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The impact of liquidity on bank lending in South Africa

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The impact of liquidity on bank lending in South Africa

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Abstract

This study investigates the effect of the introduction of the net stable funding ratio (NSFR) on South African domestic banks' lending. We decompose total lending by customer type (corporate vs household) and by loan categories (instalments, mortgages, credit cards, overdrafts and other loans) to account for different risk profiles and maturities (short-, medium- and long-term lending). Our results show that NSFR regulations in South Africa are largely compliant with Basel III standards. While total lending does not appear to have been affected, our results indicate that the introduction of the NSFR has influenced loan composition and maturity profiles. We find that South African banks have increased the proportion of short-term lending in their loan portfolios, decreasing long-term lending, especially in residential mortgages. This effect aligns with the NSFR's aim to reduce maturity transformation but could nonetheless impact households' ability to obtain long-term credit.

JEL classification

G01, G21

Key words

Net stable funding ratio, Basel III, bank lending

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1. Introduction

In 2010, the Basel Committee of Banking Supervision (BCBS) issued the Basel III regulatory framework in response to the Global Financial Crisis (GFC) of 2007–2008. The Basel III accord significantly increased bank capital requirements and introduced two new regulatory liquidity standards. The first is the liquidity coverage ratio (LCR), which aims to ensure that banks have enough liquid assets to withstand liquidity stress in the short term. The second is the net stable funding ratio (NSFR), which aims to encourage banks to hold stabler and longer-term funding sources against their liquid assets, thereby reducing maturity transformation risk, often seen as one of the major causes of the GFC (Acharya and Merrouche 2013; King 2013). The Basel accords were designed to address deficiencies in financial regulation in developed countries. Nonetheless, regulators and policymakers in emerging and frontier markets have incentives to implement the Basel guidelines in their domestic banking systems to reassure international investors and to signal sophistication (Jones, Beck and Knaack 2018). As emerging and frontier markets adopt and implement Basel III in their jurisdictions, proportionality would imply adjusting capital and liquidity requirements to the capacities and needs of simpler banking systems and different financial risk profiles. However, it is not well understood how the Basel III liquidity standards should be calibrated to suit the specific needs of emerging countries, or what the consequences are of adopting them (Adesina 2019).

In this paper, we investigate the implementation of liquidity standards in the South African banking sector. We consider both the South African Prudential Authority's regulatory parameters and the Basel III rules. Specifically, we consider the impact of regulatory liquidity ratios on bank lending.

The South African banking sector is the largest in Africa. The sector is highly concentrated, with the market share of the top five banks (in terms of banking sector assets) at about 90%. On average, capitalisation ratios are above the regulatory minimum. The sector is characterised by a high dependence on deposits as a source of funding, given that interbank markets are relatively small (Beck et al. 2011; Diesel et al. 2022). Most of the banks' funding is domestic. In addition, South African banks hold excessive liquidity (International Monetary Fund 2022). These characteristics

imply that the adoption of the Basel III liquidity requirements could have a different effect on South African banks' behaviour compared to banks in advanced economies.

There is an emerging literature on the impact of the Basel III liquidity regulation on banks' strategic behaviour. Focusing on a cross-country sample, King (2013) finds that compliance with the NSFR rule reduces the net interest margin by 70–80 basis points. Roulet (2018) shows that a sufficient NSFR has a positive effect on the commercial lending of European banks, but a negative impact on retail lending. Jung and Kim (2015) report that Korean commercial banks respond to severe liquidity shocks by decreasing their lending, but banks with high liquidity stocks do the opposite and expand lending. Diesel et al. (2022) suggest a reallocation of assets towards liquid assets and government bonds and a decrease in lending. Adesina (2019) and Mutarindwa, Schäfer and Stephan (2020) investigated the impact of Basel III liquidity standards on African countries' banking systems. Adesina (2019) reports that Basel III liquidity rules have a positive effect on bank loan growth rates, demonstrating that banks tend to grant more loans when they have more stable funding. In contrast, Mutarindwa, Schäfer and Stephan (2020) find that compliance with the NSFR reduces loan growth.

We contribute to this literature by investigating whether and how the introduction of the structural liquidity ratio (i.e. the NSFR) has affected South African banks' lending behaviour. To understand the long-term dynamics of banks' lending behaviour, we use monthly data to consider the period starting with the GFC (2008) and extending to the most recent available data (2022). We compute the NSFR – the ratio of available stable funding (ASF) to required stable funding (RSF) – following both the South African Prudential Authority's regulatory parameters and the Basel III parameters, to assess whether the discretionary power of the South African authority plays a role in the NSFR–bank-lending relationship. The direction of this potential relationship is unclear *ex ante*, as banks can manage liquidity in several different ways. For example, banks can increase the proportion of stable funding (via increased deposit taking or by issuing new equity) and their balance sheet size, possibly leading to an increase in lending to households, corporates, and small and medium-sized enterprises. Alternatively, they can reduce their balance sheet size by divesting assets, leading to a decrease in lending, with negative consequences for the real economy. Banks can also adjust

the composition of their loan portfolios toward shorter maturities to improve their liquidity profile without changing the size of their balance sheet.

Importantly, banks' compliance with liquidity standards needs to be maintained over time, thus potentially impacting bank behaviour in the long run. To evaluate these potential structural changes, we focus not only on total lending but also distinguish loans by customer type (corporate vs household) and lending category (instalments, mortgages, credit cards, overdrafts and other loans) as a proxy for different maturities (short-, medium- and long-term lending). This disaggregation allows us to evaluate whether there are differences in the sensitivity of growth rates of loans of different types and maturities. Bank lending is influenced by a variety of factors. In line with the extant literature, we include bank-specific and macroeconomic variables to account for factors affecting the supply and demand of credit (Del Giovane, Eramo and Nobili 2011; Brei, Gambacorta and Von Goetz 2013; Carlson, Shan and Warusawitharana 2013; Kapan and Minoiu 2013).

The main results of our empirical analysis can be summarised as follows. The NSFR calculated following the South African Prudential Authority calibrations is virtually equal to the NSFR calculated using the Basel III rules. Therefore, NSFR regulations in South Africa are largely compliant with international standards. Off-the-shelf adoption of international standards in countries with smaller and less sophisticated financial sectors might have both costs and risks, particularly in terms of credit availability to the real economy. Overall, we find that total lending (computed as loans and advances to total assets) in South Africa does not appear to have been affected by the introduction of the NSFR. However, when disaggregating total loans by loan types we find that it affected the composition and the maturity profile of banks' loan portfolios. More specifically, we find that higher NSFR values seems to be associated with a decrease of mortgages in favour of loans of shorter maturities, such as overdraft and other loans. These results seem to indicate that South African banks have shifted their portfolio loans from long-term to short-term lending in the period under observation. This maturity swap effect is in line with the aim of the NSFR to reduce maturity transformation, but it might come at the cost of disadvantaging some types of borrowers. Our next set of results investigates the impact by customer type. We find

that the introduction of the NSFR does not affect lending to corporates but seems to negatively affect households' access to long-term credit.

The findings of our analysis will be of particular interest to academics and policymakers, who have raised concerns that the implementation of Basel standards may not be best suited to each jurisdiction's economic structure and financial stability concerns (Jones and Zeitz 2017; Hohl et al. 2018). In particular, concerns have been raised about banks' incentives to shift their portfolios away from sectors of the economy – such as small and medium-sized enterprises – that might be considered riskier but are vital for inclusive economic development. We recognise the importance of the signalling function of the adoption of the Basel III standards by the South African Prudential Authority and evaluate the impact of the regulatory changes on South African banks' lending behaviour. Our results highlight a minimal impact on overall credit availability but a reshifting of bank portfolios towards shorter maturities, with potential negative impacts on the ability of households to access long-term mortgage finance.

The remainder of the paper is organised as follows. Section 2 provides an overview of the adoption of the Basel NSFR regulation in South Africa. Section 3 describes the sample and presents descriptive statistics of South African domestic banks' lending behaviour. Section 4 illustrates the calculation and trends of the NSFR in South Africa. Section 5 discusses the empirical approach and section 6 presents the main results. Finally, section 7 concludes and discusses the policy implications of our findings.

2. Liquidity regulation in South African banking

The concept of regulatory liquidity standards was first introduced by the Basel Committee on Banking Supervision (2010) and revised in 2014 (BCBS 2014). In this study, we focus on one of the liquidity standards, the NSFR, which is the ratio between the amount of available stable funding (ASF) and the amount of required stable funding (RSF). The ASF comprises weighted liabilities reflecting their contractual maturity and is defined as the portion of capital and liabilities expected to be a reliable source of funding over a one-year time horizon. The RSF of a specific bank is a function of the liquidity characteristics and residual maturities of the various assets held by that institution as well as those of its off-balance sheet exposures. The ASF and RSF are

calibrated to reflect the presumed degree of stability of a bank’s liabilities and the liquidity of a bank’s assets. The weights for assets and liabilities range from 0% to 100%. The stabler the liability being considered, the higher the ASF factor applied. In this way, ASF categories are biased to a greater extent by more stable funding. On the asset side, the more liquid the asset, the higher the RSF factor applied. The overall aim of the NSFR is to promote longer-term resilience by encouraging banks to fund their activities with more stable sources of funding. For a bank to be compliant, the NSFR must be above 100%.

The Basel III rules regarding the NSFR were implemented in South Africa on 1 January 2018. Directive no. 8 of 2017 allows for national discretionality, applicable only to banks conducting business in South Africa, granted to the PA of the South African Reserve Bank (SARB). This discretionality pertains to the calculation of the NSFR and involves certain weighting factors applied to specific items in the ASF numerator and RSF denominator, deviating from the weighting factors outlined in the Basel III document. Directive 1 of 2023, issued on 25 January 2023, introduced modifications to the provisions of Directive 8 of 2017, including adjustments intended to gradually align South African regulations with the Basel NSFR standard.

Table 1 summarises the specific types of liabilities and assets assigned to the ASF and RSF categories, respectively, and their associated factors in both according to the South African PA and the Basel III rules, showing their differences in terms of ASF and RSF factors (in bold).

