

Annex 1. Empirical Analyses of the Effects of NPLs

Macro-econometric Approach

To assess the feedback effects of NPLs on the real economy, the authors use a panel VAR approach (as Love and Zicchino 2006), treating all variables as endogenous, while allowing unobserved heterogeneity across countries. Impulse response functions are computed to assess the dynamic interactions between NPLs and other macro-financial variables. The sample covers annual data from 2000 to 2019 for a sample of 41 SSA countries (including both commodity exporters and noncommunity exporters).¹ The panel is unbalanced due to the unavailability of long time series of NPLs in some countries.

The following model is estimated:

$$Y_{i,t} = u_i + \theta(L)Y_{i,t} + \emptyset(L)X_{i,t} + \varepsilon_{i,t} \quad (\text{A1.1})$$

in which $Y_{i,t}$ is a vector of four endogenous variables including the growth of real GDP in country (alternatively non-oil GDP growth), the inflation rate, the NPL ratio in the entire banking system of a given country, and the ratio of credit to the private sector to GDP. $X_{i,t}$ is a vector of exogenous variables including the GDP growth rate in advanced economies and the growth rate in the export deflator for each country as SSA countries are assumed to be price takers. u_i captures country-specific effects and $\varepsilon_{i,t}$ the

¹The NPL data used in this analysis rely mostly on the IMF Financial Soundness Indicators database, supplemented with additional data from country authorities, Article IV reports, and World Bank FinStats 2019. Other macroeconomic variables come from the IMF *World Economic Outlook* and IMF Monetary and Financial Statistics.

shocks. Given the length of the sample and the low frequency of the data, the number of lags is restricted to 1. To identify the shocks, the authors use a Cholesky decomposition wherein the variables ordered first are considered more exogenous. It is assumed that the GDP growth and inflation affect NPLs contemporaneously, while NPLs affect credit to GDP ratio only with a lag.

Results show that rising NPLs cripple economic performance for several years following a shock to NPLs (Annex Figure 1.1). This shock is found to have a significant large impact on credit to the private sector, with a one standard deviation (corresponding to a 4.1 percentage point) increase in the NPL ratio leading to a 1.1 percentage point drop in the credit-to-GDP ratio after four years.² GDP growth is also affected, declining by 0.5–0.6 percentage point on average in the two years following the shock, all else being equal. Variance decomposition analysis reveal that the NPL shocks explain 30 percent of credit-to-GDP ratio variance, but only 5 percent of GDP growth variance.

Bank-level Econometric Approach

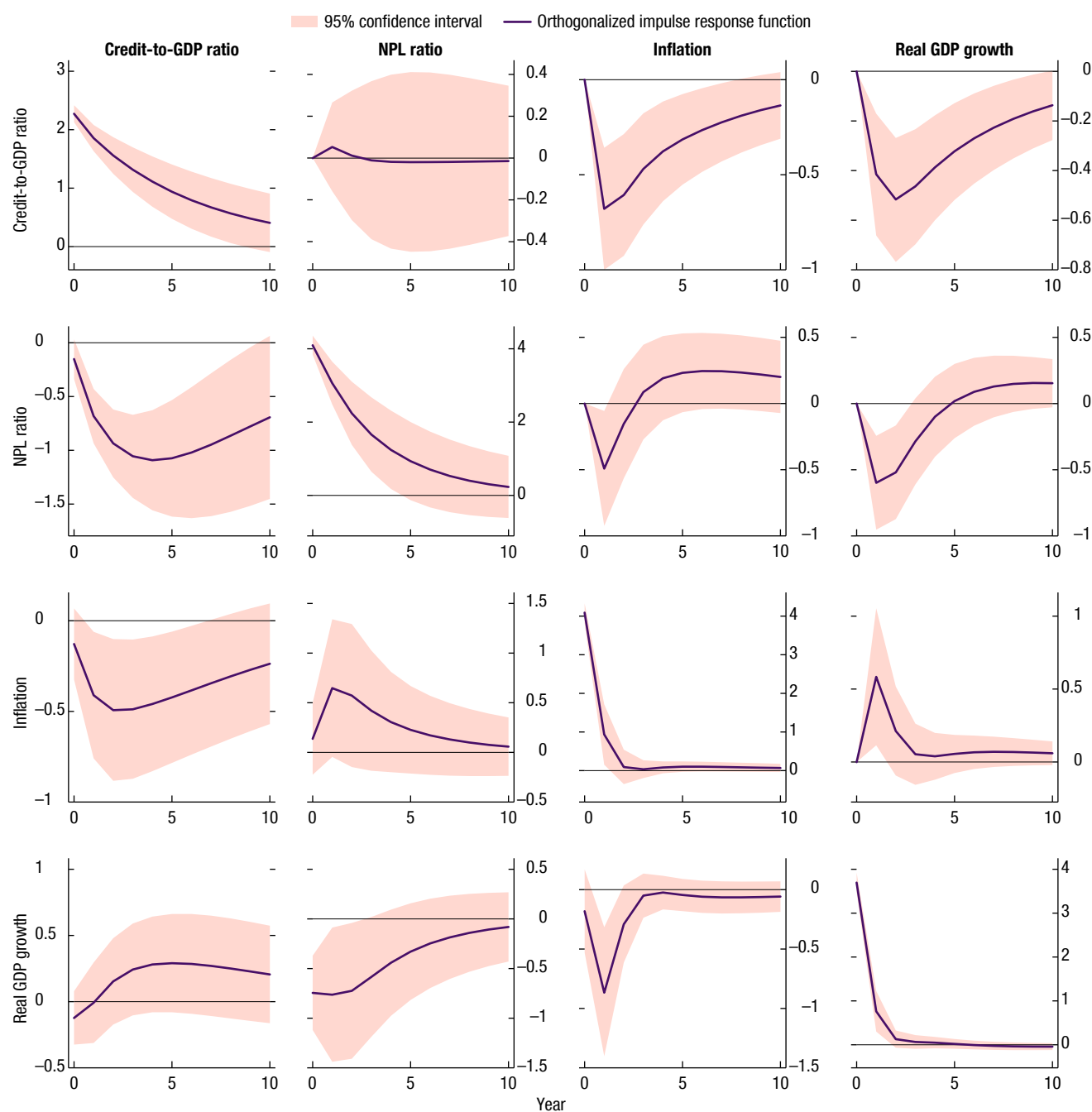
A complementary empirical analysis explores the channels through which NPLs affect bank lending using bank-level data from Fitch Connect. The sample covers 617 banks from 43 sub-Saharan countries during 1994–2018. The following regression equation is estimated:

$$Dep. variable_{i,j,t} = \alpha + \beta NPLs_{i,j,t-1} + \theta X'_{i,j,t-1} + v_i + \varphi_t + \delta_j + \varepsilon_{i,t} \quad (A1.2)$$

in which $Dep. variable_{i,j,t}$ represents each of the dependent variables considered in Annex Table 1.1 for country i , bank j , in time t . $NPLs_{i,j,t-1}$ denotes the ratio of nonperforming loans over gross loans. The dependent variables cover various indicators of bank's performance, including loans growth, risk-weighted assets growth, banks' capital growth, capital adequacy ratio, operating profit over equity, total net income growth, non-interest expenses over assets, net interest income on loans over gross loans, and provisions to loans. These data are from the Fitch Connect database. $X'_{i,j,t-1}$ is a vector of other controls, and v_i , φ_t and δ_j are country, time and bank fixed effects, respectively.

²An alternative specification is also estimated using the change in the NPL ratio and the growth of credit to the private sector. Following a 1 percentage point shock to the NPL ratio, credit growth drops by about 1 percentage point after two years.

Annex Figure 1.1. Feedback from NPLs to the Economy
(Response to one standard deviation shock on each variable)



Source: IMF staff estimates.

The control variables include the traditional determinants of bank lending such as real economic growth, terms of trade, real effective exchange rate (REER), inflation, the fiscal balance as a share of GDP, the quality of institutions captured by the index of law and order, and bank deposits. All these variables come from the IMF World Economic Outlook, World Bank's Worldwide Governance Indicators, and Fitch Connect databases. To estimate equation (A1.2), the authors use the system GMM of Blundell and Bond (1998) to deal with issues of endogeneity stemming from possible reverse causality, the omission of variables and measurement errors. In the system GMM estimator, both level and first-difference versions of equation (A1.2) are used in a system that allows the use of lagged differences and lagged levels of the explanatory variables as instruments.

The results are shown in Annex Table 1.1. The coefficients associated with NPLs are strongly significant in all columns. The results highlight that NPLs are negatively associated with loan growth (column 1), suggesting that the higher the level of NPLs ratio, the lower banks' lending. Across all specifications, the analysis shows that a 1 percentage point increase in the NPL ratio at the bank level would decrease the loan stock by 3 percent after one year. Looking at the different transmission channels in columns 2–9, the results show that NPLs are positively associated with risk-weighted assets, banks' provisions and non-interest expense, while being negatively correlated with the capital adequacy ratio, banks' capital, operating profit (over equity), total net income, and interest income on loans. These findings imply that an increase in NPLs ratio could result in lower bank capital, profit, and income and higher risk-weighted assets, provisions, and administrative costs (proxied by non-interest expenses).

Annex Table 1.1 Impact of NPLs on Lending and Transmission Channels (GMM)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	Loans growth	Risk-weighted assets growth	Capital growth	Capital adequacy ratio	Operating profit (ROE)	Net income growth	Net interest income on loans over gross loans	Non-interest expense over assets	Provisions to loans
Dependent var., $t-1$	0.0001*** (0.000)	0.0830*** (0.003)	-0.0980** (0.039)	0.4056*** (0.037)	0.0162*** (0.006)	0.0705* (0.038)	0.8263*** (0.015)	0.4862*** (0.022)	0.6758*** (0.027)
NPLs, $t-1$	-3.3392*** (0.232)	6.9682*** (1.606)	-6.5246** (2.948)	-0.1154** (0.046)	-0.5520*** (0.094)	-2.5846*** (0.314)	-1.4160*** (0.187)	0.0350*** (0.005)	0.0723*** (0.022)
REER, log, $t-1$	0.1952*** (0.070)	3.5310*** (0.327)	-0.0176 (0.575)	0.0293** (0.012)	-0.1545*** (0.034)	-0.1033 (0.078)	-0.1396*** (0.051)	0.0083*** (0.003)	-0.0115* (0.006)
Terms of trade, $t-1$	0.1482*** (0.030)	7.8005*** (0.538)	4.3687*** (0.678)	-0.0131 (0.014)	0.1862*** (0.019)	-0.0235 (0.035)	0.2451*** (0.043)	0.0015 (0.001)	-0.0003 (0.003)
Inflation, $t-1$	-0.7323*** (0.048)	-1.3375 (0.825)	-23.4408*** (6.243)	0.4824*** (0.048)	-0.0762*** (0.026)	-0.1437*** (0.048)	0.0653 (0.092)	0.0086*** (0.002)	0.0009 (0.004)
GDP growth, $t-1$	0.9359*** (0.197)	-19.7282*** (1.544)	-2.8229 (2.010)	0.1805*** (0.037)	0.2650** (0.111)	0.3246* (0.192)	0.7161*** (0.139)	-0.005 (0.008)	-0.0012 (0.026)
Bank deposits, log, $t-1$	10.8390*** (1.982)	-275.1579*** (18.292)	-43.9900** (21.273)	1.7236*** (0.496)	1.9573 (1.216)	34.8190*** (3.544)	10.8410*** (2.356)	-0.0651 (0.138)	0.6519** (0.265)
Law and order index, $t-1$	8.2901*** (1.232)	-103.3578*** (23.243)	-62.5300*** (13.718)	0.6075** (0.254)	2.0715 (1.609)	-0.61 (2.350)	-4.6212 (3.550)	-0.2916*** (0.083)	-0.0675 (0.114)
Fiscal deficit (% of GDP), $t-1$	0.2866 (0.204)	14.8512*** (1.808)	-6.4891** (2.855)	-0.4529*** (0.065)	-0.1898* (0.106)	-0.1409 (0.269)	0.3164*** (0.112)	-0.0207*** (0.007)	-0.0313** (0.014)
Observations	2,580	1,104	1,276	1,233	2,490	2,593	1,854	2,440	2,370
No. of banks	354	219	235	234	352	354	311	351	333
No. of countries	28	23	23	22	28	28	27	28	28
AR(2)	0.88	0.09	0.15	0.36	0.51	0.54	0.34	0.46	0.77
Hansen test	0.32	0.01	1	0.07	0.11	0.23	0.11	0.51	0.17
No. of instruments	114	127	135	130	130	113	117	113	112
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: IMF staff estimates.

