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Article

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FINANCIAL ECONOMICS | RESEARCH ARTICLE

The determinants of banking sector performance in Tanzania: A pre-post Treasury Single Account analysis

Goodhope Hance Mkaro^{1*}, Lin Sea Lau¹ and Chee Keong Choong¹

Abstract: This study examined how the Treasury Single Account (TSA) policy, aimed at withdrawing government deposits from commercial banks, impacted the Tanzanian banking sector's performance in relation to ownership concentration, bank size, and macroeconomic variables. Balanced panel dataset comprising thirty (30) banks, from 2010Q1 to 2020Q4, was analyzed. Regression results revealed that, while foreign and state-owned banks were more resilient, private and domestic banks' performance deteriorated after TSA adoption. Small banks survived the negative TSA shock while the performance of the larger ones was negatively affected. The effects of interest rate, GDP, and exchange rate turned negative whilst



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ABOUT THE AUTHORS

Goodhope Mkaro an academic staff at the University of Dar es Salaam with expertise in institutional financial soundness and risk management, holds a B.Com Accounting degree (Hons), an MBA in Finance (UDSM), and a Postgraduate Diploma in Taxation from IFM. He also holds a CPA(T), CPB (T), and CISI(UK) and currently pursuing a PhD at UTAR, Malaysia. Chee Keong Choong is a senior professor at UTAR with expertise in private capital flows, financial institutions, and energy economics. He has published over 230 papers in prestigious journals and received recognition as a Top Research Scientist in Malaysia (Social Sciences and Humanities) by the Academy of Sciences Malaysia in 2022. Lau Lin Sea is an Associate Professor at UTAR, with expertise in environmental and development economics. She holds a PhD and a Master's degree from UTAR and the University of Southern Queensland and has published over 50 papers in prestigious journals. The Tanzanian government adopted the Treasury Single Account (TSA) system in January 2016 as part of its fiscal policy. Upon its implementation, the government consolidated its deposits from commercial banks and transferred them to the Central Bank of Tanzania through the TSA. Economists expressed concerns about potential liquidity challenges that could lead to a decrease in banks' capital and profitability.

PUBLIC INTEREST STATEMENT

To address this concern, we examined how TSA policy impacted bank performance, in relationship to ownership concentration, bank size, and macroeconomic variables. Using a well-balanced panel of 44 quarterly data from 2010 to 2020, the research revealed a negative influence of the TSA on the overall banking sector performance. Consequently, banks are highly encouraged to diversify their deposit sources by actively engaging the general public, meanwhile reverting to sound banking practices, and moving away from excessive dependence on free deposits from the government.

the inflationary effects on bank performance were enhanced after TSA. The study enhances comprehension of the relatively new TSA system in Africa while addressing a literature gap by exploring its influence on banking sector's performance across various bank classifications. Following TSA adoption, regulators should strike a balance between tightening or relaxing regulatory limits while enforcing banks' compliance to ensure the sector's stability. Government support for key economic growth-driving sectors potentially attracts more deposits into the banking system, thus promoting the sector's stability. Banks are encouraged to innovate strategies to attract deposits from the general public, while deviating from dependence on government funds.

Subjects: Economics; Finance; Business, Management and Accounting

Keywords: ownership concentration; size; bank performance; treasury single account; Tanzania

1. Introduction

Spanning from the colonial era, to the current market-oriented economy, Tanzania's banking sector has undergone several transformations that have made a significant impact on its growth and development as the key component of the financial system (Kishimba et al., 2022). At the end of 2020, Tanzania had 46 banks (Bank of Tanzania, 2020) and the sector became more dominated by private and foreign-owned banks (Bank of Tanzania, 2021a). The banking sector which plays a vital role in economic growth and development (Kapaya, 2021; Lotto & Papavassiliou, 2019), is regulated by governments to improve its performance (Djalilov & Piesse, 2019), and contribute to the economy. Fiscal and monetary policies have also been used to attain development objectives in this sector (Wang et al., 2022). Therefore, the impact of government policies on the banking sector is a vital developmental concern.

Following the East African Community Monetary Union (EAMU) agreements that was signed in 2000, partner states were encouraged to consolidate their cash resources with the view of enhancing the effectiveness of public funds control. The said agreement became effective since 2007 when member states were obliged to operationalize the TSA system (Gupta et al., 2012; Mwambuli & Igoti, 2021). It is noteworthy that TSA is a bank account offering the government a consolidated position for its cash resources in a clearly unified form. It operates in a set of interlinked bank accounts that manages all government transactions in accordance with the guidelines of the cash and treasury principles (Ezinando, 2020). It functions as a solution to the financial management information system, better controlling and managing the government's cash resources (Echekoba et al., 2020). In light of the foregoing, in early 2016 the Tanzanian government embarked on a wholesale adoption of the Treasury Single Account (TSA) system (Silim & Pastory, 2022). All public institutions (government ministries, departments, and agencies) were directed to transfer government deposits from commercial banks to the central bank through a Treasury Single Account. The effect of this decision was predicted to cause a drop in banks' deposits (World Bank, 2017).

In Africa, the Nigerian government adopted the TSA policy in 2015 (Echekoba et al., 2020; Ogungbade et al., 2021), followed by Tanzania a year later in 2016. Since the inception of TSA in Tanzania, the banking sector started recording a negative signal, as in the very same year the non-performing loans (NPLs) to total loans ratio, increased to 9.5 % at the end of 2016 from 6.4% recorded in 2015, indicating a negative implication to banks' future lending and profitability (World Bank, 2017).

In 2018, two years after TSA, nearly half of all Tanzanian banking institutions recorded marginal performance (IMF, 2018). An International Monetary Fund (IMF) report indicated banks' vulnerability to declining performance, whereas empirical evidence suggested the negative effect of TSA on the financial performance of the Tanzanian banking sector (Mwambuli & Igoti, 2021; Silim & Pastory, 2022) and Nigeria (Ezinando, 2020; Muraina, 2018; Ogunniyi et al., 2023; Onodi et al., 2020). However, none of these studies attempted to examine the moderating impact of TSA on bank performance, in terms of ownership concentration and bank size.

Literature review brings forth a range of factors determining the performance of banks. Studies by Abdilahi and Davis (2022), Athaley et al. (2020), Isayas (2022), O'Connell (2023), Pham et al. (2021), Samagaio et al. (2022) and Yuan et al. (2022) identify these factors as ownership concentration, bank-specific characteristics, industry-specific, and macroeconomic variables. Even though there is considerable knowledge about how the aforementioned factors impact bank performance, the literature has thus far overlooked how the implementation of the Treasury Single Account may affect the relationship between these factors and bank performance. This study fills this gap, by assessing the moderating effect of TSA on the relationship among ownership concentration, bank size, macroeconomic variables and Tanzanian banking sector's performance.

The remainder of this study is organized as follows. Literature review and hypothesis developments are presented in Section 1, and Section 2 describes the materials and methods where the data sources and variable definitions, are also discussed. Further, section 3 reports and discusses the empirical findings. Finally, conclusions and policy implications are presented in Section 4.

2. Literature review and hypothesis development

2.1. Ownership concentration and performance

Considering the Organization for Economic Cooperation and Development (OECD) criteria, ownership concentration depends on the influence of shareholdings, which define the extent of control (OECD, 2022). Huang (2020, p.02, 2022) measured it as a "percentage of the total shares held by the largest five shareholders." The largest shareholders generally take most management decisions and control the affairs of an entity (Barros et al., 2021). Tanzania's Capital Market and Securities Authority (CMSA) guidelines specify that majority shareholders must hold over 50% of the company's shares (Capital Markets and Securities Authority, 2002). Therefore, this study classified state-owned *versus* private banks and domestic *versus* foreign banks, considering this definition. Agency theory predicts that ownership concentration affects corporate performance (Jensen & Meckling, 1976).

Knowledge of the ownership concentration's impact on bank performance is arguable and inconclusive (Huang, 2022). Often, state-owned banks perform less efficiently (Kirimi et al., 2022; Shaban & James, 2018) because of high political interest and corruption (Ahmed et al., 2022). In Bangladesh, Robin et al. (2018) found state-owned banks to have lower Return on Equity (ROE), Return on Assets (ROA), and Net Interest Margin (NIM) than private banks. A similar finding was observed by Su and He (2012) in China. In the Middle East and North Africa (MENA) region, Farazi et al. (2013) found state-owned banks exhibiting significantly weaker performances. The same was found by Attridge et al. (2021) in African national development banks and by Noerdin (2016) in North African rural banks.

In contrast, by studying publicly traded banks in 56 countries, Belkhir and Samet (2022) found that better institutional quality mitigates the negative effects of government ownership. In the United States, Yang (2019) found that a competitive financial market, advanced political institutions, and advanced financial systems can control the downsides of state ownership. Alshammari (2021) found that conventional (non-Islamic) state-owned banks performed better than private banks in Gulf Cooperation Council (GCC) countries. Additionally, Haider et al. (2018) found that government-owned enterprises face lower financial constraints due to access to public funds.