Table 1: NSFR calculation: ASF and RSF in South African regulation vs Basel III

Available stable funding (ASF)	ASF factor (South African regulation)	ASF factor (Basel III)
Total regulatory capital	100%	100%
Other capital instruments and liabilities with effective residual maturity of one year or more	100%	100%
Stable deposits	95%	95%
Less stable deposits	90%	90%
Other deposits and short-term borrowings	50%	50%
Rand funding with a residual maturity of less than 6 months from financial corporate customers (excluding banks)	30%	0%
All other liabilities and equity not included in the above categories	0%	0%
Required stable funding (RSF)	RSF factor (South African regulation)	RSF factor (Basel III)
Coins, banknotes, central bank reserves	0%	0%
Minimum required central bank reserves	5%	0%
Government securities	5%	5%
Loans and advances to banks with residual maturities less than 6 months	10%	10%
Loans and advances to banks with residual maturities more than 6 months	50%	50%
All other assets not included in the above categories with residual maturity of less than one year, including loans to non-financial corporate clients, loans to retail and small business customers, and loans to sovereign and public sector enterprises	50%	50%
Other securities	50%	50%
Residential mortgage loans	65%	65%
Other performing loans (excluding loans to financial institutions)	85%	85%
Exchange-traded equities	85%	85%
Physical traded commodities, including gold	85%	85%
<i>All other assets not included in the above categories:</i>		
Other deposits with and loans and advances to South African banks; deposits with and loans and advances to foreign banks, denominated in rand	100%	100%
Loans granted under resale agreements to SARB, banks, insurers, pensions funds, other financial corporate sector	100%	100%
Deposits with and advances to SARB; deposits with and advances to South African banks; other advances to South African financial corporate sector; deposits with and advances to foreign banks	100%	100%
Redeemable preference shares issued by banks, financial corporate sector, non-financial corporate sector and other	100%	100%
Credit impairments in respect of loans and advances	100%	100%
Equity holdings in subsidiaries	100%	100%
Equity holdings in associates including joint ventures	100%	100%
Unlisted equities	100%	100%

Derivative instruments issued by banks and other monetary institutions, financial corporate sector, non-financial corporate sector and other	100%	100%
Non-financial assets	100%	100%
Other assets	100%	100%
10% of liabilities derivative instruments: to domestic sector; liabilities derivative instruments: to foreign sector	100%	
20% of liabilities derivative instruments: to domestic sector; liabilities derivative instruments: to foreign sector		100%
Off balance sheet items (such as letters of credit)	National discretion: 5%	National discretion: 5%

3. Data and descriptive statistics

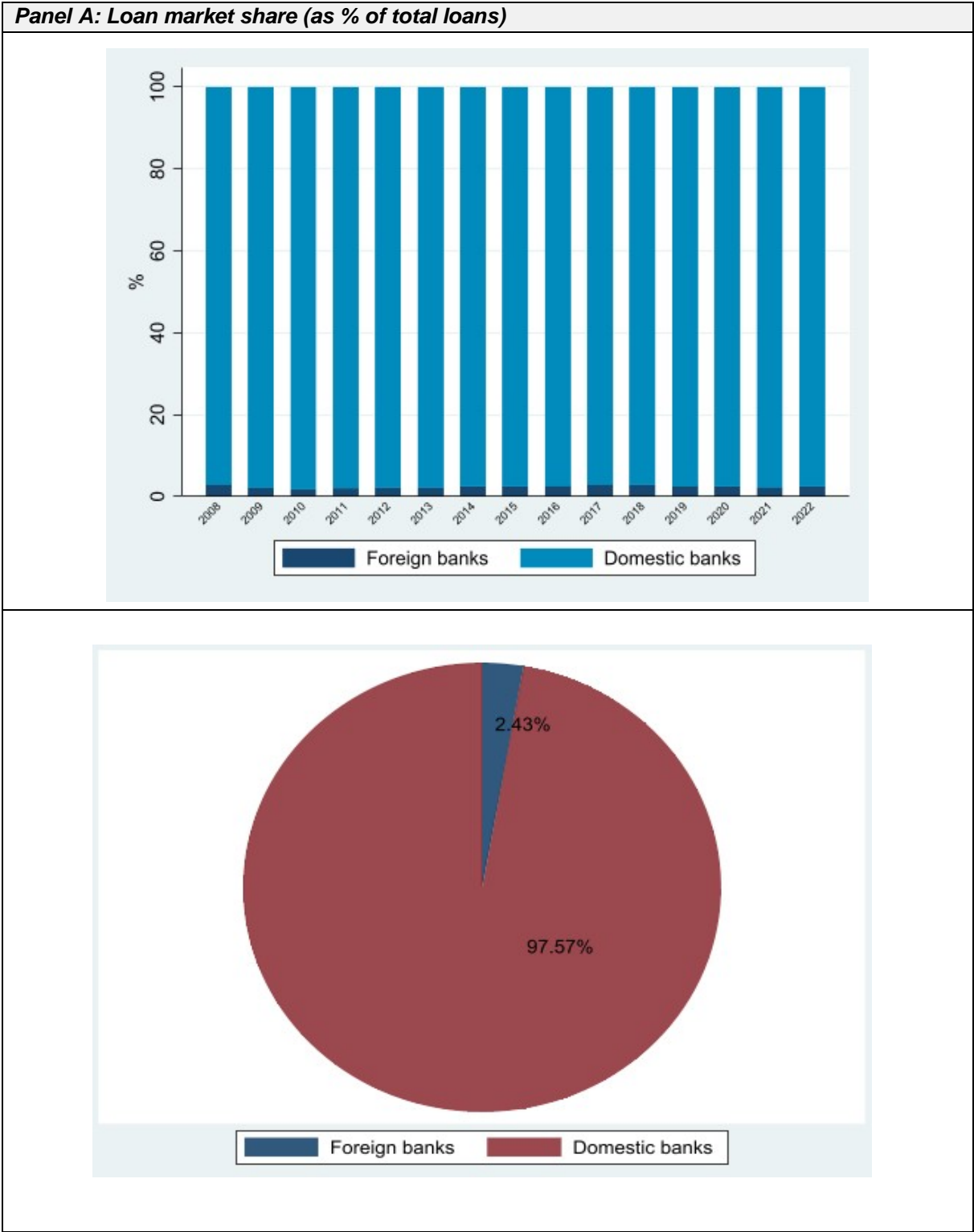
3.1 Sample description

To investigate the impact of the introduction of the NSFR on South African banks' lending behaviour, we collect information on all registered banks – foreign and domestic¹ – operating in South Africa.² Because of the small market share, both in terms of lending (Figure 1, Panel A) and in terms of total assets held by foreign banks (Figure 1, Panel B), we chose to focus our analysis on domestic banks. Our final sample is composed of 21 domestically owned South African banks, operating between 2008 and 2022. The accounting-based bank-specific data are collected from banks' BA900 economic returns, available on the SARB website.

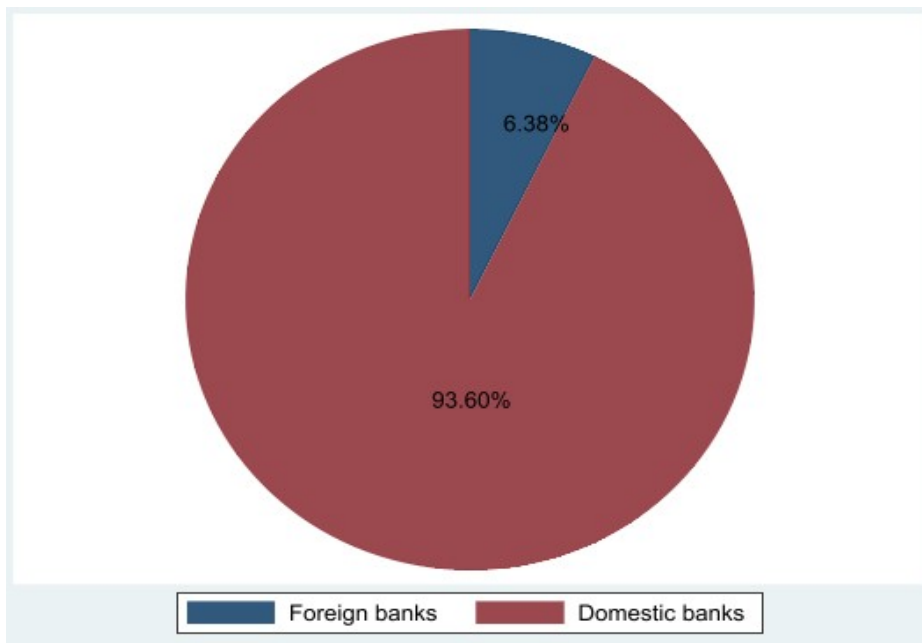
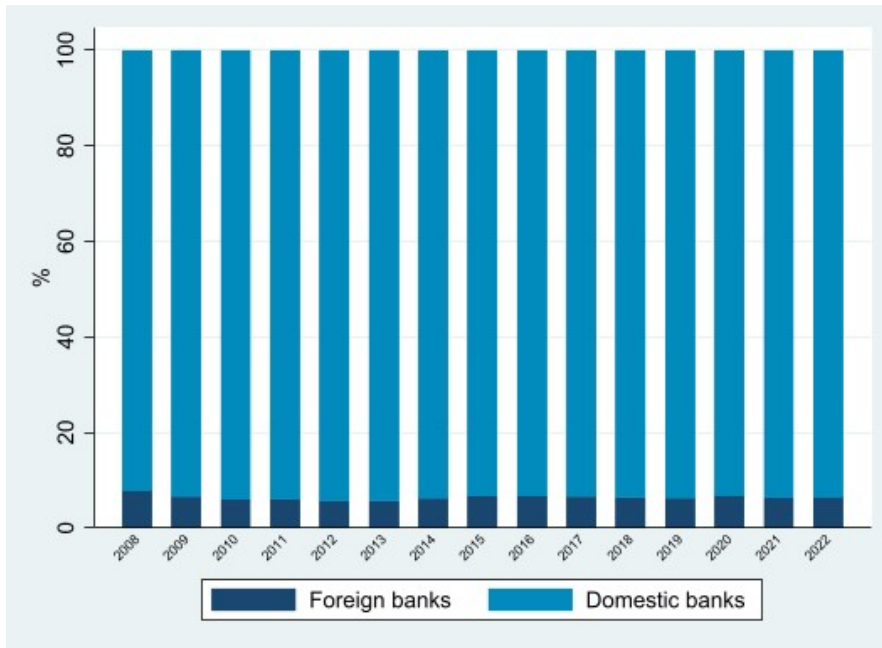
¹ South African foreign banks include branches of foreign banks, foreign-controlled banks, and representative offices of foreign banks. South African domestic banks include locally controlled banks and mutual banks.

² Data are available at <https://www.resbank.co.za/en/home/what-we-do/Prudentialregulation/sa-registered-banks-and-representative-offices>

Figure 1: Foreign vs domestic banks (2008–2022)



Panel B: Market share (as % of total assets)



Source: Banks' BA900 economic returns, available on the SARB website, <https://www.resbank.co.za/en/home/what-we-do/statistics/releases/banking-sector-information/banks-ba900-economic-returns>

3.2 Bank lending in South Africa

In this section, we illustrate key trends in bank lending to South African households and corporates. We collect data on total lending (computed as loans and advances over total assets). We then distinguish loans based on customer type as corporate or household loans. We then disaggregate the loans into the following five categories:

1. instalment debtors, suspensive sales and leases;
2. mortgage advances;
3. credit card debtors;
4. overdrafts, loans and advances to the private sector; and
5. other loans and advances.³