Note: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

This page intentionally left blank

Annex 2. Empirical Analyses of the Determinants of NPLs

Macro-econometric Approach

Following the literature on the determinants of NPL, for example Espinoza and Prasad (2010) and Klein (2013), the authors use a dynamic panel regression, which includes the lag of the NPL ratio to account for persistence along with a set of explanatory variables identified in similar studies. Estimations use the system GMM developed by Arellano and Bover (1995) and Blundell and Bond (1998) to address dynamic panel bias arising from the large autoregressive component in small time-dimension samples and endogeneity. The authors rely on the collapse approach to reduce the number of instruments and use the Hansen test to detect overidentification. The baseline specification uses annual data, covering 41 SSA countries during 2001–18. Robustness checks are done through fixed effects estimations and regressions of changes instead of levels.

The model is specified as follows:

$$NPL_{i,t} = u_i + \theta(L)NPL_{i,t} + \emptyset(L)Y_{i,t} + \varepsilon_{i,t} \quad (\text{A2.1})$$

in which $NPL_{i,t}$ refers to the level of the NPL ratio in the entire banking system, $Y_{i,t}$ is a vector of explanatory variables including the growth of real GDP, inflation, first difference of interest rates (lending rate), growth rate of the export deflator, growth of credit to the private sector and change in public debt to GDP ratio.¹ u_i captures country-specific effects and $\varepsilon_{i,t}$ is a disturbance vector. The authors have estimated different specifications with different lags and retained those that are consistently significant and robust.

¹An extended specification also includes the interest rate spread as an endogenous variable.

Annex Table 2.1 Determinants of Nonperforming Loans

Dependent variable Estimation method Sample period	(1)	(2)	(3)
	Nonperforming loans to total loans		
	Sys GMM 2000–18	Sys GMM 2010–18	Fixed effects 2000–18
L. Nonperforming loans to total loans	0.57525*** (0.0000)	0.68165*** (0.0000)	0.57728*** (0.0000)
Real GDP growth	–0.19315** (0.0301)	–0.19427* (0.0557)	–0.19324** (0.0221)
D. Average lending rate	0.23227** (0.0297)	0.23812 (0.1075)	0.19726* (0.0685)
LD. Average lending rate	0.00934 (0.9246)	0.05675 (0.6053)	0.00726 (0.9480)
Export deflator, percent change	–0.05927** (0.0301)	–0.07018** (0.0130)	–0.04696** (0.0197)
L. Inflation	0.06141 (0.3668)	0.12312 (0.1975)	0.02568 (0.7077)
L. Credit, percent change	0.02554* (0.0525)	0.00225 (0.9494)	0.02219 (0.2482)
LD. Public debt, percent of GDP	0.03273 (0.1371)	0.05447* (0.0561)	0.00274 (0.8080)
D. Public debt, percent of GDP			–0.02563 (0.2232)
Constant	6.12973*** (0.0000)	4.38456** (0.0189)	6.08369*** (0.0000)
No. of observations	450	310	450
R-squared	-	-	0.457
No. of instruments	24	24	-
AR(1), <i>p</i> -value	0.01177	0.00732	-
AR(2), <i>p</i> -value	0.36590	0.33597	-
Hansen test, <i>p</i> -value	0.74814	0.41217	-

Source: IMF staff estimates.

Note: *p*-values in parentheses, * *p* < 0.1, ** *p* < 0.05, *** *p* < 0.01; L = one lag; D = first difference; LD = $\chi_{t-1} - \chi_{t-2}$.

Results highlight the countercyclical nature of NPLs as well as the important effect of lending behavior toward credit risk (Annex Table 2.1):

- A 1 percentage point slowdown in economic growth and a 1 percentage point decline in export deflator growth instantaneously reduces the borrowers' capacity to service debt increasing the NPL ratio (by 0.2 percentage point and 0.06 percentage point, respectively). The coefficient of inflation has the right positive sign, but is not statistically significant.
- A tightening of lending conditions through a 100 basis point increase in lending rates (for example, following a monetary policy shock) has an immediate effect on the NPL ratio (+0.2 percentage point). The effect is relatively large and could reflect that a large part of credit to the private sector is at variable interest rate. Rapid credit growth, possibly reflecting banks' risk-taking behavior, is also found to be associated with a rise in NPLs with a one-year lag.

- An increase in the public debt to GDP ratio leads to higher NPLs but the effect is not significant over the entire period. However, when the sample is shortened to 2010–18, the sovereign-bank nexus becomes stronger and statistically significant while the coefficient associated with lending rates and credit becoming nonsignificant. This could suggest that more depth of financial markets and greater recourse to non-concessional debt and domestic markets by the public sector in the past decade have strengthened the sovereign-financial nexus. Another explanation is that the crowding-out effect has become stronger recently, since banks' excess liquidity observed in some SSA countries has diminished in the wake of the mid-2010s commodity price shock.
- Finally, results point to a high persistence of NPLs with first-order autocorrelation of about 0.6, suggesting that a shock to NPLs takes a long time to dissipate.

