

Research on the Impact of the Proportion of the Tertiary Industry on the Loan-to-Deposit Ratio

Ke Yu

Hefei University of Technology, Hefei, China
19873154578@163.com

Abstract. With the rapid development and structural transformation of the global economy, the importance of the tertiary industry in national economies has become increasingly prominent. As the core of China's financial system, commercial banks' loan-to-deposit ratio (LDR) is a key indicator reflecting the stability of financial markets and the health of economic development. This paper investigates the influence of the value-added share of the tertiary industry on the loan-to-deposit ratio of banks from both provincial and micro-level perspectives. Empirical analysis and regression results indicate that an increase in the proportion of the tertiary industry significantly raises the LDR. Furthermore, this study explores the underlying mechanisms through which the tertiary industry proportion affects the LDR, clarifying the transmission pathways.

Keywords: Tertiary Industry, Loan-to-Deposit Ratio, Credit Demand

1. Introduction

With continuous global economic development and transformation, the role and significance of the tertiary industry in national economies have become increasingly important. As the backbone of the financial system, commercial banks directly impact the stability of financial markets and the healthy progression of economic development through their operational conditions and risk management capabilities. The loan-to-deposit ratio (LDR) serves as a crucial indicator for measuring the liquidity and asset-liability structure of commercial banks. It reflects the relationship between a bank's capacity to issue loans and its ability to attract deposits. Under traditional profit models, a higher LDR typically signifies greater profitability [1]. However, excessively high LDRs may expose banks to liquidity risks, which can result in runs on banks during crises and potentially trigger financial turmoil with significant economic consequences. Understanding the impact of the tertiary industry on banks' LDRs can help commercial banks optimize their asset-liability management, enhance profitability and risk control, inform macroeconomic policy-making, promote economic restructuring, and support the stable development of financial markets [2]. This study not only fills a gap in the existing literature but also provides a reference for bank decision-making and relevant government policy formulation.

2. Theoretical analysis

From a theoretical standpoint, three main mechanisms illustrate how an increasing share of the tertiary industry can drive up the LDR: the direct pull effect, the income effect, and the synergy effect [3]. First, the direct pull effect implies that with economic restructuring, the rapid growth of the tertiary sector boosts credit demand among firms within the industry, thereby raising the LDR. This trend is especially evident in the tertiary industry's substantial expansion over the past 15 years.

Second, the income effect suggests that the development of the tertiary industry creates employment opportunities and raises household incomes, which spurs consumption and influences saving behaviors, indirectly affecting the LDR. In other words, as the tertiary industry expands, increased per capita income leads to higher consumption, illustrating the income effect.

Third, the synergy effect refers to the tertiary industry's role in injecting new growth momentum into manufacturing enterprises within the industrial chain, thereby increasing bank credit demand. With the widespread application of information technology and deep restructuring of global value chains, the integration of manufacturing and services has intensified, and the servitization of manufacturing has become a significant global trend.

3. Empirical research at the provincial level

3.1. Model construction, variables, and data

To examine the impact of the share of the tertiary industry on the overall loan-to-deposit ratio of banks at the provincial level, this study utilizes panel data from 31 provinces in China spanning the years 2008 to 2022. The dependent variable is the bank loan-to-deposit ratio (ldr), measured as the balance of domestic and foreign currency loans divided by the balance of domestic and foreign currency deposits in each provincial administrative region. The core independent variable is the proportion of the value added by the tertiary industry to GDP in each province ($industry3$) [4]. As control variables $Controls$, the study includes six provincial-level indicators to account for regional differences and macroeconomic policy factors: GDP growth rate, score of non-state-owned enterprises, degree of openness to foreign trade, non-performing loan ratio of commercial banks, lending rate, and reserve requirement ratio.

Table 1: Empirical research variable definitions at the provincial level

	Name	Meaning	Interpretation
Explained variable	ldr	Loan-to-deposit ratio	The balance of domestic and foreign currency loans in each provincial administrative region divided by the balance of domestic and foreign currency deposits
Explanatory variable	industry3	Proportion of the service industry	The proportion of the added value of the tertiary industry in GDP of each provincial administrative region
	gdp	GDP growth rate	The nominal GDP growth rate of each provincial administrative region
	open	Degree of openness to the outside world	The total import and export volume of each provincial administrative region /GDP
Control variable	bnsoe	Non-state-owned economic development score	Derived from Fan Gang's marketization index, some missing values are filled in by interpolation. It is assumed that 20 years and beyond are equivalent to 19 years
	npl	The non-performing loan ratio of commercial banks	The non-performing loan ratio of commercial bank branches within each provincial administrative region
	rate	Loan interest rate	The loan prime rate (LPR) for one year is taken as the loan interest rate
	ratio	Deposit reserve ratio	The annual deposit reserve ratio of RMB for large deposit-taking financial institutions

The data are primarily sourced from the Wind database and the National Bureau of Statistics, covering 31 provinces, autonomous regions, and municipalities in mainland China (excluding Hong Kong, Macao, and Taiwan), resulting in a total of 465 observations.