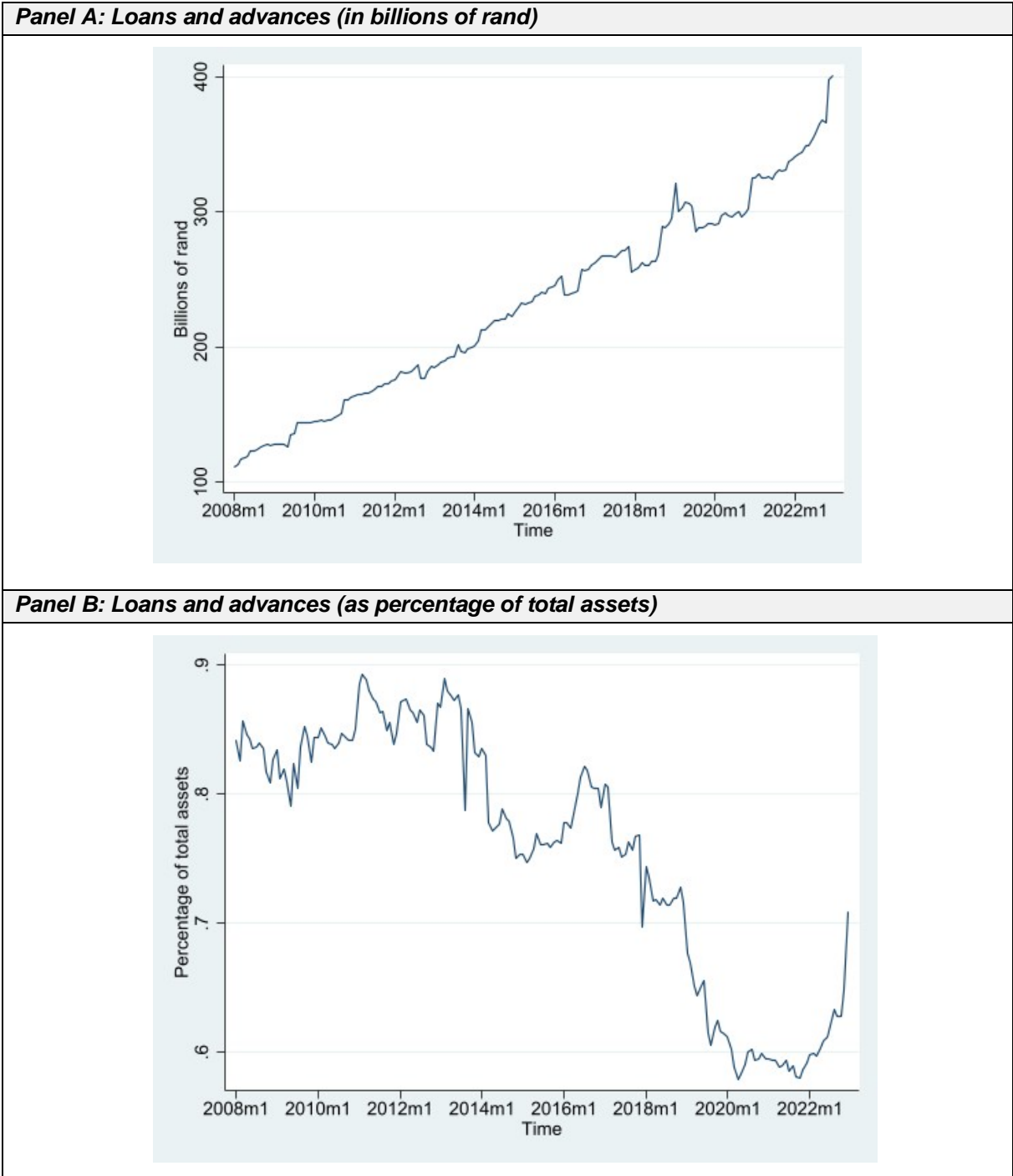
These types of loans are typically characterised by different maturities. More specifically, we assume that ‘mortgage advances’ typically have a long-term maturity, ‘instalment debtors, suspensive sales, and leases’ typically have a medium- to long-term maturity, and ‘credit card debtors, overdrafts, loans and advances to the private sector, and other loans and advances’ typically have a short-term maturity (DeYoung and Jang 2016).⁴ These disaggregations enable us to examine whether there are variations in the sensitivity of growth rates among loans of different types and maturities.

Figure 2 illustrates the evolution of total loans for our sample of domestically owned South African banks between 2008 and 2022. In term of billions of rand (panel A), the stock of total loans and advances increases during the period investigated. However, the values decrease when we normalise by total assets, suggesting a decrease in the percentage of loans in banks’ overall asset portfolios (panel B).

³ Following the definition used in the SARB Quarterly Bulletin (December 2022), we compute the variable “Loans and advances”.

⁴ We make assumptions regarding the duration of loans, as this information is not available on the SARB website or in the Banks’ BA900 Economic Returns.

Figure 2: Evolution of total loans of domestically owned South African banks, 2008–2022

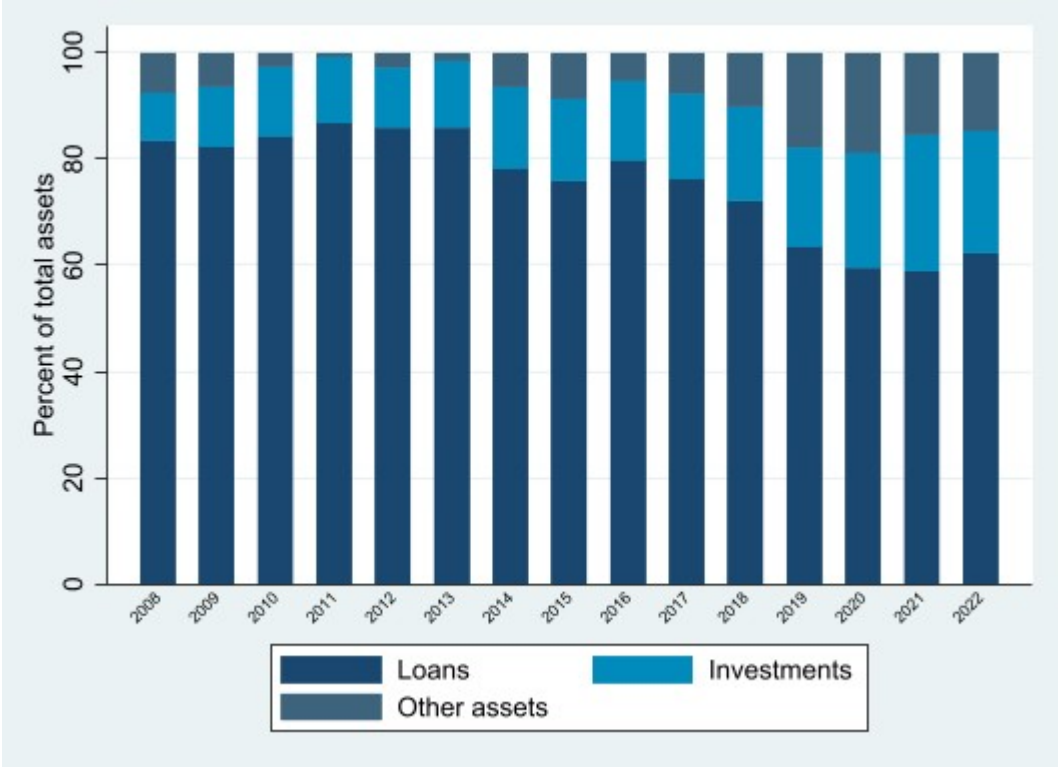


Source: Banks' BA900 economic returns

Figure 3 shows that the decrease in loans during the sample period is offset by an increase in other assets and financial investments. These findings align with those of Diesel et al. (2022), who observed that changes on the asset side of South African banks were characterised by a rise in government securities and a decline in the share of loans. Specifically, they demonstrated that loans and advances decreased from 75% to 68% as a share of total assets between January 2015 and February 2021, while

government debt security assets increased from about 5% to 14% of banking sector assets over the same period.

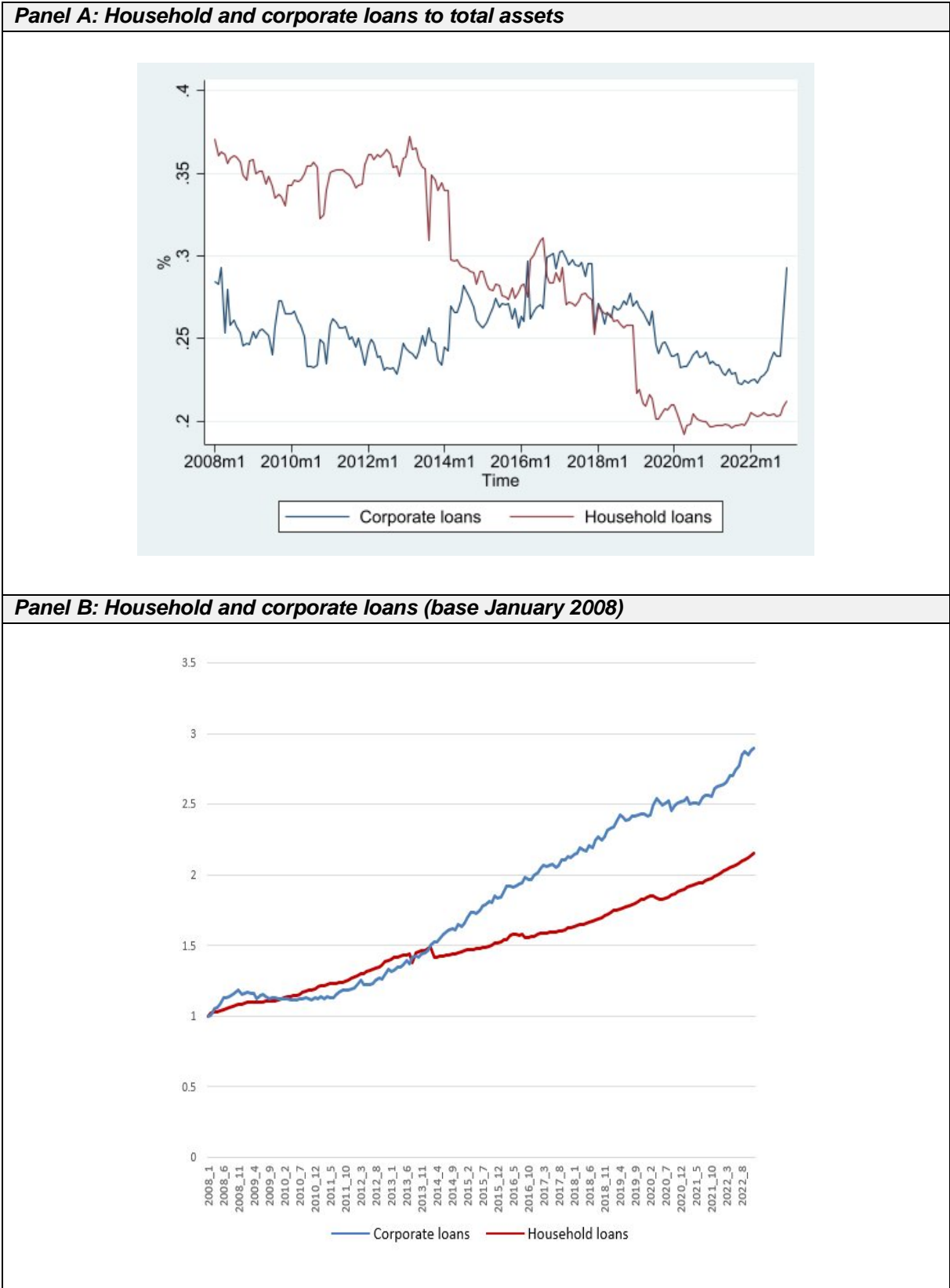
Figure 3: Asset composition (as percentage of total assets), 2008–2022



Source: Banks' BA900 economic returns

Focusing on loan customer types, Figure 4 (panel A) shows that household loans (as a share of total assets) represent the largest component of banks' assets in the early stages of the period under review. However, household loans declined in the latter part of the period, falling below the level of corporate loans. Using January 2008 as the base year, we see that corporate loans increased more than household loans after 2013 (Figure 4, panel B). Interestingly, corporate loans (as a share of total loans) are more prominent from 2018, when the NSFR was implemented in South Africa, and remain above the share of household lending in the latter part of our sample period.