Bank-level Econometric Approach

A second and complementary empirical analysis is conducted to investigate the role of bank-specific characteristics in explaining NPLs. This analysis uses financial statements data from Fitch database for 617 banks from 43 countries in SSA during 1994–2018 for which NPL data are available. The authors use a dynamic panel regression, which includes the lag of the NPL ratio to account for persistence along with a set of bank-specific indicators that have been highlighted in the empirical literature as important drivers of credit risk. Estimations use the system GMM developed by Arellano and Bover (1995) and Blundell and Bond (1998) to address the endogeneity resulting from reserve causality, measurement errors, and omission of variables. The model is specified as follows:

$$NPL_{i,j,t} = \alpha + \beta NPL_{i,j,t-1} + \theta X'_{i,j,t-1} + \varepsilon_{i,t} \quad (\text{A2.2})$$

in which $NPL_{i,j,t}$ is the nonperforming loans over gross loans ratio for country i , bank j , at time t . The dependent variables $X'_{i,j,t-1}$ cover various indicators and characteristics that can be grouped into four categories: (1) *efficiency and profitability*: operating return on average assets (ROA); return on equity (ROE); net interest margin (NIM) (calculated as the ratio of gross interest and dividend income minus total interest expenses to total assets); and bank competition measured by the Lerner index (Brei, Jacolin, and Noah 2018) adjusted for profit and cost efficiencies (Koetter and others 2012);²

²The basic index is a measure of a bank's market power and defined as the markup ratio (which is the difference between price and marginal cost, expressed in percent of price). It should be zero in perfect competition, but will increase in less competitive banking markets. The square is included to detect any nonlinear

(2) *capitalization level*: total regulatory capital ratio; (3) *bank lending policy and risk behavior*: effective interest rate on loans (measured as the interest income on loans divided by the average gross loans); loan-to-deposit ratio; and the degree of income diversification (measured by non-interest income as a proportion of total assets); (4) *variables related to the broader financial system*: degree of financial development (measured with the IMF Financial Development Index developed by Svirydzienka (2016)); supervisory quality (measured by the World Bank Worldwide Governance Indicators, Regulatory Quality Index); occurrence of banking crises (from Laeven and Valencia 2018); and bank ownership dummies (development bank, domestic banks). The instrumental variables include traditional determinants of bank lending such as real economic growth, inflation, public debt to GDP ratio, and, depending on the specified model, other exogenous variables. Year fixed effects are also controlled for. In the system GMM estimator, both level and first-difference versions of equation (A2.2) are used in a system that allows the use of lagged differences and lagged levels of the explanatory variables as instruments.

Results confirm the role of bank-level determinants in driving NPLs in SSA, in particular, those related to the existence of buffers, efficiency, profitability, moral hazard, and regulatory environment (Annex Table 2.2).

- *Capital buffers*. More capitalized banks, as measured with the CAR, tend to have lower NPL ratios (a 1 percentage point increase in CAR is associated with about 0.1–0.2 percentage points decline in banks' NPL ratio).
- *Efficiency and profitability*. Inefficient and less profitable banks, as measured with various profitability indicators, such as the ratio of ROA, the ratio of ROE, or the NIM, tend to have higher NPL ratios, perhaps because they are less well managed and unable to properly screen risks. The coefficient on ROE is significant and negative, as expected. To a lower extent, ROA is significant (column 2), also suggesting that less profitable banks may have higher NPL ratios. NIM is significant in two out of seven models, the positive coefficients suggesting that higher margins are associated with lower NPLs (a 1 percentage point increase in NIM is associated with about 0.4 percentage point decline in the NPL ratio). Income diversification is also significant, with a 1 percentage point increase in the non-interest income to gross revenue ratio being associated with 0.4–0.9 percentage point decline in the NPL ratio. Finally, bank competition (as captured by the estimated adjusted Lerner-Kotter index, which enters with a positive and significant coefficient) tends to improve the quality of the portfolio,

and U-shaped effects; that is, beyond a certain threshold, efficiency gains of more bank competition may be outweighed by financial instability effects.

Annex Table 2.2 Drivers of Nonperforming Loans to Total Loans

Dependent: Nonperforming loans to total loans								
Estimation method: System GMM	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nonperforming loans to total loans, $t-1$	0.7808*** (0.0689)	0.7730*** (0.0661)	0.7938*** (0.0762)	0.8090*** (0.0579)	0.7739*** (0.0728)	0.7744*** (0.0761)	0.7525*** (0.0700)	0.7907*** (0.0774)
Total regulatory capital ratio, $t-1$	-0.1374*** (0.0446)	-0.1123*** (0.0410)	-0.1239*** (0.0446)	-0.1637** (0.0707)	-0.1596*** (0.0487)	-0.1800*** (0.0566)	-0.1961*** (0.0551)	-0.1652*** (0.0520)
Adj competition index, $t-1$	7.1353** (2.9913)	5.6189* (3.2478)	1.0226 (4.1036)	7.0261** (2.8363)	6.0155* (3.6222)	8.0769** (3.7453)	8.4891** (3.5353)	5.9243 (3.8340)
Adj. competition index ² , $t-1$	-6.0705* (3.5202)	-6.3268** (3.2164)	-4.6636 (4.9297)	-2.6737 (3.5989)	-5.3975 (3.4173)	-4.0635 (3.7985)	-3.8074 (3.3547)	-5.8645* (3.4059)
ROE, $t-1$	-0.0067*** (0.0025)	-0.0070*** (0.0023)	-0.0065*** (0.0021)	-0.0081* (0.0041)	-0.0079*** (0.0024)	-0.0092*** (0.0031)	-0.0091*** (0.0029)	-0.0083*** (0.0028)
Loans/deposits & ST funding, $t-1$	0.0065*** (0.0017)	0.0061*** (0.0015)	0.0061*** (0.0015)		0.0061*** (0.0016)		0.0067*** (0.0012)	0.0063*** (0.0012)
Income diversification, $t-1$	-0.2903** (0.1391)	-0.2821* (0.1523)	-0.5892* (0.3367)	-0.5326* (0.3094)	-0.2579 (0.1671)	-0.9291*** (0.2800)	-0.2669** (0.1293)	-0.7866** (0.3761)
Net interest margin, $t-1$	0.1945 (0.1915)	0.1520 (0.1487)		0.2756 (0.2248)	0.2084 (0.1931)	0.4943** (0.2410)	-0.0185 (0.1994)	0.4065* (0.2390)
Regulatory quality, $t-1$	-0.8458** (0.3865)	-0.8609** (0.4358)	-1.3599* (0.7976)		-0.3269 (0.6453)	-1.9751*** (0.5735)	-0.2007 (0.5497)	-1.6968** (0.7873)
ROA, $t-1$		-0.1913* (0.1079)						
Effective interest rate on loans, $t-1$			0.1886** (0.0943)					
Financial development index, $t-1$				-5.4459** (2.5788)				
Domestic bank, $t-1$					2.7021* (1.5235)			
Development bank, $t-1$						16.6425** (7.3182)		
WAEMU							-2.7691* (1.4158)	
CEMAC							8.5931*** (2.7464)	
SACU							-2.9798*** (0.9294)	
EAC							-0.1660 (0.5107)	
Banking crisis, t								4.0819*** (1.3408)
Banking crisis, $t-1$								-5.2937*** (1.7363)
Constant	2.5171 (2.0974)	3.6409* (2.0984)	3.9147 (3.2397)	4.2766* (2.4752)	1.9355 (2.2667)	2.6912 (2.7442)	4.7149* (2.5468)	3.8324 (2.3334)
No. of observations	1525	1525	1395	1473	1525	1525	1525	1470
No of groups	283	283	275	272	283	283	283	274
No. of instruments	166	199	125	133	166	133	170	159
AR(2), p -value	0.42	0.38	0.34	0.72	0.42	0.32	0.46	0.48
Hansen test, p -value	0.75	0.91	0.80	0.31	0.79	0.51	0.64	0.73