The province fixed effect is denoted as u_i , the time fixed effect as λ_t , and the random error term as ε_{it} . The two-way fixed effects regression model at the provincial level is specified as follows:

$$ldr_{it} = \beta_0 + \beta_1 industry3_{it} + \beta^T Controls_{it} + u_i + \lambda_t + \varepsilon_{it}$$

From the descriptive statistics of the variables, the value ranges of all variables are generally reasonable. The average loan-to-deposit ratio is 77.8, and the average share of the service sector is 46.8%. Regional statistics by East, Northeast, West, and Central China show that the share of the service sector follows the pattern: East > Northeast > West > Central, whereas the loan-to-deposit ratio follows the pattern: West > Northeast > Central > East. There is no clear regional pattern between the loan-to-deposit ratio and the share of the tertiary industry. A preliminary analysis was conducted by plotting a scatter diagram and regression line between the core explanatory variable (share of the service sector) and the dependent variable (loan-to-deposit ratio). The results show a correlation direction that does not align with the theoretical expectation of a positive relationship. This discrepancy is mainly attributed to outliers from the two provinces of Beijing and Shanghai, and the lack of control variables in the initial analysis. Therefore, the results are not entirely accurate[5].

Table 2: Descriptive statistics of variables in empirical research at the provincial level

Variable	Meaning	Sample size	Average value	Standard deviation	Minimum value	Maximum value
ldr	The loan-to-deposit ratio of banks(%)	465	77.80	16.03	23.27	122.61
industry3	The proportion of added value of the tertiary industry(%)	465	46.79	9.89	28.60	83.90
gdpg	Year-on-year growth rate of GDP(%)	465	8.60	3.65	-5.00	17.82
open	The level of opening up to the outside world(%)	465	29.61	32.47	0.77	161.00
bnsoe	Non-state-owned enterprises score	465	6.95	2.19	0.94	10.52
nplr	Non-performing loan ratio(%)	357	1.70	1.10	0.40	8.70
rate	Loan interest rate(%)	465	5.02	1.00	3.68	7.04
ratio	Deposit reserve ratio(%)	465	16.51	3.00	11.29	20.83

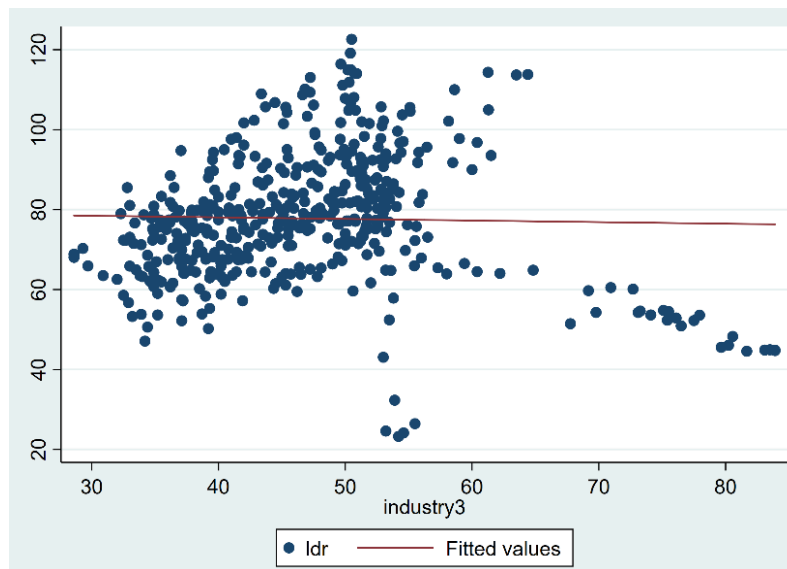


Figure 1: Provincial-level ldr and industry3 scatter plot

3.2. Regression results at the provincial level

Bidirectional fixed effects regression results indicate a significant positive correlation between the LDR and the tertiary industry share, the non-state-owned enterprise development score, loan interest rate, and certain policy indicators, while a significant negative correlation exists with the reserve requirement ratio. Specifically, the regression coefficient for the tertiary industry share is 0.573 ($p < 0.05$), meaning that a 1% increase in tertiary industry share results in a 0.573% increase in the LDR. This supports the hypothesis that growth in the tertiary sector drives up the LDR at the provincial level.