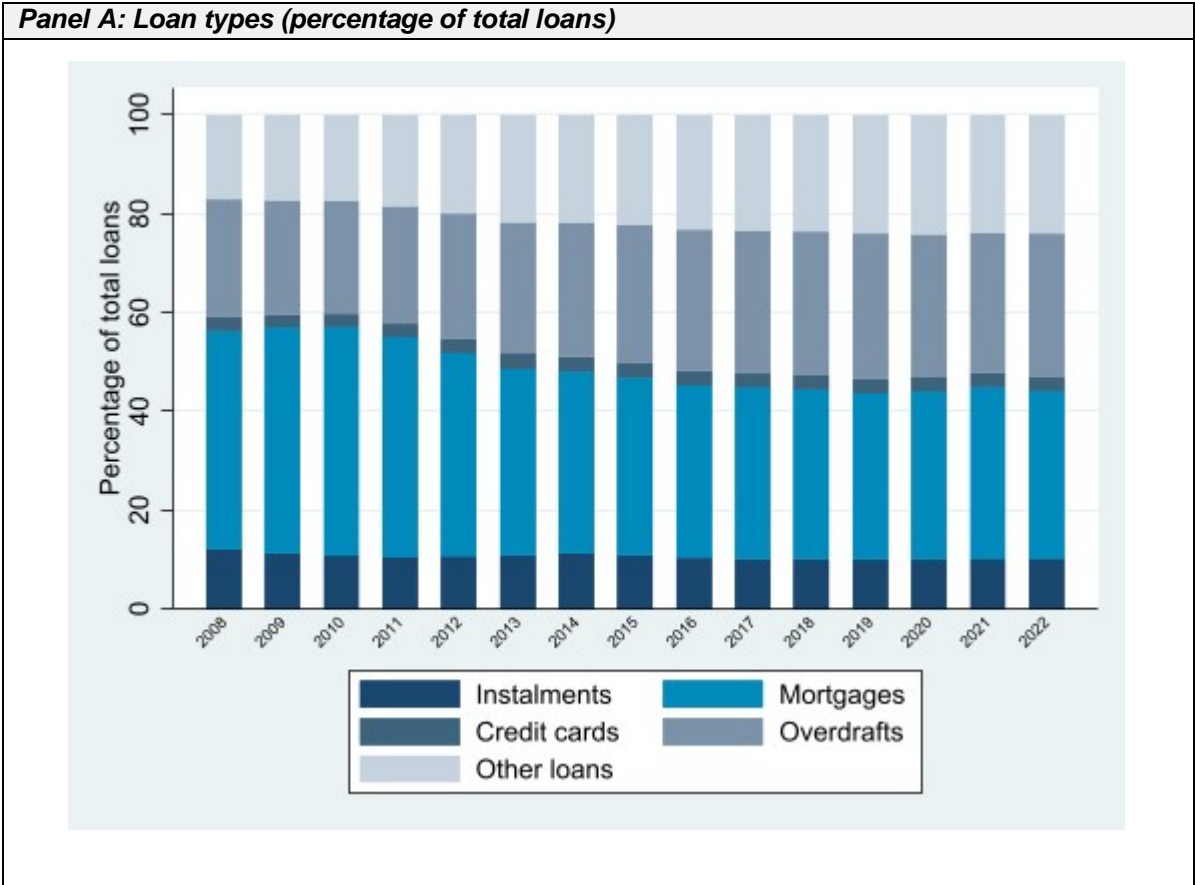
Figure 4: Household vs corporate loans (to total assets), 2008–2022



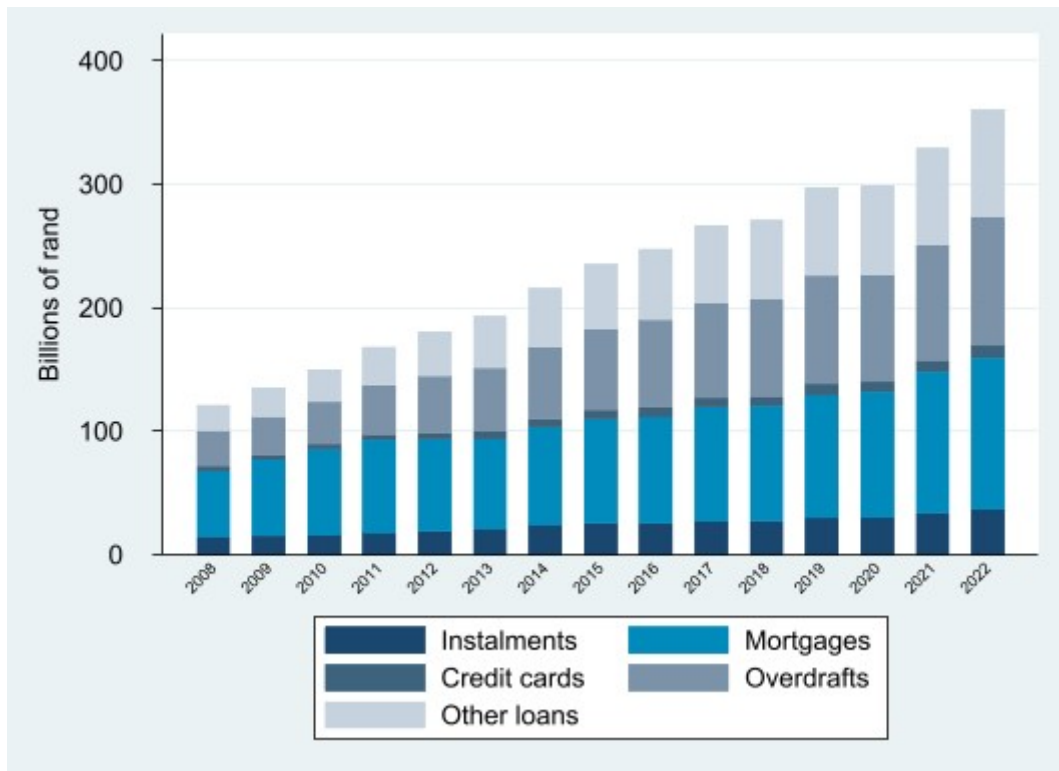
Source: Banks' BA900 economic returns

Finally, we analyse changes in the composition of loans between 2008 and 2022. Focusing on the five categories of loans, Figure 5 (Panel A) shows that although mortgage advances remain the largest type of loans, their relative weight decreases, supporting Diesel et al.'s (2022) finding of a large decline in mortgage loan share. Conversely, the proportion of overdrafts, loans and advances to the private sector, as well as other loans and advances, increase in the later years of the study period. Focusing on the evolution (in billions of rand) of the five categories of loans, Figure 5 (Panel B) shows that their stock increased during the period under study, driven by the growth in short-term lending, such as overdrafts, loans and advances to the private sector and credit card debtors.

Figure 5: Loan types, 2008–2022



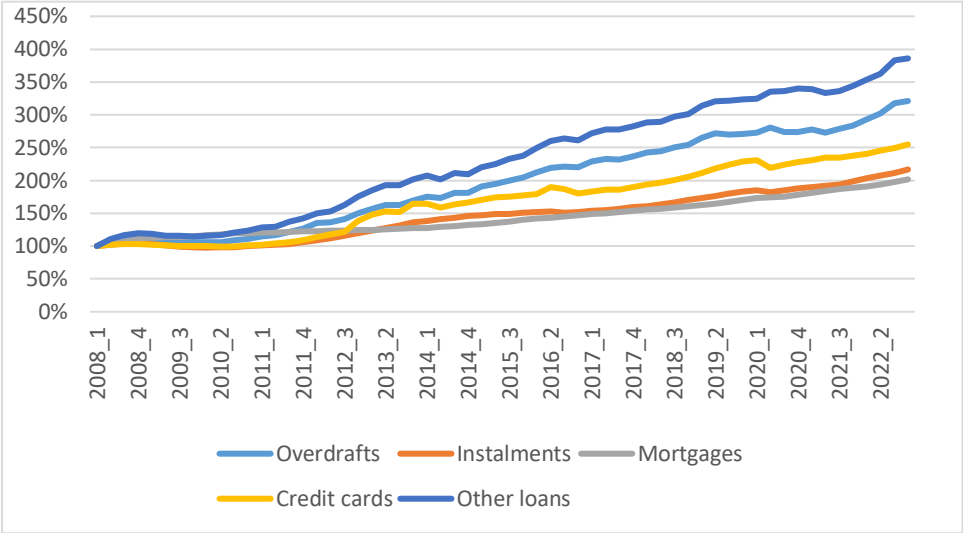
Panel B: Loan types (billions of rand)



Source: Banks' BA900 economic returns

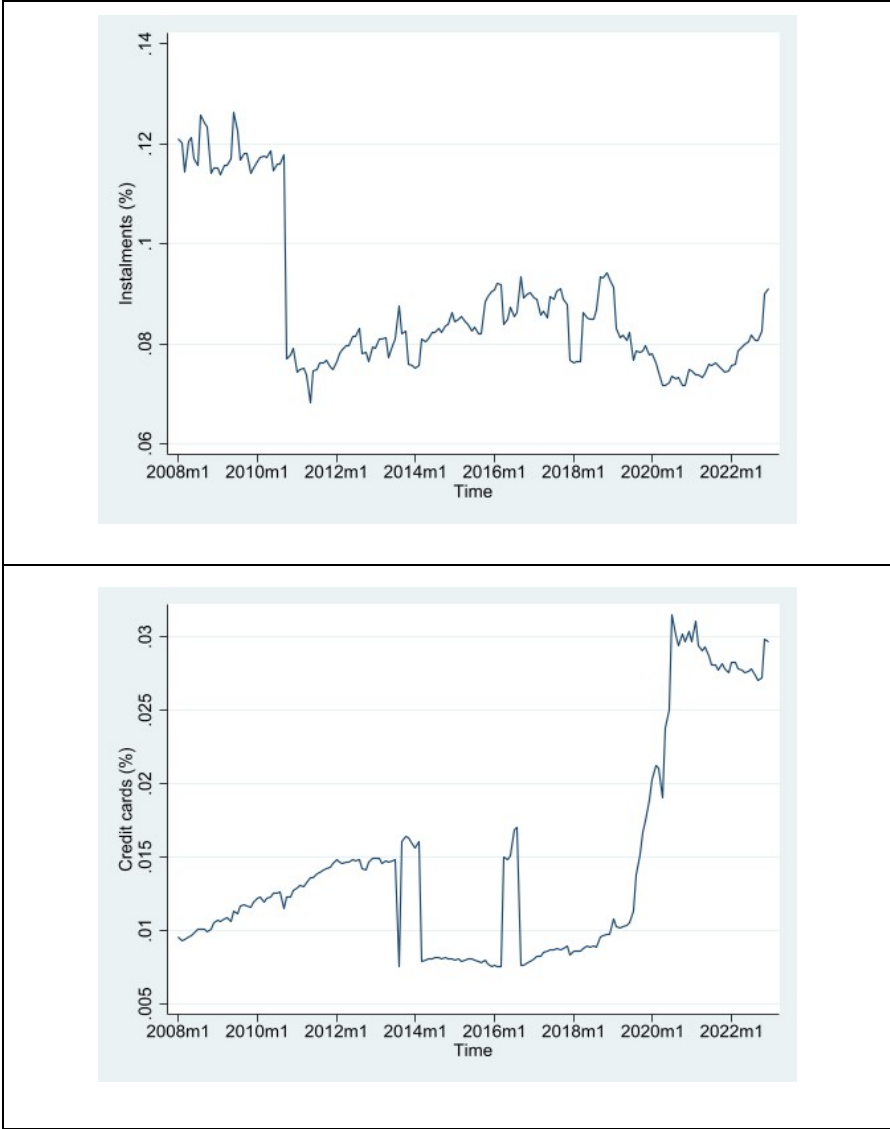
Figure 6 shows the growth in the five loan categories using January 2008 as the base year. While the trend is positive for all categories, in line with the previous findings, we show that instalment debtors, suspensive sales, leases and mortgage advances grow at a slower pace than overdrafts and other loans and advances. While all the loan categories increased in terms of rand values, their share of total assets decreased for all categories except credit card debtors (see Figure 7). This preliminary evidence suggests a shift from lending to investment and other assets, as well as a change in loan composition, towards lending of shorter maturities, particularly credit cards, overdrafts and personal loans.