Source: IMF staff estimates.

Notes: Robust standard errors; p -values in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Instrumental variables: years 1996–2018; L1.inflation_avg; L1.Debt_to_GDP; L1.realGDP_growth (all specifications); and L1.Regulatory_quality (all except model (4)); L1.Financial_Dev_Index (model (4)); region (model (7)); Banking_crisis, t and $t-1$ (model (8)). CEMAC = Central African Economic and Monetary Community; EAC = East African Community; SACU = Southern Africa Customs Union; WAEMU = West African Economic and Monetary Union.

in part because of better risk management practices. The positive effects are partly offset by adverse effects of excessive competition (lower profit margins, increased risk incentives), in line with Brei, Jacolin, and Noah (2018)—as captured by the significant negative coefficient on the square index. Effective lending rates enter with a positive and significant sign (column 3), suggesting that a loosening of lending conditions is associated with lower NPL ratios in bank balance sheets.

- *Bank lending policy and moral hazard.* Banks with higher effective interest rate on loans have higher NPL ratios, probably because of difficulties for customers to repay more expensive loans and also because of adverse selection effects. In addition, highly leveraged banks, as captured by their loan-to-deposit ratio, have higher NPLs, perhaps because they tend to loosen risk screening. The occurrence of banking crises is associated with an increase in NPL ratios in the same year, and a reduction in the following year (column 8).
- *Governance.* Bank NPLs seem positively linked to the degree of financial development and the quality of supervisory mechanisms (columns 1–4). The bank's ownership structure also matters in the SSA, with domestic and development banks having higher NPL ratios, all else equal (columns 5 and 6).
- Results point to a high *persistence* of NPLs, with first-order autocorrelation of about 0.8.

Annex 3. NPL Measures Adopted in SSA Countries

This annex reviews selected measures taken in SSA countries over the past decade or so, based on a review of IMF staff reports and other sources. The options presented below are not mutually exclusive.

Preventive Measures

- *Banks' credit risk assessment.* This measure prevents new NPLs by improving the credit risk assessment of banks and providing better information on borrowers via credit and collateral registries. For instance, Kenya has three credit reference bureaus, all regulated by the Central Bank of Kenya, with the oldest one licensed in the 1990s. According to the World Bank, private credit bureaus covered only 11 percent of the adult population in SSA countries in 2019, broadly similar to the coverage rate of the Middle East and North Africa region (12 percent), but below East Asia and Pacific (16 percent), South Asia (21 percent), Europe and Central Asia of (44 percent), and Latin America and Caribbean (49 percent).¹ Moreover, as discussed in Sy and others (2019), banks across Africa have implemented a wide range of credit underwriting innovations in recent years, the most common being machine learning to establish borrowers' credit worthiness from several sources of data (for example, Branch and Tala in East Africa, Lulalend in South Africa). Banks have also entered partnership agreements with telecom operators to gather additional data on their customers' credit-worthiness and improve their credit underwriting.
- *Enhanced bank supervision.* Stricter off- and on-site bank supervision aims at improving transparency and adequacy of loan classification and provi-

¹All country groups refer to International Development Association and International Bank for Reconstruction and Development countries, as defined by the World Bank World Development Indicators.

sioning, thus assuring proper and timely recognition of the deterioration in credit quality. For instance, the 2015 FSAP assessment of the financial sector in South Africa noted significant progress between 2010 and 2015 (IMF 2015). Over this period, the Bank Supervision Department increased supervisory staff by almost 50 percent, and it now includes a corps of risk specialists to complement the analysis teams and additional on-site inspectors, thereby enabling the Department to have more direct interaction with the banks and place less reliance on external auditors.

- *Regulatory and macroprudential tools.* Instruments like the Basel III capital and liquidity regulations that constrain banks' ability to grant loans (for example, additional capital buffers, leverage ratio, liquidity coverage ratio) and other macroprudential tools (loan-to-value, and debt-to-income limits) may help mitigate NPL surges. For instance, the eight WAEMU countries are transitioning toward Basel II/III standards by 2023. Since 2017, banks and financial institutions in Tanzania are required to maintain a capital conservation buffer of 2.5 percent of risk-weighted assets and off-balance sheet exposures, as part of the move to Basel III. However, the most sophisticated tools have not yet been applied widely in SSA. The latest IMF survey of macroprudential measures (IMF 2018b) shows that the SSA region has the lowest number of household sector tools per country and among the lowest number for corporate sector tools. There are some exceptions, such as Nigeria, Rwanda, Tanzania, and Uganda, which have relatively advanced macroprudential frameworks.