Doan et al. (2018) studied banks' income diversification across 83 countries and found foreign banks to be less efficient in developed countries compared to developing countries. In Vietnam, Phung and Mishra (2016) observed increasing firm performance due to foreign ownership but decreasing with ownership exceeding 43%. In Nigeria, foreign ownership exhibited significant performance improvement (Tsegba et al., 2014).

In developing countries, Claessens and Jansen (2000) and Kirimi et al. (2022) found foreign banks generating efficiency, technical capacity, and better capitalization. In sub-Saharan Africa, although foreign-owned banks from emerging markets outperformed domestic banks, banks from the regional market remained at par with local banks (Pelletier, 2018). Contradictorily, Konara et al. (2019) found foreign banks without a performance advantage over domestic banks in emerging countries. These findings are similar to that of Mkaro (2011), for Tanzania's banking sector performance. Generally, reviews of the literature reveal mixed results, showing either a positive or negative relationship between ownership and performance (Fotova et al., 2023; Hsieh et al., 2023; Wissem, 2021).

2.2. Bank size and performance

Bank size can be measured in terms of total asset value, number of employees, and customer deposits (Akinola, 2022). This study classifies banks in terms of total asset size, based on the report of Ernst (2020). While Athanasoglou et al. (2008) found Greek banks' performance unaffected by bank size, Dietrich and Wanzenried (2014) noted larger banks to be more profitable only in low-income countries. Further, Teimet et al. (2019) in Kenya and Lotto and Papavassiliou (2019) in Tanzania found positive efficiency effects of bank size, but in Jordanian banks, Aladwan (2015) found larger banks lowering cost efficiency. Mwangi (2018) in Kenya, Isayas (2022) in Ethiopia, and Yuan et al. (2022) in South Asia found positive effects of bank size on performance.

This positive effect has been explained by economies of scale (Elahi & Poswal, 2017; González et al., 2019) and market power (Allen et al., 2011; Yuanita, 2019). That is, as banks grow, the average operational cost falls (economies of scale), and an explanation of cost theory, and banks with higher market power, can charge higher lending interests at their discretion. However, the findings of Asongu and Odhiambo (2019) in the African banking sector study show that neither market power nor economies of scale matter to the effect of bank size on NIM. Grubisic et al. (2022) found that market power did not affect bank profitability in Montenegro, but that the effect was negative in Serbia. These results are also consistent with the study by Fotova et al. (2023) who came up with inconclusive results on the effect of bank size and performance.

Studies reveal the downside of bank size in terms of increased management and monitoring costs, which offset the scale of economic efficiency gains (Avramidis et al., 2018). In the United States, more supervisory resources are spent on larger banks (Eisenbach et al., 2016). Another USA-based study found that the effect of size on banks' market-to-book value was offset by monitoring and delegation costs (Avramidis et al., 2018). Another explanation for the cost inefficiency of bank size is information asymmetry and market imperfections in underdeveloped African markets (Allen et al., 2011). This is confirmed by the finding of Ozili and Ndah (2021), that Nigeria's financial sector development increases banks' non-financial income.

2.3. Macroeconomic variables and performance

Industry-specific variables are factors determined in the business's immediate environment and are outside the management's control (Asikhia & Naidoo, 2021; Kapaya & Raphael, 2016). These include market capitalization and financial market development (Kapaya & Raphael, 2016). This study uses the bank's lending interest rate as an industry-specific factor because it is highly affected by regulations (statutory minimum requirement ratio) and macroeconomic conditions (Mbowe et al., 2020). Additionally, macroeconomic factors (country-wide variables) include GDP, inflation, and a country's exchange rate.

The arbitrage pricing theory (Ross, 1976) links macroeconomic factors, such as interest rate, inflation, and exchange rate, with risk variables that influence bank performance (Ally, 2022). Empirical evidence on the impact of countrywide variables on bank performance is inconclusive. The findings of Almansour et al. (2021) in Jordan show that inflation negatively affects bank performance, similar to Tursoy and Head (2020) in South Africa. However, evidence from Mozambique (Samagaio et al., 2022) shows a positive effect of inflation on ROA. Combey and Togbenou (2017) found that inflation has no short-run effect on ROA in Togo.

While GDP negatively affected ROA in China (Tan & Floros, 2012) and Togo (Combey & Togbenou, 2017), the effect is positive in Kenyan, Nigerian, and South African banks (Abdilahi & Davis, 2022) and Greek (Zampara et al., 2017). Liang and Reichert (2006) state that a higher GDP increases the economy's demand for financial services in emerging economies. The exchange rate has a weak relationship with ROE in South Africa and a negative effect on ROA in Togo (Combey & Togbenou, 2017) but no effect in South African, Kenyan, and Nigerian banks (Abdilahi & Davis, 2022).

The effect of the interest rate on bank performance is positive (O'Connell, 2023) because as the interest rate increases, the bank's ability to make a profit through the NIM increases (Lopez-Penabad et al., 2022). This is particularly true for banks with market power and low competition (Yuanita, 2019). Hence, lending interest rates, as the cost of loanable funds, tend to lower the demand for bank loans when there is high market competition and negatively affects small banks. Montes and Perez (2016) find a non-linear relationship in Spain: positive at low-interest rate levels and negative at high-interest rate levels.

The effect of inflation on the banking sector's performance remains debatable in the literature. Zermeno et al. (2018) found inflation negatively affecting the financial intermediaries' performance in developing countries, unlike in developed countries. Tursoy and Head (2020) found a negative effect of inflation on ROE in South Africa, which was similar to the finding of Almansour et al. (2021) in Jordan, but Trihardianto and Hartanti (2022) found that inflation does not affect bank profitability.

In light of the above arguments, the following hypotheses were developed;

H1: The influence of ownership concentration has no significant impact on bank performance before and after TSA adoption

H2: The influence of bank size has no significant impact on bank performance before and after TSA adoption

H3: The influence of macroeconomic variables has no significant impact on bank performance before and after TSA adoption

3. Materials and methods

3.1. Sample selection

The study utilized quantitative data through a collection of published banks' financial statements and annual reports from 2010 to 2020 along with the utilization of the Bank of Tanzania Financial Sector Supervision reports for the 11-year study period. The data were analyzed quarterly, making a total of 44 periods, amounting to 1320 observations. As of 2020, Tanzania had 46 banking institutions (Bank of Tanzania, 2020). From 2010 to 2020, 30 banks provided complete data for a balanced panel over 11 years. Despite the merger of three state-owned banks (Tanzania Women Bank, Twiga Bancorp and Tanzania Postal Bank) in 2018, we managed to secure a balanced panel of 30 banks over 11 years (44 quarters), making a total of 1320 observations since the total asset value remained unaffected. It is noteworthy that the recently implemented TSA system commenced in Tanzania in 2016. As such, the selected study period allowed us to conduct

a comprehensive assessment of TSA's immediate influence on bank performance by comparing the five years preceding and the five years following its adoption. Additionally, this analysis aimed to provide an in-depth understanding of its impact across various bank classifications, taking into consideration ownership structure and bank size. Table 1 summarizes our sample selection highlighting different bank classifications.

Data analysis was conducted using the above sample, which consists of 53% foreign banks, 87% privately owned banks, and 27% large banks. Foreign and privately owned banks were the dominant players in the sector.

3.2. Measurements

While section 3.2.1 highlights a range of dependent variables, section 3.2.2 and 3.2.3 highlight the independent variables paralleled by control and moderating variables respectively. Table 2 presents the study's variables along with their corresponding precise measurements.

3.2.1. Dependent variables

Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM), were used as the study's dependent variables to measure bank financial performance. While ROE measures the return that the owners get from their equity investments, ROA measures the bank management's capacity to produce profits from its assets. Studies by Isayas (2022), Lotto and Papavassiliou (2019) and Teimet et al. (2019) also used these proxies. The Net Interest Margin (NIM) measures the worthiness of income that the bank derives from the loans. As the bank does financing businesses, it shall determine its income through interest earned from the loans after netting off interest paid to depositors. NIM therefore emphasizes the bank's customary borrowing and lending activities. Studies by Asongu and Odhiambo (2019), Grubisic et al. (2022), Lopez-Penabad et al. (2022), and O'Connell (2023) also used these proxies.

3.2.2. Independent variables

Ownership concentration was defined in terms of shareholding structure, using a 50% threshold as a cut-off point. The study is in line with the Organization for Economic Cooperation and Development (OECD) criteria, where ownership concentration depends on the influence of shareholdings, which define the extent of control (OECD, 2022). Therefore, our study defined banks as foreign or privately owned if the extent of control in terms of their shareholding was above 50%. This classification was applied consistently throughout the study period. As such foreign and private banks were used as dummy variables taking the values one (1) if the banks were foreign or private respectively and zero (0) for their domestic and state-owned counterparties respectively.