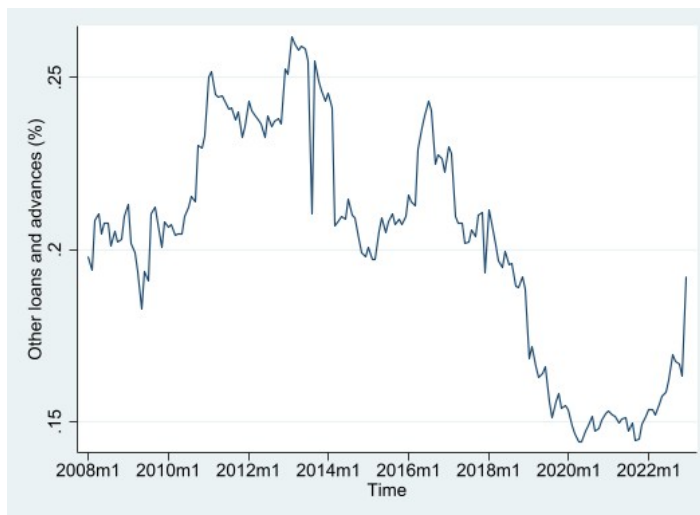
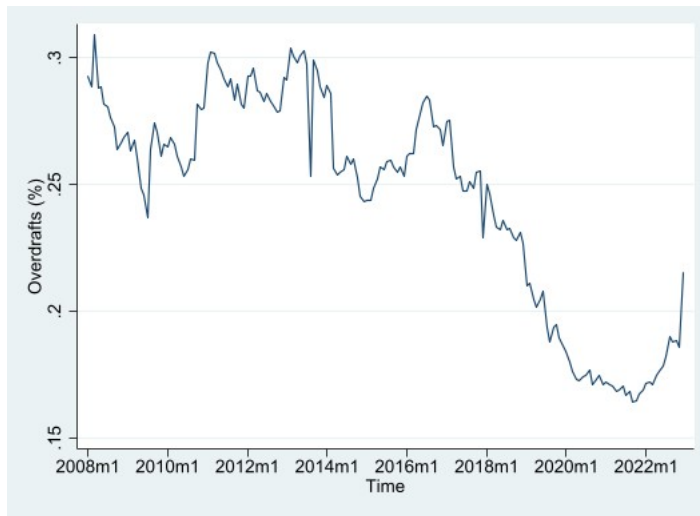
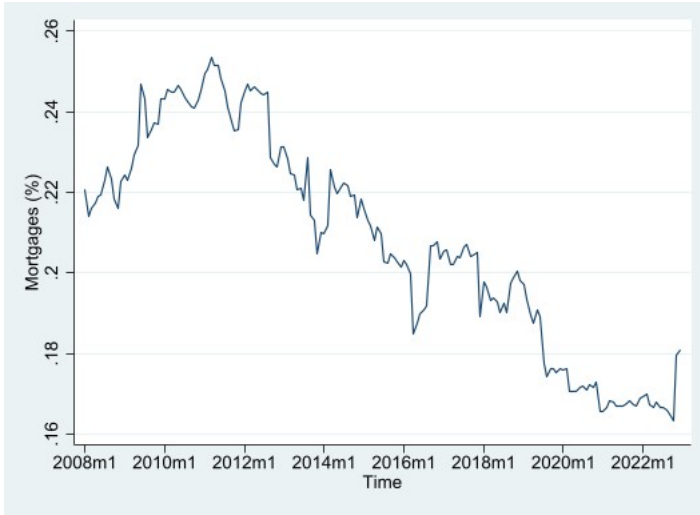
Figure 6: Evolution of loan composition (base January 2008), 2008–2022



Source: Banks' BA900 economic returns

Figure 7: Evolution of loan composition (to total assets), 2008–2022



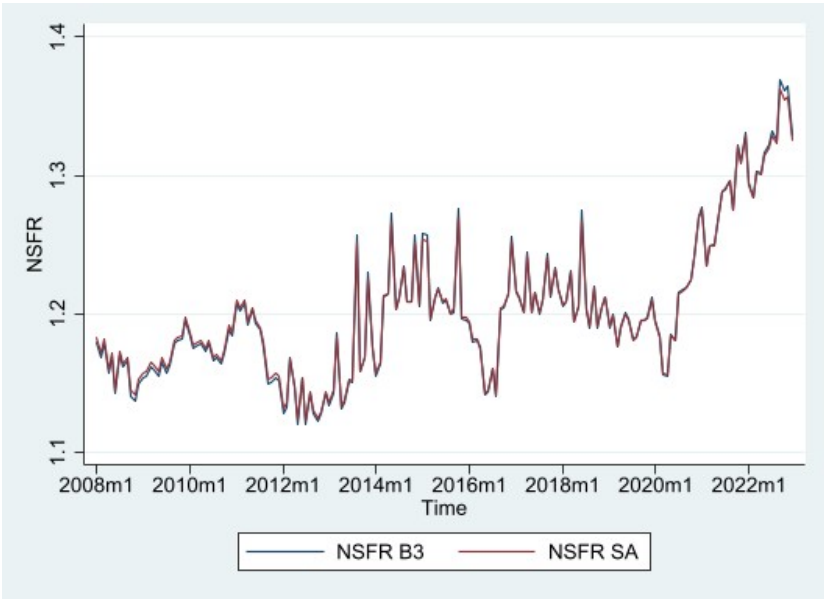


Source: Banks' BA900 economic returns

4. Calculation of the NSFR and its trend

In our analysis, we measure the NSFR using the methodologies proposed by Basel III (NSFR B3) and South African regulations (NSFR SA). Although the methodologies differ in some respects (see Table 1), Figure 8 shows that the results for NSFR B3 and NSFR SA are very similar over the entire sample period. These findings align with the information presented in ‘BCBS, Regulatory Consistency Assessment Program (RCAP): Assessment of Basel NSFR regulations – South Africa’, published by the Bank for International Settlements (BIS) in April 2023. Looking at the trend in our estimates, we can see a sharp increase in the NSFR since 2020, the year of the COVID-19 pandemic. The trend continues in the later part of our sample period, possibly indicating pandemic-related distortion in the liquidity policies of banks and corporates alike.

Figure 8: Comparison of NSFR trends under South African regulations and Basel III (yearly average values) from 2008 to 2022

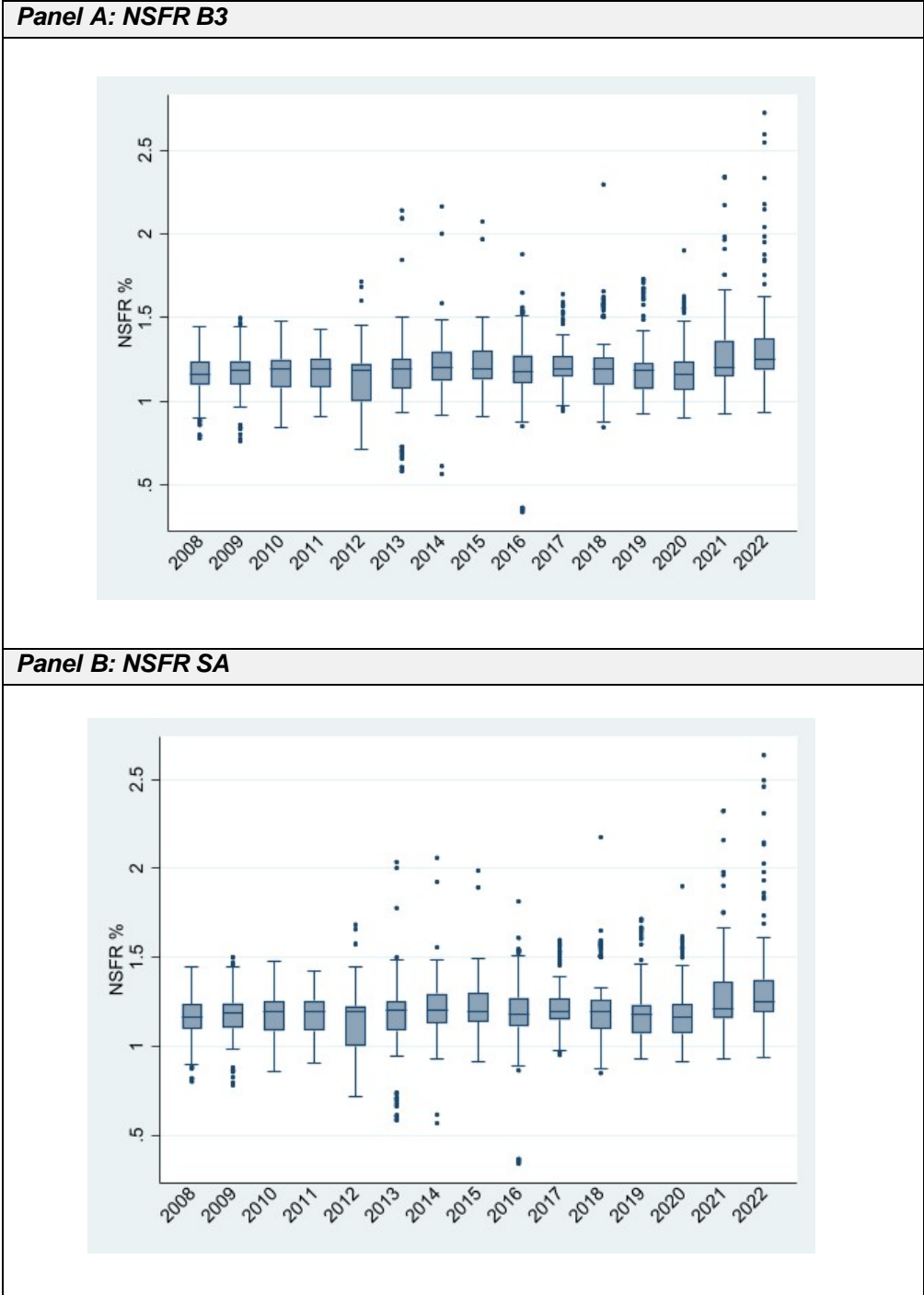


Source: Banks’ BA900 economic returns

Applying both approaches, we see that the NSFR is, on average, consistently above 100%. Figure 9 shows that almost all banks were compliant with the NSFR even before it became mandatory in South Africa. Our results are in line with Diesel et al. (2022) and suggest that South African banks may hold excess liquidity, as described by Honohan and Beck (2007) and Nana and Samson (2014). Focusing on the NSFR dispersion between 2008 and 2022, Figure 9 highlights its increase in recent years.