Remedial Actions and Mechanisms

- *Portfolio monitoring and recovery.* The bank may first follow up with the distressed borrower on an in-house basis and turn over later to a specialized collection agency. For instance, faced with rising NPLs, Standard Bank of South Africa improved risk performance and enhanced collection strategies across the portfolio (Standard Bank 2018). In an attempt to reduce the high rate of defaults of borrowers, enhance loan recovery by financial institutions, and generally improve creditor confidence, the Central Bank of Nigeria released in July 2020 Guidelines on Global Standing Instruction, which authorize financial institutions in Nigeria to recover borrowers' debt from other existing accounts through a direct set-off from deposits/investments held in those financial institutions.
- *Loan relief.* This type of measure is a standard practice when borrowers face temporary difficulties (due to natural disasters, economywide, or sectoral shocks, etc.). The objective is to ease the payment burden of a debtor in difficulty via loan restructuring, moratoriums, as well as other forms of out-of-court arrangements. For instance, in Nigeria, about 40 percent of the loans to businesses and individuals were restructured by June 2020 in

the context of the COVID-19 crisis. In Kenya, almost half of commercial banks' loan books were restructured between the beginning of the pandemic and November 2020.

- *Clearance of government arrears to banks' clients.* This is not a commonly used measure around the globe but has been prevalent in SSA. Repayment to government contractors or suppliers allows these agents to clear their overdue loans with banks. In 2018, the Gabonese authorities put in place a repayment plan to clear domestic arrears to creditors (especially small and medium enterprises) under the Club de Libreville arrangement. Other examples can be found in Chapter 3 of IMF (2019c).
- *Accelerated write-off of defaulted loans.* New regulation can force banks to swiftly write off long-defaulted loans (for example, after three years in default). Banks often shy away from writing off legacy NPLs due to the lack of proper provisioning. But, even if they are well-provisioned, NPLs may be kept on banks' balance sheets, to avoid creating the impression that debtors are let "off the hook." Other reasons include a slow and unpredictable judiciary and lack of a proper insolvency regime. The write-off of long-defaulted loans has an immediate impact on the gross NPL ratio. For instance, in Malawi, beginning in 2017, a new regulation has forced banks to step up loan recovery and write off NPLs from their balance sheets. The NPL ratio declined from 15.7 percent at the end of 2017 to 3.6 percent in September 2019, largely due to write-offs and loan recovery as well as overall growth in bank lending.
- *More efficient legal enforcement mechanisms.* Weak and lengthy debt enforcement procedures, as well as weak creditors' rights hamper banks' ability to resolve NPLs. Some SSA countries have taken various steps to reinforce their judicial system (World Bank 2018b). First, to facilitate the enforcement of credit claims, measures in recent years have included expanding court automation by introducing electronic payment or by publishing judgement decisions (Rwanda, Zambia); adopting electronic filing (Namibia); introducing or expanding specialized commercial courts (Ethiopia); and establishing collateral registries (Zambia). Second, some countries have also made progress to facilitate corporate and personal insolvency. This can accelerate and improve the value of claims that banks try to recover from businesses and individuals. Measures have included introducing or upgrading insolvency procedures (Cabo Verde, Liberia, Malawi) and regulating the insolvency administrator profession to facilitate rapid rehabilitation or liquidation (Liberia, Malawi). A pan-African insolvency regime is also contemplated for the effective operation of the African Continental Free Trade Area.
- *Sale of NPLs to an asset management company (AMC).* AMCs buy bad assets from problem banks and are tasked with managing the NPL portfolio,

including loan recovery and liquidation of the collateral. In most cases AMC are government-owned. AMCs in SSA have been found in Angola, Cameroon, Guinea-Bissau, Nigeria, and Zimbabwe. For instance, in 2016, Angola set up Recredit, a state-owned AMC, to acquire distressed assets from commercial banks. Recredit was initially set up as a conduit for the disposal of about one-third of system NPLs, which were on the balance sheet of one systemic state-owned bank. Its mandate was expanded in late 2016 to acquire impaired but recoverable loans from the entire banking system to free up lending capacity. At the end of 2016, Recredit purchased NPLs from one bank associated with six large borrowers for a total amount of Kz 480 billion or about 3 percent of GDP.

- *Securitization through a special purpose vehicle (SPV).* This can facilitate banks' offloading by turning NPLs into more marketable, liquid, and financially attractive instruments, which helps widen the pool of potential buyers. Faced with mounting banking sector difficulties, in 2010, the central bank of Nigeria set up a market-financed SPV meant to acquire NPLs of Nigerian banks and replenish the capital of some weak banks, thus boosting confidence and the liquidity of the banking sector. The SPV acquired NPLs and gave, in exchange, government securities to the banks. Afterward, NPLs were pooled and tranching and thereafter sold on the market by the SPV. Following the transfer and securitization of NPLs, the country NPL ratio dropped from 38 percent at end-2010 to below 5 percent at the end of 2012.
- *Bank restructuring and resolution.* Failing banks can be propped up and reorganized or be closed, sold, and transferred to a receiving agency. This may reduce the NPL level, if loans are written down or otherwise removed in the process. For instance, the Bank of Ghana engaged in a large cleaning up of the banking sector in 2017–19, which resulted in several mergers and exits. In the meantime, the NPL ratio declined from 22 percent at the end of 2017 to 18 percent at the end of June 2019. Another example is provided by Togo in the second half of the 2000s. In the 2000s, following a domestic crisis, the Togolese banking system became nearly completely insolvent, with elevated levels of NPLs in several state-owned and private banks. Over the following years, the government proceeded to securitize the bulk of NPLs by replacing them with bonds eligible for refinancing at the BCEAO (Central Bank of the West African Economic and Monetary), to be recovered by a newly-established state-owned entity. Only one large bank underwent restructuring at the time. As a result, the NPL ratio declined from 33.5 percent in 2005 to 10.9 in 2011 (IMF 2019b).