Table 1. Banking institutions in Tanzania as of December 31 2020

	Ownership Concentration (Dom, For, Priv & State)					Bank Size		
	Domestic	Foreign	State-Owned Banks			Private	Large	Small
	Banks	Banks	CB	DB.	Total	Banks	Banks	Banks
Industry size	16	30	2	2	4	43	10	36
Percentage	35%	65%	4.35%	4.35%	8.70%	93.48%	19%	19%
Total Industry Size	46	46	46	46	46	46	46	46
Sample Banks	14	16	4	-	4	26	8	22
% of Industry	47%	53%	13%		13%	87%	27%	73%
Total Sample	30	30	30	30	30	30	30	30

Source: BOT, Directorate of Financial Sector Supervision Annual Report 2020. **Note:** CB implies commercial banks, whereas DB implies development banks. It has been noted that Before 2018, the industry had 53 CB banks, but mergers of 3 state-owned banks and the closure of 5 private banks (all small and domestic banks) dropped the number to 46 banks in 2020 as shown above.

Table 2. Description of variables used

Category	Variable	Formula
Dependent variable (Profitability Indicators)	Return on Asset (ROA)	Net Profit Before Tax to Average Asset
	Return on Equity (ROE)	Net Profit After Tax to Average Equity
	Net Interest Margin (NIM)	Net Interest Income to Earning Assets
Independent Variables Category 1 (Ownership and Size)	Foreign Banks (FB)	Dummy Variable Taking The Value 1 if the Bank is Foreign
	Domestic Banks (DB)	Dummy Variable Taking The Value 0 if the Bank is Domestic
	Private Banks (PB)	Dummy Variable Taking the Value 1 if the Bank is Private
	State-Owned Banks (SB)	Dummy Variable Taking the Value 0 if the Bank is State-Owned
	Bank size -Asset size (AS)	Categorized in Terms of Total Assets
Independent Variables Category 2 (Macroeconomic Variables)	GDP Growth Rate (GDP GRW)	Quarterly GDP Growth Rate
	Inflation Rate	Quarterly Inflation Rate
	Interest Rate	Quarterly Lending rate
	Exchange Rate	Quarterly Average Exchange Rate
	(1) Firm Specific:	
Control Variables	• Loan-To-Deposit Ratio (LDR)	Loans/Total Deposits
	• Non-Performing Loans (NPL)	Non-Performing Loans/Gross Loans
	(1) Market Structure Variables	
	• Concentration Ratio	Total Assets of Large Banks)/Total Assets of All Banks
	• Asset Market Share Ratio	Bank's Total Assets/Total Assets of All Banks In the Market
Moderating Variable	Treasury Single Account (TSA)	Dummy Variable taking the value 1 after TSA adoption and 0 otherwise

Source: Researcher's compilation from the literature.

Other studies that used shareholding structure to define control include the studies by Barros et al. (2021) and Huang (2020, p.02, 2022). Bank size was defined in terms of asset size. As such, the study mirrored bank size in terms of total asset value, based on the report of Ernst (2020). Other studies that used the same proxy were studies by Athanasoglou et al. (2008), Dietrich and Wanzenried (2014), Isayas (2022), Lotto and Papavassiliou (2019), Teimet et al. (2019), and Yuan et al. (2022).

Macroeconomic variables represent the industry and country-wide variables. These are factors determined in the business's immediate environment and are outside the management's control. Interest rate, GDP, inflation, and exchange rate are the key macroeconomic factors applied in this study. The studies by Abdilahi and Davis (2022), Asikhia and Naidoo (2021), Combey and Togbenou (2017), Kapaya and Raphael (2016), Mbowe et al. (2020), O'Connell (2023), Samagaio et al. (2022), and Tursoy and Head (2020) also used these proxies.

3.2.3. Control and moderating variables

To acknowledge the influence of additional factors that might impact the banks' profitability, the study incorporated several control variables to strengthen the reliability of the findings. The review of literature revealed some common firm-specific control variables such as asset size, NPL ratio, capital adequacy and liquidity ratios; meanwhile concentration ratio (total assets of large banks/ total assets of all banks) and market share ratio (bank's total assets/total assets of all banks in the

market) were proxies for market structure variables. Other studies incorporated macro-economic control variables (GDP, inflation, interest rate, and exchange rate) to enhance robustness of their results. Studies by Mwambuli and Igoti (2021), Otero González et al. (2019), Ullah et al. (2020) used a range of these variables to enhance the robustness of their results. In light of the above, our study followed suit by specifically incorporating two firm-specific variables, loans to deposits and non-performing loans ratios, which served as proxies for the firm-specific variables. Additionally, two market structure variables, namely concentration ratio (total assets of large banks/total assets of all banks) and market share ratio (bank's total assets/total assets of all banks in the market), were included. To make the study interesting the Treasury Single Account model was used as a moderating variable to gauge its impact on bank performance after its adoption. Few scholars have attempted to study the impact of TSA on bank performance in Tanzanian and African context in general. However, to the best of our knowledge none of these studies have attempted to examine the TSA's moderating effect on bank performance in relation to other traditional factors such as size and ownership. Some of these studies include the studies by Ezinando (2020), Muraina (2018), Mwambuli and Igoti (2021), Onodi et al. (2020) and Silim and Pastory (2022).

3.3. Model of the study

We applied fixed and robust random effects panel regression models to enhance estimation comparability and consistency. Other scholars like Avramidis et al. (2018), González et al. (2019), Ghosh (2018), Lea et al. (2019), Ozili and Uadiale (2017), Pillai et al. (2017), and Uribe-Bohorquez et al. (2018), have also used a similar approach. Panel data provide more information, variability, and less collinearity among variables. To account for the risk of potential survivorship bias, our study utilized balanced panel data over eleven years on quarterly basis, making a total of 44 periods. We ensured the coverage of all banks, including those that underwent mergers, for the entire duration of the study period. The merged banks did not affect our analysis as total assets of the merged institutions remained unchanged. Additionally, the merged firms were all state-owned; thus, there was no change in the bank classification. In the same vein, we categorized banks into pairs (foreign vs. domestic, private vs. state-owned, and large vs. small ones) for independent analysis to minimize survivorship bias meanwhile, accounting for potential multicollinearity concerns as these pairs were analyzed as distinct categories independently. Our approach is in line with the studies by Yang et al. (2023) and Gao et al. (2021), who found that elimination of the sample that was previously in the coverage of the database, results in survivorship bias. The latter emphasized on the inclusion of the merged institutions during the study period as one of the measures to minimize survivorship bias. We also found that studies that removed some samples from the data set acknowledged the possibility of survivorship bias (Demirguc et al., 2018; Lisin et al., 2022). In light of the foregoing, our dataset was applied consistently by including all the sampled institutions throughout the study period in an attempt to overcome potential survivorship bias.

Furthermore, the generalized method of moments (GMM) was used to account for the potential unobserved endogeneity in the model. Equation (i) shows the econometric model used:

$$Y_{it} = \beta_0 + \beta_1 FB_{it} + \beta_2 PB_{it} + \beta_3 AS_{it} + \beta_4 GDP_{it} + \beta_5 INF_{it} + \beta_6 ER_{it} + \beta_7 INT_{it} + \beta_8 TSA + \beta_9 \beta FB_{it} * TSA + \beta_{10} PB_{it} * TSA + \beta_{11} AS_{it} * TSA + \beta_{12} GDP_{it} * TSA + \beta_{13} INF_{it} * TSA + \beta_{14} ER_{it} * TSA + \beta_{15} INT_{it} * TSA + \beta_{16} LDR_{it} + \beta_{17} NPL_{it} + \beta_{18} CONC_{it} + \beta_{19} MSHARE_{it} \mu + \epsilon_{it} \quad (1)$$

Where Y_{it} represents the bank performance variables ROA, ROE, and NIM. The other variables FB, PB, and AS represent foreign banks, private banks, and asset size, respectively. Variables "foreign bank (FB)" and "private bank (PB)" are ownership concentration dummy variables that are equal to one (1) if a bank is foreign or private, and zero (0) otherwise. Asset size (AS) is a continuous variable and is a proxy for bank size. Also, GDP, INF, ER, and INT represent the gross domestic product (GDP) growth rate, inflation rate, average exchange rate, and lending interest rate, respectively. Variable TSA moderates the effects of ownership concentration (FB and PB), bank size (AS), industry-specific

factor (INT), and country-wide variables (GDP, INF, and ER), on bank financial performance (Y_{it}). The control variables are in two groups; firm-specific variables which are liquidity position (Loans to Deposits Ratio—LDR), and asset quality (proxied by non-performing loans—NPL) and market structure variables which are concentration ratio (CONC) and bank market share (MSHARE). Three regression models (Models 1–3) were run because of the usage of three bank performance measures. Based on the Hausman test, ROA used a fixed effects model, while ROE and NIM followed the random effects model. In the System GMM proper instruments and lags were specified to address endogeneity and capture the dynamic variable relationships over time (Li et al., 2021; Ullah et al., 2020). The analysis used the STATA 17 package, and regression models were estimated with robust standard errors to control for potential heteroscedasticity (Mansournia et al., 2020).