Table 3: Return at the provincial level

	Provincial fixed effect	Bidirectional fixed effect	Bidirectional fixed effect (Consider autocorrelation)
VARIABLES	ldr	ldr	ldr
industry3	0.562*** (0.100)	0.515*** (0.115)	0.515** (0.245)
gdp	-0.272* (0.163)	-0.524*** (0.184)	-0.524* (0.308)
open	0.144*** (0.0311)	0.124*** (0.0318)	0.124* (0.0668)
bnsoe	3.185*** (0.425)	3.162*** (0.589)	3.162*** (1.124)
nplr	0.430 (0.319)	0.907*** (0.327)	0.907** (0.407)
rate	-0.102 (0.578)	34.64 (40.05)	34.64*** (8.998)
ratio	-0.437** (0.172)	-29.36 (30.75)	-29.36*** (6.509)
_cons	0.562*** (0.100)	259.0 (222.0)	259.0*** (59.10)
N	357	357	357
Individual fixed effect	Yes	Yes	Yes
Time-fixed effect	No	Yes	Yes

Note: The values in parentheses are robust standard errors. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4. Micro-level empirical analysis

This section presents the main part of the micro-level empirical analysis. After eliminating missing values related to the study, the analysis is conducted using the bank sample data from the banking research section of the CSMAR (China Stock Market & Accounting Research) database. The sample includes a large number of non-listed banks, covering urban commercial banks, rural commercial banks, foreign banks, rural cooperative banks, rural credit cooperatives, and three types of newly established rural financial institutions. In total, 406 banking institutions are included, yielding 3,159 observations. This significantly enhances the richness and comprehensiveness of the bank sample, thereby improving the accuracy, comprehensiveness, and robustness of the study's empirical findings.

4.1. Model construction, variables, and data

To further investigate the impact of the rising share of the tertiary industry on the loan-to-deposit ratio of individual banks at the micro level, this study constructs a panel data model covering 406 banks in China from 2008 to 2022. In the baseline micro-level regression model, the proportion of value added by the tertiary industry to GDP (industry3) is set as the core explanatory variable, and the loan-to-deposit ratio (ldr) is the dependent variable[6]. As for control variables (Controls), the model includes ten variables: eight bank-level controls—log of total assets, non-performing loan ratio, capital adequacy ratio, total asset turnover ratio, retained earnings-to-assets ratio, provision coverage ratio, earnings before interest and taxes to total assets ratio, and return on assets—and two

province-level controls—GDP growth rate and the score of non-state-owned enterprises. The individual fixed effect is denoted as u_i , the time fixed effect as λ_t , and the random error term as ε_{it} .

For robustness checks, the study replaces the core explanatory variable—tertiary industry value-added share (%)—with the proportion of employment in the tertiary industry (%) and re-estimates the regression. The model is specified as follows:

$$\text{ldr}_{it} = \beta_0 + \beta_1 \text{industry3}_{it} + \beta^T \text{Controls}_{it} + u_i + \lambda_t + \varepsilon_{it}$$

This section employs a two-way fixed effects panel data model from a micro-level perspective to examine the impact of an increased share of the tertiary industry on the bank loan-to-deposit ratio. The baseline regression results are presented in Table 4.

The regression results show that, from a model including only the tertiary industry share to those with gradually added bank- and province-level control variables, the coefficient of the tertiary industry share on the bank loan-to-deposit ratio remains positive and statistically significant at the 1% level. After including all control variables, the results indicate that a 1% increase in the tertiary industry share leads to a 0.7006% increase in the loan-to-deposit ratio.

