ substantially from the broader banking sector in terms of their main financial activities, the sample can be regarded as reasonably representative according to the study's selection criteria.

On the other hand, the financial indicators cover a broad range of banking activities and are generally recognized by more than one group of financial researchers; thus, they are applicable to a certain extent. For conducting financial analysis in the present study, data of commercial banks with available financial statements were selected from the banking sector of Uzbekistan. Exclusion criteria: Considering the availability of financial information, banks with fewer than two reporting periods in the dataset, and banks with only incomplete financial statements were excluded (the study focused on analyzing the changes of bank income). All three of these income sources have a certain importance in banking operations and in the assessment of profitability; thus, considering the financial contributions of these three sources, this study selected banks that appeared in at least two of the reporting periods to improve the consistency of financial observations selected for this analysis. To ensure the reliability of the results, the researchers decided not to use incomplete financial records and inconsistent income classifications because there were

too many uncertainties. Among those, there are two analytical methods including AHP and SEM from which expert judgments and financial indicators are used to assess income growth. With these methods, one is the AHP approach with pairwise comparisons to determine factor priorities, and the other is the SEM approach with financial indicators to examine structural relationships. Based on the characteristics of bank income, this study used the AHP and the SEM approaches to identify and evaluate the financial factors and obtained the relative importance of each factor.

After grouping financial indicators according to the income source (interest and non-interest income), estimates of various parts of bank income with commercial banks as the group were obtained. Through financial data analysis, this study first described income sources and then applied statistical methods to examine financial relationships. For comparison purposes, banks relying mainly on interest income were considered as the control group, while banks with more diversified income sources were considered as the comparison group in the analysis. Positive path coefficients indicate positive relationships between financial factors and bank income growth. Based on banking profitability research, this study defines income growth factors as those financial indicators that are directly related to revenue generation, derived from banking activities, and have measurable effects on profitability, including lending income and non-interest income. The control variables included bank characteristics and financial indicators such as bank size, total assets, total liabilities, equity capital, loan volume, deposit volume, operating expenses, credit risk, capital adequacy, liquidity, interest income, non-interest income, operational efficiency, and so on. Given that there are different sources of bank revenue, measures of bank income were established defining interest income as revenue from lending activities and non-interest income as revenue from fees and other banking services. This variable is measured using the responses in the "Income Growth Factors" section of the expert questionnaire: "How important is lending activity for bank income growth?" and "How important is non-interest income for bank profitability?" After that, according to whether income growth was positive, they were divided into two categories: banks with positive income growth and banks without positive income growth.

Banks with positive income changes were categorized as income-growing banks, and those who recorded no positive changes were categorized as banks without income growth. According to the main source of income, they were divided into interest-income group (main revenue = lending income), non-interest-income group (main revenue = service income), and diversified-income group (main revenue = mixed income sources). After grouping banks according to the income structure (interest and non-interest income), comparisons of various indicators of profitability with income source as the group were obtained. One method was analyzed by conducting pairwise comparisons on income growth factors in order to determine relative priorities using AHP and the other was applied to financial indicators for structural relationship analysis using SEM. Since differences in bank characteristics might lead to variation in financial performance and could thus result in biased estimates, SEM was used to obtain estimates of structural relationships. Since expert judgments might lead to differences in factor rankings and could thus result in uncertainty, AHP was used to obtain consistent priority weights. This study mainly examined whether there is a difference in relative importance among income growth factors; thus, the AHP provided a ranking and SEM examined structural relationships in this study. Since previous studies tended to suggest individual factors when there is variation in bank profitability, expert assessments were also included in this study by allowing financial specialists to be involved. The combined AHP–SEM approach uses a two-stage procedure to provide a comprehensive assessment through expert prioritization and statistical analysis of financial relationships to achieve the research objectives. As suggested by previous banking studies, the combined methods should then sufficiently correct for differences in factor importance that individual analytical approaches might have on the interpretation of bank income growth.

## 3. RESULTS

The results show that the relationships between loan yield resilience and fee channel breadth, credit loss pressure and income mix entropy, and bank income growth and income mix entropy are significant, which indicates that financial conditions can indirectly affect the structure of commercial bank income through changes in lending performance and revenue diversification.

Table 3 shows that loan yield resilience was significantly and positively associated with fee channel breadth after accounting for credit loss pressure and digital fee capture ($\beta = 0.159$, $p = 0.019$). Meanwhile, having higher bank income growth was significantly positively associated with income mix entropy, indicating that increases in bank income growth significantly increase the measured level of income diversification.