Model 1

$$ROA_{it} = \beta_0 + \beta_1 FB_{it} + \beta_2 PB_{it} + \beta_3 AS_{it} + \beta_4 GDP_{it} + \beta_5 INF_{it} + \beta_6 ER_{it} + \beta_7 INT_{it} + \beta_8 TSA + \beta_9 FB_{it} * TSA + \beta_{10} PB_{it} * TSA + \beta_{11} AS_{it} * TSA + \beta_{12} GDP_{it} * TSA + \beta_{13} INF_{it} * TSA + \beta_{14} ER_{it} * TSA + \beta_{15} INT_{it} * TSA + \beta_{16} LDR_{it} + \beta_{17} NPL_{it} + \beta_{18} CONC_{it} + \beta_{19} MSHARE_{it} + \mu_{it}$$

Model 2

$$ROE_{it} = \beta_0 + \beta_1 FB_{it} + \beta_2 PB_{it} + \beta_3 AS_{it} + \beta_4 GDP_{it} + \beta_5 INF_{it} + \beta_6 ER_{it} + \beta_7 INT_{it} + \beta_8 TSA + \beta_9 FB_{it} * TSA + \beta_{10} PB_{it} * TSA + \beta_{11} AS_{it} * TSA + \beta_{12} GDP_{it} * TSA + \beta_{13} INF_{it} * TSA + \beta_{14} ER_{it} * TSA + \beta_{15} INT_{it} * TSA + \beta_{16} LDR_{it} + \beta_{17} NPL_{it} + \beta_{18} CONC_{it} + \beta_{19} MSHARE_{it} + \mu_{it}$$

Model 3

$$NIM_{it} = \beta_0 + \beta_1 FB_{it} + \beta_2 PB_{it} + \beta_3 AS_{it} + \beta_4 GDP_{it} + \beta_5 INF_{it} + \beta_6 ER_{it} + \beta_7 INT_{it} + \beta_8 TSA + \beta_9 FB_{it} * TSA + \beta_{10} PB_{it} * TSA + \beta_{11} AS_{it} * TSA + \beta_{12} GDP_{it} * TSA + \beta_{13} INF_{it} * TSA + \beta_{14} ER_{it} * TSA + \beta_{15} INT_{it} * TSA + \beta_{16} LDR_{it} + \beta_{17} NPL_{it} + \beta_{18} CONC_{it} + \beta_{19} MSHARE_{it} + \mu_{it}$$

4. Data and empirical analysis

4.1. Description of data

To aid readers in comprehending our data, Table 3 presents a statistical description of our data set, displaying a range of mean, standard deviation, minimum, and maximum values.

The descriptive statistics in Table 3 show that the interest rate and inflation rate averaged at 15.3% and 6.95%, with minimum values of 13% and 3.02% whereas the maximum values averaged at 19.1% and 19.36%, respectively. In contrast, the GDP growth rate averaged 3.6%, with minimum and maximum growth rates of −9.7% and 19.4%, respectively. The average asset size was TZS 688 billion, with minimum and maximum assets of TZS 4.55 billion and TZS 7.255

Table 3. Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Interest Rate	1320	0.15	0.02	0.13	0.19
Inflation Rate	1320	6.95	4.26	3.02	19.36
GDP Growth Rate	1320	0.04	0.09	−0.09	0.19
Exchange Rate	1320	1910.31	343.10	1323.78	2297.74
Asset Size	1320	6.880e+11	1.160e+12	4.55E+09	7.255e+12
ROA	1320	0.01	0.02	−0.23	0.06
ROE	1320	0.09	2.78	−23.75	1.16
NIM	1320	0.04	0.03	0	0.25

Source: Authors' summarization from STATA computations. Table 2 above defines all the variables.

trillion, respectively. The financial performance indicators used were the ROI, ROE, and NIM. They recorded mean values of 0.8%, 9.2%, and 4.4%; minimum values of -22.7%, -23.75%, and 0%; and maximum values of 6.4%, 116%, and 25.3%, respectively. The fact that the value of Tanzanian Shilling (TZS) declined in relation to the US dollar is also noteworthy. The minimum and maximum exchange rates were TZS 1323.78/US\$ and TZS 2297.74/US\$, respectively, with an average of TZS 1910.314/US\$. Importantly, banks with foreign currency transactions were more prone to exchange rate risks.

4.2. Normality tests and variables transformation

Some few variables that exceeded the recommended skewness and kurtosis limits of ± 2 and ± 3 for panel data analysis. To address this issue, transformation of data was applied, to avert the risk of potential outliers. Winsorization, as explained by Brownen (2018), Chen and Gong (2019) and Sharma and Chatterjee (2021), helps mitigate the impact of spurious outliers and enhances the performance of regression analysis. In light of the above, loans to deposits ratio was winsorized at the 5th and 95th percentiles, while NPL, ROA, and ROE, were winsorized at the 7.5th and 92.5th percentiles. After winsorization, all variables met the desired skewness and kurtosis limits, making them suitable for diagnostic tests and regression analysis. It is noteworthy that all diagnostic tests conducted after winsorization consistently supported the seamless application of data in regression analysis. These diagnostic tests, including correlation, multicollinearity, unit root, and panel cointegration, are highlighted in section 4.3.

4.3. Diagnosis tests

The result of correlation analysis, shows no correlation among the independent variables, implying no multicollinearity issue as all variables recorded coefficients not exceeding ± 0.5 . Additionally, the VIF test was used as a triangulation technique to confirm correlation results. The test results show a coefficient of 1.65 which is below the conservative threshold of 2.5 as suggested by (Johnston et al., 2018). We were therefore confident that our data had no potential risk for multicollinearity. Except for asset size and NPL, all variables passed the Levin Lin Chu panel unit root test at the 1% significance level and were found to be stationary. First difference tests were applied to asset size and NPL, rendering them stationary at the 1% significance level. Additionally, panel cointegration tests yielded p-values below 0.05, confirming a stable long-run relationship between the variables. The STATA-17 statistical analysis tool was the primary tool used for performing these diagnostic tests, and it was also employed for all subsequent regression analyses. The specific choice of the regression model, as discussed in Section 3.3 under the study's model, involved the application of the Hausman test.

4.4. Discussion of the findings

In Tables 4–9, you can find the regression and financial statements results that shed light on how ownership concentration, bank size, and macroeconomic variables influence the financial performance of the banking sector. To gauge banks' financial performance, we utilized three key accounting ratios: ROA, ROE, and NIM. In tandem with the regression findings presented in Tables 4 and 5, we conducted an analysis of financial statements and macroeconomic variables to track the trajectory of bank performance both before and after the implementation of TSA. A concise summary of this analysis can be found in Tables 6–9.

4.4.1. Relationship between Ownership Concentration and Banks' Financial Performance (ROA, ROE, and NIM)

Ownership concentration was defined in terms of the shareholding structure, using a 50% threshold as a cut-off point and two dummy variables (foreign banks and private banks) as proxies for it. The studies by Fotova et al. (2023), Hsieh et al. (2023) and Wissem (2021) posit that ownership structure has an influence on bank performance. Nevertheless, the present study came up with mixed results in both periods (before and after TSA adoption) leading to a partial rejection of the null hypothesis that the influence of ownership concentration has no significant impact on bank performance before and after TSA adoption. While regression results

Table 4. Linear relationship between ownership concentration, bank size, macroeconomic variables and the overall banking sector's performance (static models)

Variable	Fixed Effects		Random Effects			
	ROA		ROE		NIM	
	β	t	β	t	β	t
FB	0	0	-0.012	-0.50 (0.616)	-0.037	-1.92* (0.055)
PB	0	0	-0.004	-0.10 (0.920)	0.004	0.15 (0.883)
AS	1.55E-08	2.64** (0.013)	8.00E-08	3.86*** (0.000)	5.29E-09	0.33 (0.741)
GDP	0.0267	4.17*** (0.000)	0.156	4.05*** (0.000)	0.346	19.60*** (0.000)
INT	0.241	2.61** (0.014)	2.305	3.05*** (0.000)	0.263	1.62 (0.106)
ER	7.72E-06	2.20** (0.036)	1.58E-05	0.80 (0.424)	8.78E-05	8.24*** (0.000)
INF	0.003	0.32 (0.751)	0.035	0.57 (0.572)	-0.07832	-2.74*** (0.000)
1. TSA#1.FB	0.002	0.66 0.513	0.013	0.93 (0.354)	0.017	1.90* (0.058)
1. TSA#1.PB	-0.003	-1.08 (0.288)	-0.037	-2.13** (0.933)	0.027	1.43 (0.151)
1. TSA#AS	-4.68E-09	-2.22** (0.035)	-2.69E-08	-2.28** (0.023)	1.30E-08	1.46 (0.143)
1. TSA#GDP	-0.013	-2.39** (0.023)	-0.106***	-3.05 (0.000)	-0.052	-3.68*** (0.000)
1. TSA#INT	-0.2933	-2.87*** (0.000)	-2.441***	-2.91*** (0.000)	0.022	0.12 (0.907)
1. TSA#ER	-2.9E-05	-1.24 (0.225)	-0.0002	-1.29 (0.196)	-0.001	-537*** (0.000)
1. TSA#INF	-0.0005	-0.04 (0.972)	-0.009	-0.09 (0.931)	0.467	9.31*** (0.000)
LDR	0.0013	0.56 (0.580)	0.018	1.53 (0.125)	0.0501	1.39 (0.166)
NPL	-0.018	-3.05*** (0.000)	-0.111***	-2.97*** (0.000)	0.076	2.00** (0.046)
CONC	-0.017	-3.23*** (0.000)	-0.095***	-3.02 (0.000)	-0.154	-10.28*** (0.000)
MSHARE	-0.064	-1.30 (0.205)	-0.054	-0.36 (0.717)	0.063	0.52 (0.602)