This result suggests that there are a few outliers to most South African banks, which are predominantly compliant with international liquidity standards, and the differences between compliant and non-compliant banks increase in the latter part of the sample period.

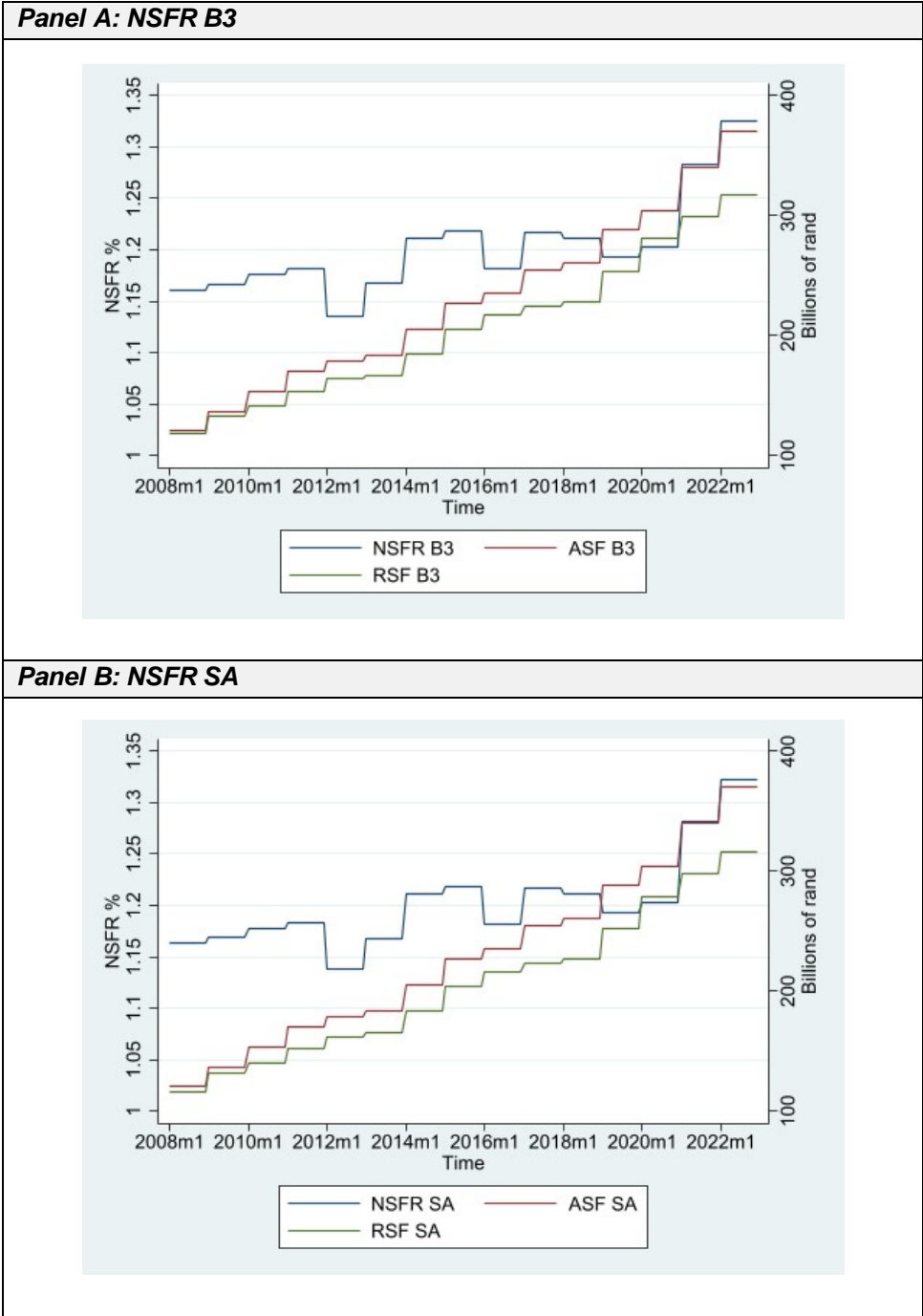
Figure 9: Dispersion of the NSFR, computed using South African regulation vs Basel III, 2008–2022



Source: Banks' BA900 economic returns

Finally, focusing on the NSFR decomposition, Figure 10 shows that the yearly average values of the NSFR (computed according to both the Basel III and South African regulations) and its components (ASF and RSF) show a positive trend between 2008 and 2022.

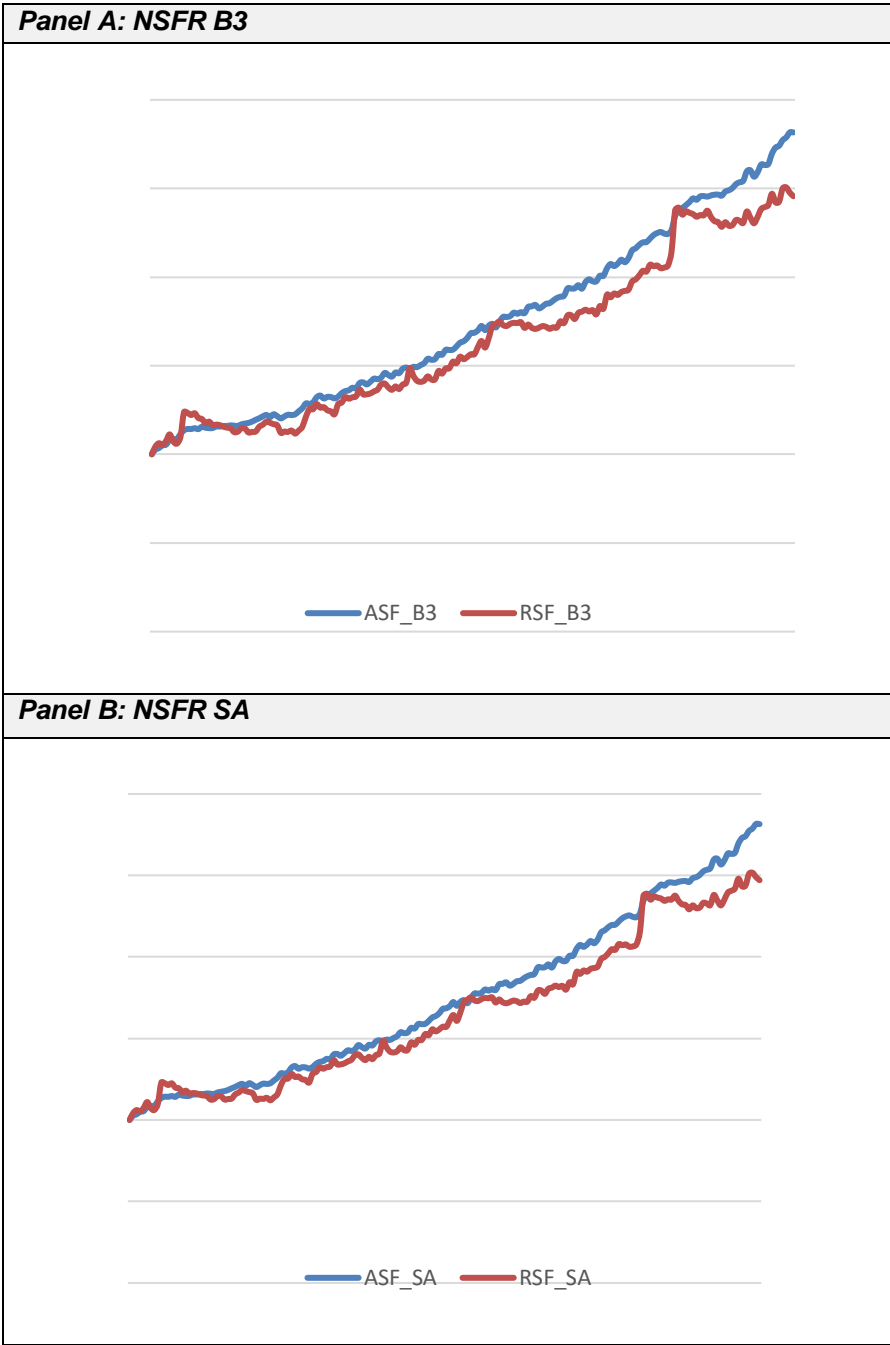
Figure 10: NSFR decomposition (yearly average values), 2008–2022



Source: Banks' BA900 economic returns

When examining the yearly average growth of NSFR components using January 2008 as the base year, Figure 11 shows that the numerator (ASF) increases more than the denominator (RSF), although the difference is small. The gap widens between 2017 and 2020 (before the COVID-19 pandemic) but narrows during the pandemic due to increases in RSF. This suggests that increases in NSFR are primarily driven by growth in ASF rather than a reduction in RSF.

Figure 11: ASF and RSF trends (year-on-year average, January 2008 as base year), 2008–2022



Source: Banks' BA900 economic returns

5. Empirical methodology

To investigate the effect of the NSFR on South African banks' lending behaviour, we run the following panel data regression with bank fixed effects (FE):

$$LOANS_TA_{i,t} = \beta_1(NSFR)_{i,t-1} + \beta_2(SUPPLY\ ACCOUNTING\ DATA)_{i,t-1} + \beta_3(DEMAND\ MACRO\ DATA)_{c,t-1} + DUMMY_COVID + \delta_i + \varepsilon_i \quad (1)$$

where i refers to the bank, t indicates the month, c refers to the country, δ_i is the bank FE and ε_i is the standard errors clustered by bank. D_Crisis is the COVID dummy crisis, which takes the value of 1 from March 2020 on, and zero otherwise.⁵ Our dependent variable is loans to total assets (LOANS_TA), computed using, alternatively, loans at aggregate and disaggregate level (see section 3.2). The target variable is the NSFR computed using both methodologies (NSFR B3 and NSFR SA). This dual approach allows us to assess whether the discretionary power vested in the South African authority influences the relationship between NSFR and bank lending.

The relationship between the NSFR and bank lending is unclear ex ante, because it depends on the adjustment strategy chosen by non-compliant banks to meet the liquidity ratio. On the one hand, we expect a negative sign when banks increase the structural liquidity ratio by reducing loans to non-financial sectors or by shifting their asset composition from loans to securities with lower RSF weights. On the other hand, the sign could be positive when banks improve their NSFR by purchasing liquid assets with stable funding, thereby increasing their level of stable funding, or by shifting their portfolio towards liquid assets by reducing other assets (different from loans) with a high RSF factor.