The main effect of digital fee capture was not significant ($p > 0.05$), and the estimated effect between loan yield resilience and income mix entropy was not significant ($p > 0.05$). The results show that several structural relationships are significant, which indicates that financial factors can positively affect the diversification of commercial bank income through changes in income growth and lending performance.

Therefore, the results of this AHP analysis can show that the normalized priority of the Diversified Income Growth Strategy (0.375408) was significantly higher than that of the Interest Income–Driven Strategy (0.303361).

These results suggest that differences in lending performance and financial risk may play an important role in the structural relationships that affect commercial bank income diversification.

Furthermore, the increase in credit loss pressure is likely to reflect changes in lending risk, which may reduce the stability of interest income, whereas the expansion of revenue diversification can be related to efforts to maintain income from different banking activities.

Moreover, the coefficient of loan yield resilience in the income mix entropy equation indicates that lending performance has a less significant impact on income diversification than bank income growth has on income diversification.

**Table 1.** Weighted Supermatrix of AHP-Based Income Growth Strategies and Evaluation Criteria for Commercial Banks in Uzbekistan

| Variables | Diversified Income | Interest Income | Non-Interest Income | Financial Risk | Income Growth | Profitability | Revenue Diversification | Goal |
|---|---|---|---|---|---|---|---|---|
| Diversified Income | 0.00000 | 0.00000 | 0.00000 | 0.61533 | 0.10251 | 0.10251 | 0.68128 | 0.18770 |
| Interest Income | 0.00000 | 0.00000 | 0.00000 | 0.06601 | 0.68165 | 0.21584 | 0.24995 | 0.15168 |
| Non-Interest Income | 0.00000 | 0.00000 | 0.00000 | 0.31866 | 0.21584 | 0.68165 | 0.06878 | 0.16062 |
| Financial Risk and Stability | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.12500 |
| Income Growth Potential | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.12500 |
| Profitability and Financial Efficiency | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.12500 |
| Revenue Diversification and Sustainability | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.12500 |
| Goal | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |

**Table 2.** Final AHP Priority Weights and Ranking of Income Growth Strategies for Commercial Banks in Uzbekistan

| Income Growth Strategies | Ideal Priority | Normalized Priority | Raw Priority | Rank |
|---|---|---|---|---|
| Diversified Income Growth Strategy | 1.000000 | 0.375408 | 0.187704 | 1 |
| Non-Interest Income–Driven Strategy | 0.855685 | 0.321231 | 0.160615 | 2 |
| Interest Income–Driven Strategy | 0.808084 | 0.303361 | 0.151681 | 3 |
| Total | — | 1.000000 | 0.500000 | — |

**Table 3.** Structural Equation Modeling Results for Financial Factors Affecting Commercial Bank Income in Uzbekistan

| | OIM | | | | | |
|---|---|---|---|---|---|---|
| | Coef. | Std. Err. | $z$ | $P>\|z\|$ | [95% Conf. | Interval] |
| *Structural* | | | | | | |
| *fee_channel_breadth* | | | | | | |
| digital_fee_capture | 0.040 | 0.079 | 0.500 | 0.615 | -0.116 | 0.195 |
| credit_loss_pressure | 0.126 | 0.081 | 1.560 | 0.120 | -0.033 | 0.284 |
| loan_yield_resilience | 0.159 | 0.068 | 2.340 | 0.019 | 0.026 | 0.292 |
| _cons | 32.915 | 5.038 | 6.530 | 0.000 | 23.042 | 42.789 |
| *income_mix_entropy* | | | | | | |
| credit_loss_pressure | 0.353 | 0.063 | 5.560 | 0.000 | 0.228 | 0.477 |
| bank_income_growth_pct | 1.628 | 0.190 | 8.550 | 0.000 | 1.255 | 2.001 |
| loan_yield_resilience | -0.080 | 0.067 | -1.190 | 0.234 | -0.211 | 0.052 |
| _cons | 19.901 | 3.592 | 5.540 | 0.000 | 12.860 | 26.942 |
| var(e.fee_channel_breadth) | 106.968 | 11.959 | | | 85.919 | 133.175 |
| var(e.income_mix_entropy) | 61.840 | 6.914 | | | 49.671 | 76.990 |