Note: *, **, and *** indicate the level of statistical significance at 10%, 5%, and 1%, respectively; β implies the coefficient; and t is the test statistic: FB=Foreign banks, PB=Private banks, AS=Asset size, GDP=GDP Growth rate, INT=Interest rate, ER=Exchange rate, INF=Inflation, 1. TSA =Dummy variable used as a moderator, LDR=Loans to deposits ratio used as a control variable, NPL=Non-Performing Loans used as a control variable, MSHARE=Market share used as a control variable. (L.ROI, L.ROE & L.NIM) =Lag variables. loans to deposits ratio (LDR) was winsorized at the 5th and 95th percentiles, while NPL, ROA, and ROE, were winsorized at the 7.5th and 92.5th percentiles

reported significant results at one point (either before or after TSA adoption), the results were contrariwise in the other period, resulting into a partial rejection of the null hypothesis as discussed below.

4.4.1.1. Return on Asset (ROA) and Return on Equity (ROE). In Table 4, the fixed effects model excluded the pre-TSA ownership concentration coefficients to eliminate the influence of group-specific constants. Nevertheless, the post-TSA regression results demonstrate that ownership

Table 5. Linear relationship between ownership concentration, bank size, macroeconomic variables and the overall banking sector's performance (dynamic model)

Variable	System GMM					
	ROA		ROE		NIM	
	β	t	β	t	β	t
FB	-0.090	-2.83*** (0.000)	-0.051	-0.36 (0.724)	-0.318	2.30** (0.029)
PB	0.059	2.65** (0.013)	0.114	1.11 (0.276)	0.261	1.09 (0.286)
AS	2.21E-08	1.71* (0.098)	7.86E-08	1.46 (0.156)	4.16E-09	0.05 (0.962)
GDP	0.022	-0.87 (0.390)	0.331	7.27*** (0.000)	-0.244	-3.13*** (0.004)
INT	-0.912	0.93 (0.362)	4.714	1.61 (0.117)	0.459	0.58 (0.568)
ER	4.21E-06	-0.04 (0.965)	-1.3E-05	-0.56 (0.578)	-6.8E-05	-1.39 (0.174)
INF	-0.0004	-0.40 (0.695)	-0.022	-0.50 (0.618)	-0.064	-1.07 (0.296)
1. TSA#1.FB	0.174	-2.08** (0.046)	-0.078	-0.24 (0.813)	0.123	0.77 (0.445)
1. TSA#1.PB	-0.102	-0.45** (0.653)	0.116	0.51 (0.611)	-0.004	-0.03 (0.973)
1. TSA#AS	-1.00E-08	-0.69 (0.495)	-1.70E-07	-1.93* (0.063)	-9.32E-08	-1.29 (0.206)
1. TSA#GDP	-0.007	0.78 (0.442)	-0.164	-4.44*** (0.000)	0.042	1.18 (0.247)
1. TSA#INT	0.855	-0.09 (0.929)	-5.430	-1.76* (0.089)	0.701	0.86 (0.399)
1. TSA#ER	-1.1E-05	-0.13 (0.899)	0.001	1.72* (0.095)	-0.001	-3.71*** (0.000)
1. TSA#INF	-0.009	-1.25 (0.222)	-0.544	-1.43 (0.163)	0.427	2.12** (0.042)
LDR	-0.021	0.14 (0.889)	0.062	0.93 (0.360)	0.401	2.67** (0.012)
NPL	0.006	-0.91 (0.372)	-0.229	-1.37 (0.180)	-0.138	-0.74 (0.463)
CONC	-0.035	-2.02 (0.053)	-0.587	-3.90*** (0.001)	2.124	7.00*** (0.000)
MSHARE	-1.634	0.96* (0.346)	-12.354	-2.76** (0.010)	-46.228	-2.19** (0.037)
L. (ROI/ROE/ NIM)	0.044	0.23 (0.817)	0.476	5.11*** (0.000)	-1.57	-10.56*** (0.000)

Note: *, **, and *** indicate the level of statistical significance at 10%, 5%, and 1%, respectively; β implies the coefficient; and t is the test statistic: FB=Foreign banks, PB=Private banks, AS=Asset size, GDP=GDP Growth rate, INT=Interest rate, ER=Exchange rate, INF=Inflation, 1. TSA =Dummy variable used as a moderator, LDR=Loans to deposits ratio used as a control variable, NPL=Non-Performing Loans used as a control variable, MSHARE=Market share used as a control variable. (L.ROI, L.ROE & L.NIM) =Lag variables. loans to deposits ratio (LDR) was winsorized at the 5th and 95th percentiles, while NPL, ROA, and ROE, were winsorized at the 7.5th and 92.5th percentiles.

concentration does not impact ROA, aligning with the findings of Konara et al. (2019) who came up with similar results. Similarly, when employing the random effect model to assess ROE, the regression outcomes indicated no significant impact of ownership concentration on performance. On the other hand, while it was determined that there was no correlation between foreign banks and ROE, privately owned banks did have a negative effect on ROE compared to state-owned

Table 6. Trend of banks' financial performance in terms of ownership structure

Pre TSA														Post TSA				
	2010	2011	2012	2013	2014	2015	Average	2016	2017	2018	2019	2020	Average					
	ROA(DB)	-0.4	0.61	0.69	1.14	1.61	1.62	0.88	1.25	0	0.34	0.77	0.75	0.62				
	ROA(FB)	0.97	0.88	0.71	0.71	0.85	1.12	0.87	0.99	0.95	0.5	0.35	0.15	0.59				
	ROA(I)	2.16	2.53	2.58	2.55	2.51	2.49	2.47	2.09	1.15	1.04	1.86	1.94	1.62				
	ROE(DB)	2.83	4.43	4.12	5.54	11.3	4.99	5.54	3.5	0.31	0.14	1.04	0.9	1.18				
	ROE(FB)	5.94	6.25	3.64	1.74	5.07	7.78	5.07	2.67	3.79	1.62	1.15	0.42	1.93				
	ROE(I)	12.1	14.5	13.9	13.1	12.6	12.2	13.1	9.26	4.67	2.88	7.13	7.61	6.31				
	NIM(DB)	4.14	4.95	5.29	5.46	5.77	5.76	5.23	5.65	5.48	5.14	4.75	4.08	5.02				
	NIM(FB)	3.14	3.15	3.7	3.8	3.84	4	3.6	4.17	4.17	4.08	3.79	3.49	3.94				
	NIM(I)	6.46	7.17	7.81	8.25	8.37	8.19	7.71	8.12	7.42	7.01	6.21	5.85	6.92				
	ROA(PB)	0.47	0.85	0.9	0.97	1.33	0.81	0.89	0.83	0.72	0.41	0.42	0.35	0.55				
	ROA(SB)	-0.62	0.14	0.31	0.61	0.83	1.98	0.54	-0.01	-0.68	0.6	1.2	0.85	0.39				
	ROA(I)	2.16	2.53	2.58	2.55	2.51	2.49	2.47	2.09	1.15	1.04	1.86	1.94	1.62				
	ROE(PB)	5.3	6.14	5.04	3.75	4.44	1.95	4.44	1.67	2.57	0.65	-0.15	0.13	0.97				
	ROE(SB)	-0.02	1.22	2.16	-1.62	2.03	2.73	1.08	-1.7	0.53	1.83	6.33	4.13	2.22				
	ROE(I)	12.1	14.5	13.9	13.1	12.6	12.2	13.1	9.26	4.67	2.88	7.13	7.61	6.31				
	NIM(PB)	3.9	4.2	3.95	4.83	5.01	4.08	4.33	4.96	5	5.12	4.8	4.3	4.84				
	NIM(SB)	3.37	4.69	4.92	5.26	5.49	5.87	4.93	5.01	5.65	3.58	2.83	2.23	3.86				
	NIM(I)	6.46	7.17	7.81	8.25	8.37	8.19	7.71	8.12	7.42	7.01	6.21	5.85	6.92				
Note: ROA=Return on Assets, ROE = Return on Equity, NIM = Net Interest Margin, where DB =Domestic Banks, FB = foreign banks, PB = private banks, SB = state-owned banks, I= Industry-average ratio																		