Following the related literature, we account for bank-specific and country-specific variables based on accounting and macroeconomic data, respectively, to account for both credit supply and demand. On the supply side, we use the natural logarithm of a bank's total assets to proxy for bank size (SIZE), the bank capital measure equity to

⁵ We also do not control for the GFC, because African banking systems, with lower levels of financial depth and connectedness compared to their peers in Europe and the United States (Allen and Giovannetti 2011; Kasekende, Ndikumana and Rajhi 2009), were not severely affected by the crisis.

total assets (EQUITY_TA), and the ratio of impairment of loans to total assets (IMPAIRMENT_TA) as a proxy for credit risk.

To account for the credit demand side, we incorporate the following macroeconomic variables:⁶ the quarterly percentage change in the gross domestic product (GDP) rate, adjusted on a monthly frequency; the monthly percentage change in the consumer price index (INFLATION); and the change in the short-term interest rate (SHORT_TERM_INT_RATE) during the period t and $t-1$ (i.e. the previous month). Data on these macroeconomic variables are collected by the Organisation for Economic Co-operation and Development (OECD).⁷ Finally, we control for the COVID-19 pandemic, as both supply and demand for credit were affected in many countries (Colak and Öztekin 2021). All the explanatory variables are lagged by one period (the previous month) to address potential endogeneity problems. Table 2 provides brief definitions of all variables.

⁶ In an alternative specification, we remove the country variables and used time FE instead. The estimations with Bank and Time FE are available upon request and give similar qualitative results.

⁷ To mitigate the effect of outliers, except for the variable SIZE (i.e. computed as the natural logarithm of total assets), following the BACON algorithm proposed by Billor, Hadi and Velleman (2000), we drop outliers in the 0.01 percentile. See also Weber (2010).

Table 2: Overview of all variables used in the empirical analysis

Variables	Description	Source
Dependent variables	Loans and advances to total assets (Total loans)	Authors' estimations based on Banks' BA900 Economic Returns data available on the SARB website
	1. Instalment debtors, suspensive sales and leases to total assets	
	2. Mortgage advances to total assets	
	3. Credit card debtors to total assets	
	4. Overdrafts, loans and advances to private sector to total assets	
	5. Other loans and advances to total assets	
	Corporate loans	
	1. Instalment debtors, suspensive sales and leases to total assets	
	2. Mortgage advances to total assets	
	3. Credit card debtors to total assets	
	4. Overdrafts, loans and advances to private sector to total assets	
	5. Other loans and advances to total assets	
	Household loans	
	1. Instalment debtors, suspensive sales and leases to total assets	
	2. Mortgage advances to total assets	
	3. Credit card debtors to total assets	
	4. Overdrafts, loans and advances to private sector to total assets	
	5. Other loans and advances to total assets	
Target variables	NSFR computed using the ASF and RSF factors defined by South African regulations (NSFR SA)	Authors' estimations based on Banks' BA900 Economic Returns data available on the SARB website
	NSFR computed using the ASF and RSF factors defined by Basel III regulation (NSFR B3)	
Control variables	Natural logarithm of total assets (SIZE)	Authors' estimations based on Banks' BA900 Economic Returns data available on the SARB website
	Equity to total assets (EQUITY_TA)	
	Impairment of loans to total assets (IMPAIRMENT_TA)	
	Quarterly percentage change in GDP adjusted on monthly frequency (GDP)	OECD
	Monthly percentage change of consumer price index (INFLATION)	
	Monthly difference between short-term interest rate (i.e. the rate at which short-term government paper is issued or traded in the market) in t and short-term interest rate in t-1, that is, the previous month (SHORT_TERM_INT_RATE)	
	Dummy COVID equals 1 from March 2020; 0 otherwise (DUMMY_COVID)	

6. Main results

This section discusses the results of the panel regressions for our sample of domestic South African banks between 2008 and 2022. We analyse the relationship between the the NSFR, calculated using both the South African Prudential Authority’s regulatory parameters and Basel III parameters, and bank lending. We decompose bank lending, considering different types of loans (total loans, corporate loans, household loans, all disaggregated maturities).

Table 3 shows the results of the panel regressions for our sample of South African banks for total loans computed as loans and advances over total assets. The empirical analysis reveals that total lending does not appear to have been affected by the introduction of the NSFR. More specifically, we find an insignificant coefficient between the NSFR calculated with Basel III weights (NSFR B3) and loans and advances over total assets, but a weakly significant positive coefficient when NSFR is calculated with South African weights (NSFR SA). This result is in line with Adesina (2019), which shows a positive effect of Basel III liquidity rules on bank loan growth rates, demonstrating that banks tend to grant more loans when they have more stable funding.

Table 3: Relationship between NSFR and total loans

Variables	NSFR SA	NSFR B3
NSFR (-1)	0.333*	0.308
	(0.191)	(0.185)
SIZE (-1)	-0.002	-0.002
	(0.055)	(0.056)
EQUITY_TA (-1)	0.476	0.468
	(0.530)	(0.536)
IMPAIRMENT_TA (-1)	0.347	0.256
	(2.717)	(2.725)
GDP (-1)	-0.002	0.000
	(0.033)	(0.033)
INFLATION (-1)	0.557	0.564
	(0.557)	(0.559)
SHORT_TERM_INT_RATE (-1)	0.876	0.937
	(1.543)	(1.546)
DUMMY_COVID	-0.056	-0.055
	(0.044)	(0.044)
Constant	0.304	0.342
	(1.052)	(1.052)
Bank FE	Yes	Yes
No. of observations	2 590	2 590
R-squared	0.854	0.853

Table 4 shows the result of the analysis disaggregating total loans by loan types (the five categories of loans characterised by different maturities). The results indicate that the introduction of the NSFR affected the loan composition and the maturity profile of loan portfolios. More specifically, we find that higher NSFR values seem to be associated with a decrease in mortgage loans (typically of long-term maturity) in favour of an increase in overdrafts, loans and advances to the private sector and in other loans and advances (all typically short term). These results are confirmed by both the South African and Basel III calculation approaches and suggest that domestic South African banks have shifted their portfolio loans from long-term to short-term lending. The maturity swap effect is in line with the aims of regulators, who intended to reduce maturity mismatch. Banks thus seem to shorten the maturity of their loans to reduce maturity transformation and thereby boost their NSFR. This is in line with Ananou et al. (2021), who find that Dutch banks subject to the Dutch liquidity balance rule – a liquidity requirement implemented prior to Basel III and similar to the NSFR – adjust the composition of loan portfolios by shifting from long-term to short-term loans.

Table 4: Total loans disaggregated by loan type

Panel A: NSFR computed following the South African regulation

	(1)	(2)	(3)	(4)	(5)
Variables	Instalments	Mortgages	Credit cards	Overdrafts	Other loans
NSFR SA (-1)	0.010	-0.081**	0.018	0.214*	0.171*
	(0.018)	(0.031)	(0.021)	(0.103)	(0.091)
SIZE (-1)	0.014*	-0.040*	0.005	0.000	0.0176
	(0.008)	(0.023)	(0.003)	(0.035)	(0.034)
EQUITY_TA (-1)	0.076	-0.360**	-0.142	0.453	0.448
	(0.060)	(0.164)	(0.103)	(0.295)	(0.288)
IMPAIRMENT_TA (-1)	-0.028	0.117	0.378	0.156	-0.276
	(0.151)	(0.430)	(0.242)	(1.444)	(1.726)
GDP (-1)	0.001	0.014	0.005	-0.018	-0.005
	(0.003)	(0.016)	(0.005)	(0.021)	(0.019)
INFLATION (-1)	0.108	-0.375	0.070	0.421	0.333
	(0.076)	(0.279)	(0.045)	(0.329)	(0.308)
SHORT_TERM_INT_RATE (-1)	0.000	0.731	-0.302	0.185	0.261
	(0.264)	(0.913)	(0.242)	(1.065)	(0.989)
DUMMY_COVID	-0.005	0.004	-0.004	-0.032	-0.019
	(0.004)	(0.014)	(0.002)	(0.021)	(0.022)
Constant	0.0227	1.191***	-0.093	-0.310	-0.506
	(0.137)	(0.396)	(0.057)	(0.655)	(0.626)
Bank FE	Yes	Yes	Yes	Yes	Yes
No. of observations	2 590	2 590	2 590	2 590	2 590
R-squared	0.973	0.934	0.811	0.873	0.880

Panel B: NSFR computed following the B3 regulation

	(1)	(2)	(3)	(4)	(5)
Variables	Instalments	Mortgages	Credit cards	Overdrafts	Other loans
NSFR B3 (-1)	0.010	-0.078**	0.016	0.200*	0.160*
	(0.017)	(0.030)	(0.020)	(0.100)	(0.088)
SIZE (-1)	0.014*	-0.040	0.005	0.000	0.017
	(0.008)	(0.023)	(0.003)	(0.035)	(0.034)
EQUITY_TA (-1)	0.075	-0.360**	-0.142	0.450	0.445
	(0.060)	(0.164)	(0.103)	(0.299)	(0.291)
IMPAIRMENT_TA (-1)	-0.030	0.128	0.372	0.104	-0.318
	(0.150)	(0.430)	(0.239)	(1.449)	(1.730)
GDP (-1)	0.001	0.013	0.005	-0.016	-0.004
	(0.003)	(0.016)	(0.005)	(0.021)	(0.019)
INFLATION (-1)	0.108	-0.376	0.0709	0.425	0.336
	(0.076)	(0.279)	(0.045)	(0.33)	(0.309)
SHORT_TERM_INT_RATE (-1)	0.001	0.728	-0.298	0.217	0.287
	(0.263)	(0.912)	(0.240)	(1.068)	(0.987)
DUMMY_COVID	-0.005	0.004	-0.004	-0.031	-0.018
	(0.004)	(0.014)	(0.002)	(0.021)	(0.022)
Constant	0.023	1.185***	-0.091	-0.288	-0.488
	(0.136)	(0.396)	(0.057)	(0.656)	(0.626)
Bank FE	Yes	Yes	Yes	Yes	Yes
No. of observations	2 590	2 590	2 590	2 590	2 590
R-squared	0.973	0.934	0.811	0.872	0.880

Finally, we consider loans to different customer types, distinguishing between corporate and household loans (Table 5), then disaggregate them in their components (as in the previous analysis) according to maturity (see Tables 6 and 7). Table 5 shows that the introduction of the NSFR does not affect either total corporate loans or total household loans (both scaled to total assets). These results are confirmed by both the South African and Basel III calculation approaches.

Table 5: Accounting for customer types: corporate vs household loans (scaled to total assets)

Variables	NSFR SA		NSFR B3	
	Household	Corporate	Household	Corporate
NSFR (-1)	0.051	0.057	0.045	0.050
	(0.074)	(0.063)	(0.070)	(0.061)
SIZE (-1)	0.000	0.004	0.000	0.004
	(0.021)	(0.017)	(0.021)	(0.017)
EQUITY_TA (-1)	-0.116	0.127	-0.119	0.120
	(0.227)	(0.099)	(0.228)	(0.097)
IMPAIRMENT_TA (-1)	-0.480	0.620**	-0.50	0.598**
	(1.170)	(0.260)	(1.171)	(0.252)
GDP (-1)	0.015	-0.012	0.016	-0.011
	(0.012)	(0.014)	(0.012)	(0.014)
INFLATION (-1)	-0.047	0.348	-0.045	0.348
	(0.184)	(0.282)	(0.184)	(0.282)
SHORT_TERM_INT_RATE (-1)	0.509	0.008	0.524	0.036
	(0.647)	(0.677)	(0.642)	(0.687)
DUMMY_COVID	-0.045***	0.012	-0.045***	0.013
	(0.015)	(0.018)	(0.015)	(0.018)
Constant	0.535	-0.020	0.543	-0.003
	(0.386)	(0.261)	(0.383)	(0.263)
Bank FE	Yes	Yes	Yes	Yes
No. of observations	2 590	2 151	2 590	2 151
R-squared	0.942	0.888	0.942	0.888

Interestingly, lending decreased for households during the pandemic but not for corporate borrowers. This can be explained by the fact that many governments intervened in the economy during the pandemic, aiming to support non-financial corporate firms through credit support for businesses or through loan guarantees. The South Africa COVID-19 Response Support Programme contributed to efforts to ensure business resilience.