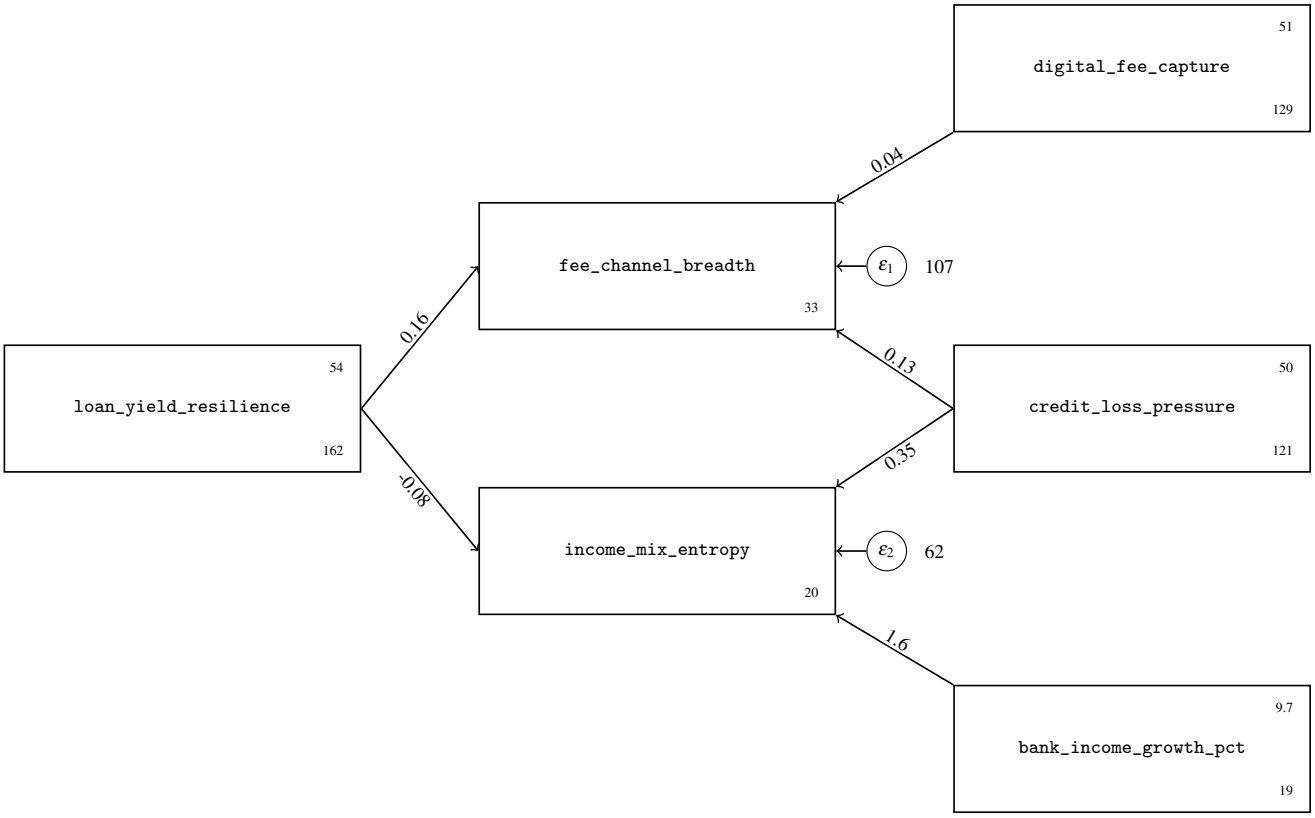
**Table 4.** Structural Equation Model Fit Statistics for Commercial Bank Income in Uzbekistan

| Fit statistic | Value | Description |
|---|---|---|
| Likelihood ratio | | |
| $\chi^2_{ms}(3)$ | 78.111 | Model vs. saturated model |
| $p > \chi^2$ | $< 0.001$ | Statistical significance |
| $\chi^2_{bs}(9)$ | 182.435 | Baseline vs. saturated model |
| $p > \chi^2$ | $< 0.001$ | Statistical significance |