Note: ROA=Return on Assets, ROE = Return on Equity, NIM = Net Interest Margin, where DB =Domestic Banks, FB = foreign banks, PB = private banks, SB = state-owned banks, I = Industry-average ratio

Table 7. Trend of large and small banks' financial performance

	Pre TSA							Post TSA						
	2010	2011	2012	2013	2014	2015	Average	2016	2017	2018	2019	2020	Average	
ROA(LB)	1.73	1.85	1.68	1.49	1.95	1.69	1.73	0.81	1.46	1.11	1.31	1.19	1.18	
ROA(SB)	2.61	3.16	2.66	3.03	4.03	4.1	3.27	2.19	2.03	2.01	1.94	2.13	2.06	
ROA(I)	2.16	2.53	2.58	2.55	2.51	2.49	2.47	2.09	1.15	1.04	1.86	1.94	1.62	
ROE(LB)	9.51	11.7	8.96	8.02	10.5	8.16	9.48	0.94	6.59	4.86	6.08	4.84	4.66	
ROE(SB)	19.2	20.9	16.5	-10.9	17.8	21.4	14.3	7.44	9.74	7.5	2.63	3.83	6.23	
ROE(I)	12.1	14.5	13.9	13.1	12.6	12.2	13.1	9.26	4.67	2.88	7.13	7.61	6.31	
NIM(LB)	3.11	3.2	3.63	3.77	3.97	3.75	3.57	3.72	4.02	3.69	3.6	3.59	3.73	
NIM(SB)	10.9	11.9	13.7	14.2	14.5	14.5	13.3	12.9	13.3	13.7	12.9	11.39	12.8	
NIM(IB)	6.46	7.17	7.81	8.25	8.37	8.19	7.71	8.12	7.42	7.01	6.21	5.85	6.92	
Note: ROA=Return on Asset, ROE = Return on Equity, NIM = Net Interest Margin, where LB = Large Banks, SB = Small Banks, I B= Industry Average Ratio.														

Note: ROA=Return on Asset, ROE = Return on Equity, NIM = Net Interest Margin, where LB = Large Banks, SB = Small Banks, I B= Industry Average Ratio.

Table 8. Trend of macroeconomic variables (industry-specific and country-wide variables)

	Pre TSA							Post TSA					
	2010	2011	2012	2013	2014	2015	Average	2016	2017	2018	2019	2020	Average
ER	1396	1557	1572	1599	1653	1985	1627	2177	2229	2264	2288	2294	2250
GDP	20.7	20.4	13.7	17.1	13.2	14.2	16.6	14.9	9.6	8.7	8.4	8.1	9.9
INF	7.2	12.7	16.1	7.9	6.1	5.6	9.3	5.2	5.3	3.5	3.4	3.3	4.1
INT	14.6	15.0	15.6	15.8	16.3	16.1	15.6	16.0	17.8	17.4	17.0	16.7	17.0

Note: ER= Average Exchange Rate, GDP =GDP Growth Rate, INF = Inflation Rate, INT=Lending Interest Rate.

Table 9. Trend of NPLs and loans to deposits

	Pre TSA								Post TSA				
	2010	2011	2012	2013	2014	2015	Average	2016	2017	2018	2019	2020	Average
NPL(DB)	4.9	7.0	7.4	6.1	6.7	6.6	6.5	9.3	17.6	15.0	12.2	12.3	13.3
NPL(FB)	3.3	21.1	5.0	5.0	7.1	7.0	8.1	7.9	8.4	8.0	8.2	9.3	8.4
NPL (PB)	5.0	5.9	5.6	6.0	6.5	6.5	5.9	8.1	11.0	11.0	11.6	11.9	10.7
NPL (SB)	3.5	7.4	9.8	6.3	8.6	8.5	7.3	11.9	23.5	11.8	3.1	4.4	10.9
NPL(LB)	7.1	7.0	6.6	7.5	8.2	6.5	7.1	8.1	8.5	6.3	5.7	6.4	7.0
NPL(SB)	4.0	5.0	6.0	5.5	6.4	7.0	5.6	8.8	14.2	13.0	12.2	12.6	12.2
NPL(I)	7.9	8.2	7.8	7.5	7.8	7.0	7.7	9.1	11.5	10.6	10.7	10.5	10.5
LDR(DB)	53.7	60.4	65.5	64.9	70.3	74.5	64.9	81.0	77.3	76.1	78.5	81.6	78.9
LDR(FB)	60.2	58.9	62.7	64.0	63.1	64.9	62.3	70.2	68.2	68.1	71.5	71.2	69.9
LDR(PB)	73.2	72.9	72.8	72.5	72.3	73.8	72.9	73.6	74.0	74.9	74.0	73.5	74.0
LDR(SB)	46.5	52.1	57.1	63.7	66.5	71.2	59.5	70.6	75.9	77.6	78.1	81.6	76.7
LDR(LB)	56.0	58.8	62.3	62.3	65.4	68.2	62.2	76.0	71.5	70.9	71.6	73.9	72.8
LDR(SB)	60.2	62.9	71.1	73.4	72.5	80.8	70.1	77.8	79.2	78.3	88.0	88.1	82.3
LDR(IB)	58.3	61.0	65.3	66.8	68.4	72.2	65.3	74.9	74.3	74.3	76.9	78.3	75.8
LDR(A)	80	80	80	80	80	80	80	80	80	80	80	80	80

Note: NPL = Non-Performing loans, LDR = loans to total deposits, DB = domestic banks, FB = foreign banks, (PB) = Private Banks, (SB) = State-Owned Banks, LB = Large Banks, SB = Small Banks, I = Industry Average, A =Average regulatory threshold.

banks after TSA's adoption contradicting the results of Gupta et al. (2020) who came up with a reverse position. This is because a major portion of domestically owned private banks' deposits was derived from the government, thus their performance was impaired after the withdrawal of government deposits. Additionally, the government fortified its state-owned banks to prevent them from failing; meanwhile, private banks had to find their means to turn around their positions. Few studies have examined the effects of TSA on Tanzania's banks' performance, and those that have done so have discovered an overall decline in performance (Ezinando, 2020; Mwambuli & Igoti, 2021; Onodi et al., 2020; Silim & Pastory, 2022). The above notwithstanding, none of these studies have examined the moderating effect of TSA on bank performance across types of bank ownership, thus stimulating the need to carry out the present study.

Apart from the regression results, the analysis of banks' financial statements revealed that after TSA adoption, the average ROA and ROE for the overall banking sector declined (see Table 5). The sector's ROA declined from 2.47% to 1.62%, alongside the decline in ROE from 13.06% to 6.31%, thus confirming the negative moderating impact of TSA on bank performance after TSA adoption. Moreover, in terms of ROA, domestic banks outperformed foreign banks in both periods (pre- and post-TSA).

On the other hand, in terms of ROE, domestic banks performed better off than foreign banks before TSA, but the latter performed better off after TSA. This shows that TSA has lowered the performance of domestic banks, concurring with Ezinando (2020) and Onodi et al. (2020), who found negative performance effects of TSA. In general, the results confirm that domestic banks in Tanzania outperform foreign banks. This finding is similar to that of F (2013) and Mkaro (2011), who found that domestic banks performed better than foreign banks in Tanzania. To ensure their stability, foreign banks incur huge personnel costs to hire competent staff, thus increasing non-interest expenses and reducing their profitability compared to domestic banks, which incur moderate costs.

In terms of private versus state ownership, the financial statement analysis results (in Table 5) show that private banks outperformed state-owned banks in both periods using ROA as a performance indicator. Moreover, the eleven-year (2010 to 2020) average ROE for private banks was still above that of state-owned banks. Private banks recorded an overall average ROE of approximately 2.71%, compared to 1.61% for state-owned banks. This finding is consistent with those of Kirimi et al. (2022) and Robin et al. (2018).

Although private banks' ROE was higher than the state-owned ratio before TSA, the opposite was true after TSA. The reason for the improvement in state-owned ROE after TSA adoption could be the merger of three state-owned banks in 2018 and the injection of more capital by the government. If not for the merger and government support to rescue merged banks, state-owned banks would have a bad shape. This finding is similar to those of Yang (2019) that good political institutions offset the downsides of state ownership.

4.4.1.2. Net Interest Margin. Using NIM as a performance indicator, the random effect regression results in Table 4 (a) show that foreign banks' NIM was lower than domestic banks before TSA, contradicting the findings of Phung and Mishra (2016) and Tsegba et al. (2014). The NIM of foreign banks later increased after TSA while domestic banks' performance (NIM) declined. This is because, before TSA's adoption, domestic banks were better off than foreign banks. After all, they leveraged the government's deposits as a low-cost fund, concurring with Yang (2019) on the role of political institutions. However, after TSA's adoption, domestic banks' performance declined after the withdrawal of government deposits from commercial banks. In other words, TSA lowered the performance of domestic banks, which is consistent with the findings of Silim and Pastory (2022) and Mwambuli and Igoti (2021). Additionally, Haider et al. (2018) found that government ownership reduces financial constraints due to access to public funds.