These results hold true even when we consider the different categories of corporate loans. We find no significant relationship with the NSFR and any of the loan types for corporate borrowers (Table 6), but we find a significant negative relationship with household mortgage loans (Table 7). More specifically, we find that the NSFR only negatively affects the household mortgage loans that are typically of longer maturity compared to the other loan categories. This suggests that banks have reduced long-term household lending more than other types of loans. This result confirms those reported by Ananou et al. (2021), who document a similar decline in the share of mortgage loans by Dutch banks.

Table 6: Corporate loans disaggregated by loan type**Panel A: NSFR computed following the SA regulation**

	(1)	(2)	(3)	(4)	(5)
Variables	Instalments	Mortgages	Credit cards	Overdrafts	Other loans
NSFR SA (-1)	-0.048	-0.006	0.000	0.036	0.062
	(0.038)	(0.006)	(0.000)	(0.027)	(0.040)
SIZE (-1)	0.019	0.000	0.000	-0.013	-0.003
	(0.016)	(0.003)	(0.000)	(0.009)	(0.006)
EQUITY_TA (-1)	-0.087	0.030	0.000	0.022	0.099
	(0.108)	(0.042)	(0.000)	(0.040)	(0.082)
IMPAIRMENT_TA (-1)	-0.221	0.018	0.001	0.449	0.305
	(0.235)	(0.110)	(0.001)	(0.364)	(0.256)
GDP (-1)	-0.001	0.007	-0.000	-0.010	-0.003
	(0.005)	(0.005)	(0.000)	(0.007)	(0.013)
INFLATION (-1)	0.172	-0.021	0.001	0.075	0.082
	(0.112)	(0.061)	(0.001)	(0.095)	(0.130)
SHORT_TERM_INT_RATE (-1)	-0.221	-0.119	0.002	-0.123	0.426
	(0.203)	(0.194)	(0.004)	(0.260)	(0.358)
DUMMY_COVID	-0.002	0.011	-0.000	-0.008	0.010
	(0.006)	(0.011)	(0.000)	(0.006)	(0.009)
Constant	-0.175	0.111**	-0.001	0.145	-0.043
	(0.201)	(0.043)	(0.001)	(0.102)	(0.076)
Bank FE	Yes	Yes	Yes	Yes	Yes
No. of observations	2 151	2 151	2 151	2 590	2 590
R-squared	0.514	0.947	0.780	0.747	0.808

Panel B: NSFR computed following the B3 regulation

	(1)	(2)	(3)	(4)	(5)
Variables	Instalments	Mortgages	Credit cards	Overdrafts	Other loans
NSFR B3 (-1)	-0.046	-0.00805	0.000	0.033	0.058
	(0.036)	(0.00660)	(0.000)	(0.026)	(0.038)
SIZE (-1)	0.019	0.000248	0.000	-0.013	-0.003
	(0.016)	(0.00324)	(0.000)	(0.009)	(0.006)
EQUITY_TA (-1)	-0.086	0.0283	0.000	0.021	0.098
	(0.108)	(0.0413)	(0.000)	(0.040)	(0.082)
IMPAIRMENT_TA (-1)	-0.216	0.0127	0.001	0.440	0.292
	(0.233)	(0.107)	(0.001)	(0.360)	(0.258)
GDP (-1)	-0.001	0.008	-0.000	-0.010	-0.002
	(0.005)	(0.005)	(0.000)	(0.007)	(0.013)
INFLATION (-1)	0.172	-0.021	0.000	0.076	0.083
	(0.111)	(0.060)	(0.001)	(0.095)	(0.130)
SHORT_TERM_INT_RATE (-1)	-0.224	-0.110	0.002	-0.116	0.433
	(0.201)	(0.196)	(0.004)	(0.260)	(0.360)
DUMMY_COVID	-0.002	0.011	-0.000	-0.007	0.011
	(0.006)	(0.011)	(0.000)	(0.006)	(0.009)
Constant	-0.180	0.115**	-0.001	0.149	-0.037
	(0.204)	(0.044)	(0.001)	(0.104)	(0.075)
Bank FE	Yes	Yes	Yes	Yes	Yes
No. of observations	2 151	2 151	2 151	2 590	2 590
R-squared	0.514	0.947	0.780	0.746	0.808

Table 7: Household loans disaggregated by loan type**Panel A: NSFR computed following the SA regulation**

	(1)	(2)	(3)	(4)	(5)
Variables	Instalments	Mortgages	Credit cards	Overdrafts	Other loans
NSFR SA (-1)	0.005	-0.070**	0.007	0.000	0.108
	(0.009)	(0.033)	(0.026)	(0.000)	(0.086)
SIZE (-1)	0.008	-0.038	0.008	0.000	0.022
	(0.005)	(0.024)	(0.005)	(0.000)	(0.036)
EQUITY_TA (-1)	0.016	-0.336*	-0.136	-0.008*	0.348
	(0.029)	(0.168)	(0.107)	(0.004)	(0.292)
IMPAIRMENT_TA (-1)	-0.093	-0.000	0.268	-0.009	-0.645
	(0.092)	(0.436)	(0.272)	(0.0172)	(1.582)
GDP (-1)	0.003	0.007	0.008	-0.001	-0.001
	(0.004)	(0.013)	(0.006)	(0.000)	(0.013)
INFLATION (-1)	-0.026	-0.338	0.071	0.005	0.240
	(0.065)	(0.276)	(0.043)	(0.004)	(0.262)
SHORT_TERM_INT_RATE (-1)	0.073	0.872	-0.204	0.0123	-0.246
	(0.273)	(0.899)	(0.274)	(0.0220)	(1.053)
DUMMY_COVID	-0.000	-0.007	-0.004	-0.002**	-0.032*
	(0.004)	(0.010)	(0.002)	(0.000)	(0.018)
Constant	0.083	1.040**	-0.113*	0.004	-0.479
	(0.091)	(0.416)	(0.063)	(0.006)	(0.662)
Bank FE	Yes	Yes	Yes	Yes	Yes
No. of observations	2 590	2 590	2 590	2 590	2 590
R-squared	0.965	0.924	0.727	0.989	0.928

Panel B: NSFR computed following the B3 regulation

	(1)	(2)	(3)	(4)	(5)
Variables	Instalments	Mortgages	Credit cards	Overdrafts	Other loans
NSFR B3 (-1)	0.004	-0.066*	0.006	0.000	0.100
	(0.008)	(0.032)	(0.024)	(0.000)	(0.082)
SIZE (-1)	0.008	-0.038	0.008	0.000	0.022
	(0.005)	(0.024)	(0.005)	(0.000)	(0.036)
EQUITY_TA (-1)	0.015	-0.335*	-0.136	-0.008*	0.346
	(0.029)	(0.169)	(0.107)	(0.004)	(0.294)
IMPAIRMENT_TA (-1)	-0.095	0.013	0.265	-0.009	-0.674
	(0.092)	(0.436)	(0.267)	(0.017)	(1.583)
GDP (-1)	0.003	0.007	0.008	-0.001	-0.001
	(0.005)	(0.013)	(0.006)	(0.000)	(0.014)
INFLATION (-1)	-0.025	-0.339	0.071	0.005	0.242
	(0.065)	(0.276)	(0.043)	(0.004)	(0.264)
SHORT_TERM_INT_RATE (-1)	0.075	0.865	-0.201	0.011	-0.227
	(0.272)	(0.899)	(0.271)	(0.022)	(1.047)
DUMMY_COVID	-0.000	-0.007	-0.004	-0.002**	-0.031*
	(0.004)	(0.010)	(0.002)	(0.000)	(0.018)
Constant	0.084	1.034**	-0.112*	0.004	-0.467
	(0.091)	(0.416)	(0.063)	(0.006)	(0.659)
Bank FE	Yes	Yes	Yes	Yes	Yes
No. of observations	2 590	2 590	2 590	2 590	2 590
R-squared	0.965	0.924	0.727	0.989	0.928

7. Conclusion

The regulatory reforms issued by the Basel Committee for Banking Supervision in 2010, known as the Basel III accords, introduced new regulatory liquidity standards, among which is the NSFR. This ratio addresses mismatches in the maturity of assets and liabilities, identified as one of the major causes of the GFC. The Basel accords were intended to address financial regulation deficiencies in developed countries, whose banking and financial systems differ from those in emerging countries. However, to date there has been limited understanding of the effect of the Basel III standards on banks' strategic behaviour, particularly in terms of lending in emerging economies. Our research aimed to address this knowledge gap.

Despite the growing literature, the impact of the NSFR on bank lending remains unclear, as it hinges on the adjustment strategy chosen by non-compliant banks to meet the liquidity ratio. This uncertainty is prevalent because banks tend to hold a larger proportion of liquid assets as precautionary liquidity, especially in emerging economies.

In this paper we focused on South Africa, where banks were given until 2018 to achieve full compliance with the NSFR requirement, set at a minimum of 100%. Notably, calculating the NSFR requires a level of national discretion granted to the Prudential Authority, particularly to determine certain weighting factors. Consequently, we calculate the NSFR using both the Prudential Authority's regulatory parameters and the Basel III parameters. This dual approach allowed us to assess whether the discretionary power vested in the South African Authority influences the relationship between NSFR and bank lending.

We concentrated not only on total lending but also on loans categorised by customer type (corporate vs household). We distinguished between various loan types, including instalments, mortgages, credit cards, overdrafts and other loans. Each of these loan types typically has a different maturity.

We found that the NSFR calculated with the South African approach is equivalent to the NSFR calculated using the Basel III approach. This suggests that NSFR regulations in South Africa are largely compliant with the Basel NSFR standard,

yielding very similar empirical results. In examining the relationship between NSFR and lending, we found that overall total lending in South Africa does not appear to have been significantly affected by the introduction of the NSFR, regardless of whether it is computed following the South African or Basel III regulations.

However, when disaggregating total loans by loan types, we found that the introduction of the NSFR stimulates South African banks to adjust the composition of their loan portfolios toward shorter maturities. Specifically, higher NSFR values seem to be associated with a decrease in residential mortgage loans, typically long term, in favour of overdrafts and other loans, typically short term. This indicates that South African banks have shifted from long-term to shorter maturity loans in response to the imposition of the NSFR, aligning with the regulators' intention to reduce maturity mismatch. In other words, banks shortened the maturity of their loans to mitigate maturity transformation and improve their NSFR, which could make it harder for households to access credit.

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