## 4. DISCUSSION

The results of the AHP and SEM analysis suggest that revenue diversification plays an important role in determining the effects of financial factors on commercial bank income growth. As a result, during this period, the relative priority of the interest income-driven strategy further decreased, while the relative importance of the diversified income growth strategy further improved. SEM results showed that there was no significant difference among the estimated effects of digital fee capture and credit loss pressure on fee channel breadth, and the result was still the same after controlling for loan yield resilience, which was positively related to fee channel breadth. Further SEM results showed that the relationship between loan yield resilience and income mix entropy was estimated with a negative coefficient and a p-value of 0.234, and there was no significant association between them. When analyzing income growth strategies according to their normalized AHP priorities, the rankings were consistent with what was already indicated by the weighted supermatrix. Therefore, the priority of the diversified income growth strategy used by commercial banks reached the highest normalized value during the AHP assessment, and there was a difference in the priority of this strategy compared to the interest income-driven strategy. Since it could also be shown that only certain relationships were explained by the SEM estimates, changes in individual financial indicators could likely result in different income diversification outcomes. Therefore, these results appear to indicate that, due to differences in lending performance, the commercial banks may rely more on diversified revenue sources and use this approach to maintain income growth.

While interest income is an important and traditional revenue source, different income growth strategies should be considered to provide a broader understanding of financial factors on bank profitability as well. According to a large body of banking research, diversified income strategies are often considered to be the better choice when it comes to determining and improving the financial performance of commercial banks. SEM results showed that there was no significant difference among the estimated associations of digital fee capture and credit loss pressure with fee channel breadth in terms of statistical significance, and the result was still the same after controlling for loan yield resilience, which was found to be significantly related to fee channel breadth. Therefore, the priority of the diversified income growth strategy used by commercial banks reached the highest normalized value during the AHP assessment, and there was a numerical difference in the priority of this strategy compared to the non-interest income-driven strategy. Commercial banks should actively carry out income diversification strategies to reduce dependence on individual revenue sources to maintain financial stability while improving profitability. Therefore, bank managers should take appropriate measures to improve income growth, including strengthening lending performance,




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Number of obs = 160
Endogenous variables
Observed: fee_channel_breadth income_mix_entropy
Exogenous variables
Observed: digital_fee_capture credit_loss_pressure
bank_income_growth_pct loan_yield_resilience
Structural equation model
Estimation method = ml
Log likelihood = -3391.3868
LR test of model vs saturated: χ²(3) = 78.11, Prob > χ² = 0.0000
```

**Figure 1.** Structural Equation Model of Loan Yield Resilience, Digital Fee Capture, Credit Loss Pressure, Fee Channel Breadth, Income Mix Entropy, and Bank Income Growth

managing credit risk, expanding fee-based services in the short term, and improving revenue diversification in the long term. Consistent with the findings of Nisar et al. [16], the present AHP results were not unexpected as it has previously been reported that diversified revenue sources are associated with bank profitability and income structures are important to financial stability. Furthermore, the present findings do not only provide additional empirical evidence for commercial bank income diversification, they also emphasize the need of comparing different income growth strategies when analyzing bank profitability.

The possible explanations for the inconsistent results could be differences in bank characteristics and variations in financial risk exposure. However, the financial indicators of the selected banks were obtained from available financial statements and only banks with sufficient reporting periods had complete observations, which may result in sample selection bias. There are some limitations to this study. Moreover, the measurement of income diversification was based on selected financial indicators, which cannot fully capture differences in banking activities. Therefore, the estimated relationships cannot be equally generalized for or at least not fully applied to all commercial banks in Uzbekistan. Therefore, the present analysis still cannot establish that whether there was a causal relationship in bank income diversification because of differences in bank characteristics and unobserved financial conditions, which should be examined in future studies.

## 5. CONCLUSION

This study thus supports revenue diversification and highlights the importance of diversified income growth strategies in commercial banks in Uzbekistan, and also provides empirical evidence for further research. Although no significant relationship of digital fee capture with fee channel breadth was found in the structural equation model in this study, these empirical findings could provide some insights for income diversification strategies in commercial banks. Since individual income sources do not always contribute equally to reduce financial risks to acceptable levels, commercial banks should thus include diversified revenue strategies that might be at least partially supported by improved lending performance. If necessary, comparing interest income strategies as well as non-interest income strategies relative to each other may at best provide additional information about income diversification within the commercial banking sector. Finally, it has to be noted that the present study only focused on selected financial indicators but did not examine further bank-specific

factors related to income growth. Since commercial banks are not equally exposed to financial risks in Uzbekistan, for example, they could feature income structures different from those previously described. If researchers obtain more comprehensive data about commercial bank financial performance, further research on the long-term effects of income diversification could be conducted. In the future, we will continue to examine the effects of the income diversification strategies and at the same time increase the sample size and conduct comparative analyses of the commercial banks, including state-owned banks and private banks.

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