Annex 4. Assessing the Impact of NPL Disposal on New Lending

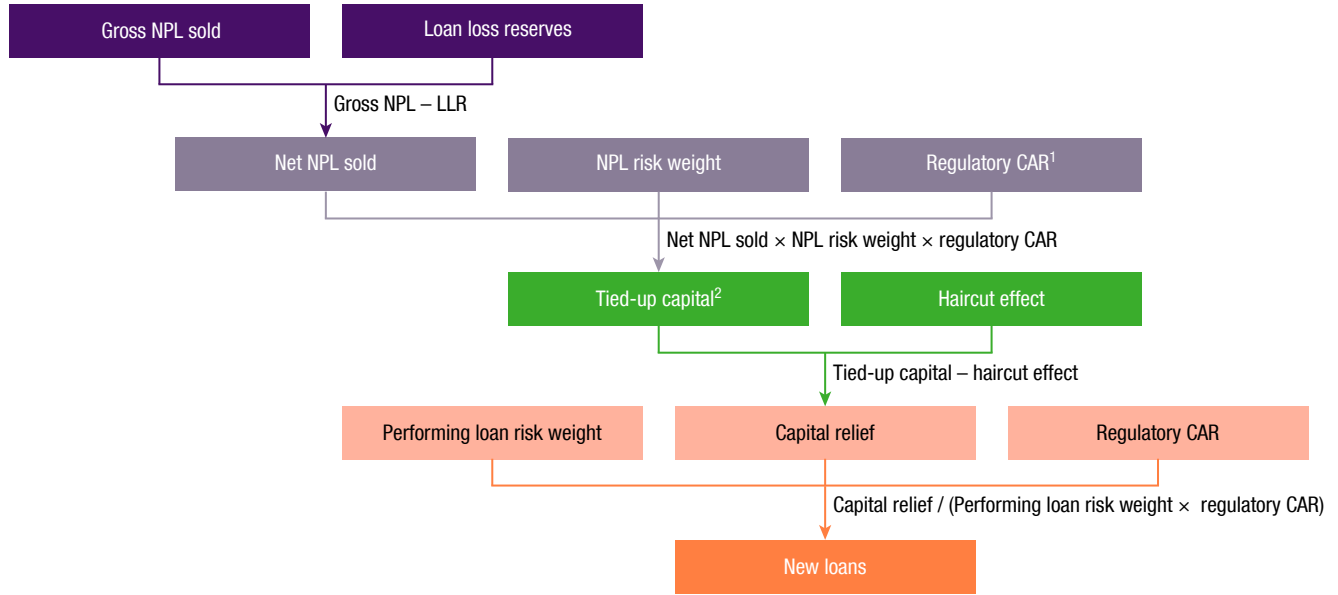
A simple framework is used in Chapter 5 to assess the space for new loans created by NPL disposal strategies. The template is described in more detail in Bunda, Eyraud, and Wang (How-To Note 2021/006). It is based on annual country-level data, although some simulations also use bank-level data—in particular, to get the split between different categories of NPLs (loss, doubtful, and substandard).

The computation of the capital relief and new credit entails three main steps (Annex Figure 4.1). In the first stage, the template computes the capital tied up by NPLs. The bank is indeed required to put capital aside in line with the regulatory capital requirement and the risk-weighted assets of NPLs, which can be higher than for cash and performing loans. In line with the standardized method under the Basel II/III regulatory framework, the capital requirement ratio applies to net NPLs, that is gross NPLs minus loan loss reserves (LLR). In the second stage, the capital relief is computed as the tied-up capital minus a possible haircut, which is defined as the difference between the net book value of the NPL and its sale price. The haircut can be set in an ad hoc way (for instance, at 10 percent of the net book value) or computed from a quantitative loan valuation model (see below). In the third step, the amount of new loans is estimated as a function of the capital relief, the regulatory capital requirement on performing loans and the risk weight of new loans.

The haircut can be computed with a simple valuation model, which quantifies the effect of key structural parameters. The haircut is proxied by the amount of “unprovisioned” losses on the loan, that is, the amount of future losses beyond what the bank has already provisioned for.¹ Total projected

¹From the bank’s perspective, the total projected loss on the loan (in net present value at the time of the sale) can be approximated by the shortfall of the sale price relative to the gross book value of the loan. Therefore, the haircut (which is defined as the difference between the net book value and the sale price) is approximately equal to the difference between total losses and cumulated provisions.

Annex Figure 4.1. Main Steps of the Calculations



Sources: Bunda and others (How-To Note 2021/006); and IMF staff.

Note: CAR = capital adequacy ratio; LLR = loan loss reserves.

¹Statutory capital requirement ratio (percent).

²Tied-up capital = capital that the bank needs to set aside (proportional to the risk-weighted assets).

losses are then estimated, at the time of the sale, under two alternative recovery routes: a consensual approach with probability (p), and legal enforcement with seizure of the collateral with probability ($1-p$), assuming that the uncollateralized portion of the loan is fully lost. A fraction of the loan α can be recovered during the resolution process under the consensual route. The net present value of the collateral reflects the discount rate (r , which is the expected return expected by the entity owning the NPL), the average remaining duration of the resolution process in years (t), and the rate of decay of the collateral asset (δ). The costs under the legal proceeding route include management/servicing fees and legal fees; they are denoted, respectively, m_cost and l_cost , expressed in percent of the gross loan value, and defined in bulk at the initial period. Finally, the loan loss reserves llr (expressed in percent of NPL unit) are deducted from the total projected loss to get the “unprovisioned” loan loss. Therefore, the formula, expressed per unit of gross NPL is:

$$\begin{aligned}
 &\text{Unprovisioned loan loss} \\
 &= p(1 - \alpha) + (1 - p)(1/(1 + r)^t - \text{collat} * (1 - \delta)^t/(1 + r)^t + m_cost + l_cost) - llr = \text{Haircut}
 \end{aligned}$$

The baseline calibration of the model is tailored to the situation of African countries. More details and justifications on calibration are provided in Bunda, Eyraud, and Wang (How-To Note 2021/006). For baseline scenarios, the following parameters are used:

- It is assumed that the NPL ratio is halved relative to its 2018 value, which is the latest year with available data at the time of drafting this paper.
- The regulatory CAR is set at 12 percent for all countries.
- NPLs are weighted at either 100 percent or 150 percent in the risk-weighted assets. This is consistent with prudential standards and SSA practice. Performing loans are weighted at 100 percent.
- Provisioning rates are estimated at the country level using the ratio of total provisions to total NPLs from the FSI database.
- The discount rate is set at 10 percent, which is the assumed expected return for the owner of the NPL.
- 80 percent of the NPLs are assumed to be collateralized ($\text{collat} = 0.8$); that is 20 percent of the principal value is unsecured ($\text{uncollat} = 0.2$). The collateral value decays over time at rate $\delta = 0.05$ per year.
- Management fees m_cost are set at 5 percent, while legal costs l_cost are proxied by the costs of enforcing a contract through courts taken from the 2018 *World Bank Doing Business* report.²
- The time to resolution is proxied by the time to enforce contracts sourced from the 2018 *World Bank Doing Business* report. For robustness, simulations are also conducted with time to resolve insolvency from the same report, although insolvency procedures are not common in the SSA region.
- Given that legal frameworks are often weak and inefficient in Africa, the authors assume that $p = 0.67$, meaning that the NPL recovery takes consensual forms in two-thirds of the cases, and legal proceedings in one-third.
- $\alpha = 0.35$ is the net present value that can be recovered through the consensual route. Bunda, Eyraud, and Wang (How-To Note 2021/006) provide a justification for this calibration, based on assumptions by types of loans (viable, marginally viable, and nonviable).