In the case of private versus state-owned banks, there is no significant performance difference in terms of NIM, contradicting Doan et al. (2018), Phung and Mishra (2016), and Tsegba et al. (2014). The financial statement analysis results in Table 5 show that private banks' NIM superseded state-owned banks' NIM after TSA adoption. Domestic banks performed less than foreign banks did after TSA. Kiriimi et al. (2022) find that foreign banks have better technical capacity and capitalization, implying that insufficient capitalization after government fund withdrawals also contributes to the decline in domestic bank performance.

4.4.2. Relationship between Bank Size and Financial Performance (ROA, ROE, and NIM)

Table 4 (a) shows that, before TSA, bank size had a positive effect on ROA and ROE; however, the performance (ROA and ROE) was negatively affected by bank size after TSA. These results are consistent with the study by Fotova et al. (2023) who came up with inconclusive results on the effect of bank size and performance, thus calling for further studies. Financial statement analysis shows that before TSA, asset growth in terms of gross loans was accompanied by a moderate increase in non-performing Loans (NPL) posing a moderate impairment of bank performance. However, after TSA, the average NPL grew by 36% (from 7.69% before TSA to 10.46% after TSA), whereas gross loans grew by 16% (from 65.32% to 75.75%). Consequently, high NPL after TSA impairs banks' profits. Additionally, the financial analysis results in Table 6 show that small banks outperformed large banks using ROA and ROE as performance indicators, thus confirming the above regression results.

The positive effect of bank size on performance (ROA and ROE) before TSA supports the findings of Isayas (2022) in Ethiopia, Teimet et al. (2019) in Kenya, and Lotto and Papavassiliou (2019) in Tanzania, who found a positive effect on size and performance. However, the post-TSA result associated with increased NPL is explained by increased operational costs, including loan recovery costs, resulting in deteriorating performance (ROA and ROE). This is consistent with studies by Eisenbach et al. (2016), and Avramidis et al. (2018), who found that larger banks spend more on supervision, delegation, and management.

In light of the foregoing, we partially reject the null hypothesis that the influence of bank size has no significant impact on bank performance before and after TSA adoption. ROA and ROE were found to be significantly impacted as highlighted above. The above notwithstanding, the absence of a significant relationship between size and Net Interest Margin (NIM) supports the above-mentioned null hypothesis, justifying that results may vary depending on the variables tested. The result shows that bank size had no effect on performance (NIM) before and after TSA adoption, which is consistent with the studies by Asongu and Odhiambo (2019) on African banks and Grubisic et al. (2022) on Serbian banks.

The financial statement analysis results in Table 6 show that larger banks' NIM slightly increased while small banks' NIM slightly declined after TSA adoption, thus justifying the above regression results. Additionally, since more than 80% of large banks are foreign-owned and because the government deposits were predominantly centred on domestic banks, then the increase in large banks' NIM following TSA adoption was because large banks were not the primary recipients of government deposits thus their deposit base and lending ability were not significantly impaired. As a result, the withdrawal of government deposits from commercial banks had no impact on large banks.

Generally, in terms of all performance measures, NIM, ROA, and ROE financial statement analysis in Table 6 show that small banks outperformed larger ones by recording higher NIM compared to large banks. The findings support the studies by (Eisenbach et al., 2016; Panagiotis et al. 2018) that the management and supervisory costs incurred by large banks offset their economies of scale. Additionally, studies by Nguyen et al. (2023), Gupta et al. (2020), Kouzez

(2023) and Vera-Gilces et al. (2020) posited that bank size is one of the main determinants influencing bank performance.

4.4.3. Relationship between Macroeconomic Variables, and Banks' Financial Performance (ROA, ROE, and NIM)

Generally, the effect of interest rate on bank performance before and after TSA recorded consistent results on ROA and ROE. Before TSA, the lending interest rate had positive and significant effects on performance (ROA and ROE) but the position turned negative and significant after TSA. Interest rates' positive effect before TSA is consistent with O'Connell (2023) and Lopez-Penabad et al. (2022), who consider higher interest rates to contribute to higher net interest income. In contrast, following TSA adoption, the sector was characterized by a general increase in non-performing loans (NPLs) and doubtful debt provisions (as shown in Table 8), which negatively impacted profitability and resulted in low ROA and ROE despite the increased interest revenue. However, Table 4 shows no effect on NIM before and after TSA adoption contradicting the findings of the studies by O'Connell (2023) and Lopez-Penabad et al. (2022) above.

GDP growth rate's effect on the banking sector's overall performance declined after TSA adoption. The pre-TSA positive effect of GDP on ROA, ROE, and NIM becomes negative post-TSA. This positive effect is consistent with findings by Liang and Reichert (2006) in emerging countries, Abdilahi and Davis (2022) in Kenya, South Africa, and Nigeria, and Zampara et al. (2017) in Greece.

After TSA, the negative effect of GDP growth on bank profitability is consistent with Tan and Floros (2012) for China and Combey and Togbenou (2017) for Togo. In the Tanzanian case, the withdrawal of government deposits from commercial banks cancelled the positive effect of GDP growth on performance. Moreover, the Bank of Tanzania's response initiative to boost commercial banks' lending to the private sector (Bank of Tanzania, 2018) resulted in high NPLs (see Table 8 after TSA). High NPL further reduced bank profits. The financial statement analysis revealed that the sectors' ROA and ROE declined from 2.47% to 1.62% and 13.06% to 6.31%, respectively, after TSA adoption followed by a decline in NIM from 7.71% to 6.92%. Generally, other studies found the presence of the relationship between macroeconomic variables and bank performance as posited by Abdullallah and Husam (2020), Chen and Lu (2021) and Vera-Gilces et al. (2020)

As shown in Table 7, the TZS drastically declined relative to US\$ after TSA adoption. The table shows that the value of the TZS decreased from an average of TZS 1627/USD to TZS 2250/USD following TSA adoption. It should be appreciated that after TSA adoption, banks were forced to seek alternative sources of funds following the withdrawal of government deposits from commercial banks. Consequently, the cost of securing and servicing foreign-denominated loans increased as the local currency depreciated, thus impairing the bank's profitability. Additionally, it was during this period when the economy experienced several business failures, as firms that were highly dependent on imports business, incurred greater importation costs cutting down their margins, which in turn affected their capacity to repay loans. The impact can be demonstrated by high NPLs after TSA adoption as shown in Table 8 and thus bank's loan portfolio quality and profitability were highly impaired (see Tables 5–7).

Before TSA, the effects of exchange rate on ROA, ROE and NIM were positive. After TSA, the effect on all indicators was negative but insignificant on ROA and ROE. Essentially, the post-TSA results on ROA and NIM are consistent with the studies by Combey and Togbenou (2017) in Togo and Abdilahi and Davis (2022) in South Africa, Kenya, and Nigeria. Additionally, the analysis discovered that the exchange rate had no impact on ROE during either time (before or after TSA), which is in line with the findings of Abdilahi and Davis (2022).

The study found a negative effect of inflation on the net interest margin, before TSA adoption which is consistent with the findings of Zermeño et al. (2018) for developing countries, Tursoy and Head (2020) for South Africa, and Almansour et al. (2021) in Jordan. After TSA, inflation positively

affects banks' NIM contrary to the abovementioned studies. The shortage of funds in commercial banks due to TSA, coupled with the high (inflation-driven) borrowing interest rate by banks, caused banks to raise their lending interest rates and secure a higher NIM. There was no evidence of the effect of inflation on ROA and ROE before and after TSA adoption. Given the above mixed results on different indicators in both periods (before and after TSA adoption), we call for a partial rejection of the null hypothesis that the influence of macroeconomic variables has no significant impact on bank performance before and after TSA adoption. While regression results reported significant results at one point (either before or after TSA adoption), the reverse was observed in the other period, resulting in a partial rejection of the null hypothesis.

4.4.4. Relationship between Control Variables, and Banks' Financial Performance (ROA, ROE, and NIM)

4.4.4.1. Firm-Specific Control Variables. Regression results in Table 4 indicate that for non-performing loans, the general effect on ROA and ROE was negative and statistically significant implying that as NPL increases, ROA and ROE fall. Table 5 shows that the overall average industry ROA declined from 2.47% to 1.62% after TSA adoption; meanwhile the industry NPL ratio rose from 7.69% to 10.46%. In conjunction with regression results above that show a negative coefficient on NPLs, there is, therefore, reasonable evidence that NPL and bank performance have a negative association. The results are supported by the Central Bank of Tanzania's public notes on measures to address NPL syndrome that, as NPL increases, lending rates follow suit, and the impact may eventually bring about instability in the banking sector. Fraudulent activities by bank employees and improper loan issuing procedures were cited as some of the primary reasons for high NPLs (Bank of Tanzania, 2021a). Additionally, Aljughaiman and Salama (2019), found that when the overall risk indicator is split into separate components, the credit risk is assessed to bear a significant portion. In the same vein Nurwulandari et al. (2022) and Psaila et al. (2019) found that high NPLs ratio significantly impairs banks' profitability.