Table 4: Benchmark regression

	(1)	(2)	(3)
	ldr	ldr	ldr
industry3	0.6535*** (0.1899)	0.7345*** (0.2029)	0.7006*** (0.2047)
lasset		-1.0043* (0.5404)	-1.1242** (0.5438)
nplr		0.5833** (0.2843)	0.5498* (0.2845)
car		-0.3097** (0.1257)	-0.3165** (0.1256)
assetturnover		80.5534* (47.7839)	85.1095* (47.7777)
retainedearnigratio		-4.8691 (43.3920)	-19.1470 (43.8688)
pvcra		0.0026** (0.0010)	0.0027*** (0.0010)
ebittoasset		-22.8429 (26.8301)	-24.4776 (26.8521)
returnonassets		0.0965 (0.7044)	0.0589 (0.7041)
gdpg			-0.5498** (0.2566)
bnsoe			0.9156* (0.5546)
_cons	35.1869*** (7.9556)	48.6495*** (11.2231)	51.0382*** (12.4972)
N	3502	3159	3159
Individual fixed effect	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes

Note: The values in parentheses are robust standard errors. * p < 0.1, ** p < 0.05, *** p < 0.01 will not be elaborated further in the following text.

4.2. Robustness test

To ensure the robustness of the baseline regression results, this section keeps the dependent variable and control variables unchanged, while replacing the core explanatory variable with the proportion of employment in the tertiary industry relative to total employment. The robustness test results are presented in Table 6.

Specifically, the core explanatory variable is replaced with the share of tertiary industry employment in total employment (industry3 _ emp), and the regression is re-estimated with all control variables included. The coefficient of tertiary industry employment share on the bank loan-to-deposit ratio remains statistically significant at the 1% level. The results show that a 1% increase in the proportion of tertiary industry employment leads to a 0.7867% increase in the loan-to-deposit ratio. The similarity between the coefficient obtained from this robustness test and the baseline regression confirms the robustness of the main findings.

Table 5: Robustness test (replacing the core explanatory variable)

	(1)	(2)	(3)
	ldr	ldr	ldr
industry3_emp	0.5463*** (0.2104)	0.7884*** (0.2156)	0.7867*** (0.2268)
lasset		-1.0915** (0.5415)	-1.1365** (0.5438)
nplr		0.6710** (0.2841)	0.6285** (0.2844)
car		-0.3326*** (0.1258)	-0.3354*** (0.1257)
assetturnover		92.7463* (47.8799)	96.3228** (47.8603)
retainedearningratio		-12.6494 (43.2799)	-18.6406 (43.8740)
pvcra		0.0028*** (0.0010)	0.0029*** (0.0010)
ebittoasset		-25.1864 (26.8461)	-28.5898 (26.8853)
returnonassets		0.2093 (0.7042)	0.1860 (0.7039)
gdpg			-0.6530** (0.2547)
bnsoc			0.1920 (0.5827)
_cons	41.5232*** (8.0326)	49.9229*** (10.9175)	56.9410*** (11.3086)
N	3502	3159	3159
Individual fixed effect	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes

5. Conclusion and policy recommendations

This study, using both provincial and micro-level empirical data, confirms that an increase in the proportion of the tertiary industry significantly raises the LDR. This supports the theoretical mechanisms of the direct pull effect, income effect, and synergy effect. At the provincial level, a 1% rise in tertiary industry share increases the LDR by 0.573%; at the micro level, the increase is 0.7006%. These results are validated by robustness checks. The findings provide insights for commercial banks to improve asset-liability management and for government agencies to develop effective industrial and financial regulatory policies. These measures will promote economic restructuring and the stable development of financial markets.

References

- [1] Gao Wei. (2010). Loan Rates, GDP Fluctuations, and the Growth of Credit in Chinese Commercial Banks: An Empirical Study Based on 1993–2008 Time-Series Data. *Science & Technology Economy Market*, (06): 52–53+51.

- [2] Ji Zhihong. (2013). Regional Differences in Loan-to-Deposit Ratios: A Study Based on Branch Data of Commercial Banks. *Financial Research*, (05): 12–31.
- [3] Lu Ming. (2023). Economic Structural Transformation and Consumption Development Trends in China. *New Finance*, (11): 7–10.
- [4] Luo Hong. (2013). Empirical Analysis and Countermeasures for Low Loan-to-Deposit Ratios in Banking Institutions. *Financial Economy*, (02): 77–79.
- [5] Shao Guangqing. (2012). A Case Study of County-Level Loan-to-Deposit Ratios in Underdeveloped Central Regions: The Case of Jingzhou. *Wuhan Finance*, (12): 48–49.
- [6] Wang Xiaolong. (2015). Factors Influencing Loan-to-Deposit Ratio Differences Among Prefecture-Level Cities in Six Central Provinces. Master's Thesis, Hunan University.