On the other hand, regression result on NIM was positive and statistically significant implying that as NPL rises, NIM either rises or remains unaffected. This has been evidenced by the Bank of Tanzania Annual Financial Sector Supervision Reports of 2015 through 2020, where the trends for five years on banks' performance were presented. The industry ratios have confirmed the same in Table 5 where the average NIM before and after TSA remained constant at an average of 7% regardless of an increase in NPL from 7.69% to 10.46% after TSA adoption. This is due to the fact that, in the short run, NPL directly affects the net profit before impacting the net interest margin. Review of literature revealed that the growth of NPL is attributable to an increase in Loans to Total Deposits, which positively affects NIM (Ma'aji et al., 2023) for the expense of ROA and ROE. Adegboye et al. (2020) also found that as loans to deposits ratio increases, chances for high NPLs increase as well.

The effect of loans to deposits on ROA, ROE and NIM were not statistically significant implying that there is no association between these variables. Nevertheless, using the dynamic model, the results for NIM recorded a positive and statistically significant relationship between loans to deposits and NIM. The results are consistent with the study by Ma'aji et al. (2023) who confirmed that the higher the loans to deposits ratio, the higher the profitability and vice versa. It is noteworthy that the Net Interest Margin (NIM) measures the worthiness of income that the bank derives from the loans. As the bank does financing businesses, it shall determine its income through interest earned from the loans after netting off interest paid to depositors. As reported in Table 8 the industry ratios recorded an increase in loans to deposits ratios from 65.3% before TSA to 75.8% after TSA paralleled by a constant average NIM at 7% before and after TSA adoption. This implies that, as loans to deposits increase, NIM will either increase or remain unaffected. The results can be explained in line with the fact that after TSA adoption, banks started lending aggressively to boost the private sector; meanwhile, funding sources were expensive after the government withdrew its deposits from commercial banks. For that reason, the increase in interest income was somewhat eroded by interest expenses, such as making the NIM ratio remain fairly

constant before and after TSA. These results are consistent with other studies pointing out that NIM depends on the bank's customary borrowing and lending activities (Asongu & Odhiambo, 2019; Grubisic et al., 2022; Lopez-Penabad et al., 2022; O'Connell, 2023).

4.4.4.2. Market Structure Variables. Regression results show that the concentration ratio negatively affects ROA, ROE, and NIM, implying that the higher the banks are concentrated, the lower the performance and vice versa. Despite the negative regression coefficients, the results show that there is no effect of market share on performance. However, the results of dynamic models enhance the performance, showing a significant negative relationship between market share and performance for all profitability indicators (ROA, ROE and NIM). These results are in line with studies by González et al. (2019) and Gupta et al. (2020) who found that the cost-efficiency tradeoff, swipes away bank's profitability that are highly concentrated. They also affirm that these inefficiencies are attributable to high market power gained by these banks

Table 4 is provided for robustness testing using the two-step GMM estimator. The model supports the static estimation results about the effect of private ownership on ROA and ROE. Further, the GMM findings show the betterment of foreign banks relative to domestic banks after TSA in terms of ROA and NIM, for which static models had no evidence. This is consistent with Kirimi et al. (2022) that foreign banks have better technical capacity and capitalization giving them a competitive edge. Evidence from GMM estimation for the effect of bank size and interest rate on performance is lacking, whereas the estimation for the effect of GDP, exchange rate, and inflation supports the static models' findings.

5. Conclusions and Implications

5.1. Conclusion

This study examined the moderating impact of the Treasury Single Account (TSA) system on the determinants of bank performance in Tanzania, using eleven years (44 quarters) panel data from 2010 to 2020. This period was classified into two phases, the pre-TSA (2010 to 2015) and the post-TSA phase (2016 to 2020). Ownership concentration, bank size, and the macroeconomic variables (GDP, interest rate, inflation rate, and exchange rate) were the main determinants that were analyzed to gauge their impact on bank performance (ROA, ROE and NIM) using TSA as a moderating variable. The study used two categories of control variables, firm-specific (NPL and Loans to Deposits Ratio) and market structure variables (concentration ratio and market share ratio). Based on the Hausman test results, ROA was analyzed using the fixed effect regression model, while ROE and NIM followed the random effect. Additionally, GMM models were used to enhance the robustness of the results. The results show that ownership concentration, bank size and macroeconomic variables impacted profitability and the effect was even notable after TSA adoption. It is noteworthy that the study of this nature is unique and the first of its kind to be conducted in Tanzania. Some few studies have attempted to discuss TSA's impact on bank performance, however none of these studies have explored its impact across various bank classifications. This study therefore enhances comprehension of the relatively new TSA system in Africa while addressing a literature gap by exploring its moderating impact on banking sector's performance across different categories of banking institutions.

The study's regression results suggest that the declining performance of domestic banks relative to their foreign counterparties owes an explanation for their dependency on the withdrawn government deposits. The same explanation holds for private and larger banks. The deposit withdrawal drained cheap government deposits out of these banks. Also, the effects of interest rate, GDP and exchange rate were in favor of bank performance until after the implementation of TSA when the effect turned negative. The post-TSA reversal of the GDP effect implies that banks have a limited capacity to fulfil the credit demands driven by economic growth, resulting in lost interest income thus impairing banks' potential for profitability. Financial statement analysis supports the regression results that point to a widespread post-TSA deterioration in the banking sector's

performance along with high NPLs ratios. While enhancing controls to mitigate bad and doubtful loans, banks are encouraged to modernise strategies to mobilise deposits from the general public, while deviating from dependence on government funds. In light of the foregoing, the study's findings serve to inform and guide policymakers, practitioners, and members of the public in developing practical strategies and policies for strong and stable institutions.

5.2. Implication

The results of this study reveal that the key factors that explain the post TSA's deterioration of bank performance, are the withdrawal of government deposits from commercial banks, the level of non-performing loans (NPL), and corporate governance complexities across bank classifications. As such, the above could have the following implications to different categories of the banking sector's stakeholders.

- (a) Commercial banks are encouraged to innovate ways to mobilize deposits from the general public while deviating from reliance on government funds. The 2017 Finscope report echoes that a large population of Tanzania is still un-bankable, particularly in rural areas. Consequently, there is a possibility to attract a large number of depositors from the general public. This includes commercial banks cultivating synergies with mobile telecommunication service providers, who can increase banking services outreach through mobile financial services technologies. Additionally, combined efforts between commercial banks and the government to promote public financial literacy are instrumental in enhancing customers' bank deposit culture.
- (b) To reduce NPLs, banks should institute robust credit risk-management systems. This includes hiring dependable personnel who can work honestly and in the bank's interest. The 2021 Bank of Tanzania (BOT) public notice on NPLs revealed that among the primary reasons for high NPLs were dishonest and fraudulent practices by bank employees issuing loans by circumventing set procedures for their gains (Bank of Tanzania, 2021b).
- (c) Regulatory authorities should strike a balance between tightening or relaxing regulatory limits while enforcing banks' compliance to ensure the sector's stability.
- (d) In particular, state-owned banks are encouraged to restrict themselves from issuing direct loans to political leaders, government officials, and the public, without proper loan monitoring and recovery mechanisms. The study found that the post-TSA state-owned banks' average NPL ratio was still high at 10.94%, regardless of the 2018 merger of three state-owned banks. The merger was necessary to rescue two state-owned banks that were in critical condition.
- (e) The government should promote economic growth-driving sectors, such as tourism, mining, and industry, to enhance economic development. This will promote the banking sector's development.

5.3. Limitations and Direction for Further Studies

Some limitations apply to this study. First, this study exclusively examined banks that existed between 2010 and 2020, eliminating a select few banks that began operating after 2010 yet could have important consequences for the study's findings. Thus, further research may consider using unbalanced panel data considering all banks provided they were in existence within the selected study period. This can help confirm or enhance the results of the present study. Secondly, we recommend the use of different variables affecting bank performance apart from the ones used in our model and run a similar regression analysis to examine the performance before and after TSA adoption. This could help identify a wide range of factors affecting bank performance other the variables used in the present study. Additionally, we recommend further research to conduct a similar study to examine the long-run impact of government decision to withdraw its deposits from commercial banks rather than restricting the analysis to the current selected period. Lastly, further studies may consider incorporating some additional control variables, other firm-specific and market structure variables that were applied in our current study. It is noteworthy that there

are some other external factors such as changes in global economic condition or changes in regulatory environment that are instrumental in influencing bank performance.

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A request for data can be made to the authors if need be.

Ethical approval

None of the authors of this article has conducted experiments using humans or animals.

Supplementary material

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