For the policy experiment with targeted NPL disposal strategy, the parameters must be adjusted to account for the fact that the sale focuses mostly on loss NPLs. In this particular experiment, banks are assumed to sell their

²The *World Bank Doing Business* indicator on “enforcing contracts” is used as a proxy in the absence of better alternative. It is important to note that this indicator does not refer to the recovery of bank loans, but a hypothetical case where a commercial debt is recovered through the court system. Bank loans may have different procedures available, and most importantly, the indicator does not refer to the recovery of secured loans.

oldest NPLs first—starting with loss NPLs and, after exhausting the loss NPL portfolio, moving to doubtful ones before finishing, if necessary, with substandard loans. To account for the specific characteristics of loss NPLs, the parameters have to be modified:

- The provisioning rate is computed as weighted average of the provisioning rates for the various buckets of NPLs using data from the World Bank's Bank Regulation and Supervision Survey database.³ The weights for the different NPL categories are taken from the Fitch Connect bank-level database.
- Management fees are increased by 1 percentage point to 6 percent.
- The probability of consensual route is lowered from 67 percent to 50 percent to account for the higher likelihood of legal proceedings in the case of loss NPLs.
- α , the net present value that can be recovered through consensual approach, is lowered from 35 percent to zero percent given the low quality of the loans and the fact that they have remained unperforming for a long time.
- The discount rate is lowered to 5 percent given lower expected returns on legacy NPLs.
- The collateralized portion of the loan is reduced from 80 percent to 60 percent because of a selection bias effect (one of the reasons why legacy NPLs stay on banks' balance sheets for so long is because they are under-collateralized, reducing incentives for banks to try to resolve them). Results are very sensitive to this assumption. If the collateralized part declines to around 40 percent, all the gains from the targeted disposal strategy would disappear, on average.

³The database is available at: <https://www.worldbank.org/en/research/brief/BRSS>.

References

- Aiyar, Shekhar, Wolfgang Bergthaler, Jose M. Garrido, Ana Llyina, Andreas Jobst, Kenneth Kang, Dmitriy Kovtun, Yan Liu, Dermot Monaghan, and Marina Moretti. 2015. “A Strategy for Resolving Europe’s Problem Loans.” IMF Staff Discussion Note 15/19, International Monetary Fund, Washington, DC.
- Arellano, Manuel, and Olympia Bover. 1995. “Another Look at the Instrumental Variable Estimation of Error-Components Models.” *Journal of Econometrics* 68: 29–51.
- Awad, Rachid, Caio Ferreira, Ellen Gaston, and Luc Riedweg. 2020. “Banking Sector Regulatory and Supervisory Response to Deal with Coronavirus Impact (with Q and A).” IMF Money and Capital Markets Special Series on COVID-19 <https://www.imf.org/en/Publications/SPROLLS/covid19-special-notes>.
- Bank for International Settlements (BIS). 2017. “Resolution of Non-Performing Loans—Policy Options.” Financial Stability Institute Insights on Policy Implementation No. 3. Basel.
- Bank of Ghana. 2018. “Strategy for Resolution of NPLs in the Banking Sector.” Unpublished.
- Bank of Tanzania (BoT). 2018. “Annexure to BoT Circular Number Fa. 178/461/01/02 Dated 19th February 2018 on Measures to Increase Credit to Private Sector and Contain Non-Performing Loans.” Dodoma.
- Basel Committee on Banking Supervision (BCBS). 2017. “Guidelines—Prudential Treatment of Problem Assets—Definitions of Non-Performing Exposures And Forbearance.” Basel.
- Baudino, Patrizia, and Hyuncheol Yun. 2017. “FSI Insights on Policy Implementation No. 3. Resolution of Non-Performing Loans—Policy Options.” October. Financial Stability Institute, Bank for International Settlements, Basel.

- Blundell, Richard, and Stephen Bond. 1998. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics* 87(1): 115–43.
- Brei, Michael, Luc Jacolin, and Alphonse Noah. 2018. "Credit Risk and Bank Competition in Sub-Saharan Africa." Working Paper 664, Banque de France, Paris.
- Bunda, Irina, Luc Eyraud, and Zhangrui Wang. 2021. "How to Assess the Benefits of Nonperforming Loan Disposal in Sub-Saharan Africa Using a Simple Analytical Framework." IMF How-To Note 2021/006, International Monetary Fund, Washington, DC.
- Cerrutti, Caroline, Eric D. Cruikshank, Josep M. Julia, Andres F. Martinez, and Marta Sanchez Sache. 2019. "DARP—Creating Distressed Assets Markets." Distressed Asset Recovery Program, International Finance Corporation, Washington, DC.
- Curak, Marijana, Sandra Pepur, and Klime Poposki. 2013. "Determinants of Non-Performing Loans—Evidence from Southeastern European Banking Systems." *Banks and Bank Systems* 8 (1): 45–53.
- De Bock, Reinout, and Alexander Demyanets. 2012. "Bank Asset Quality in Emerging Markets: Determinants and Spillovers." IMF Working Paper 12/71, International Monetary Fund, Washington, DC.
- Dobler, Marc, Marina Moretti, and Alvaro Piris. 2020. "Managing Systemic Banking Crises. New Lessons and Lessons Relearned." Departmental Paper 20/05, IMF Monetary and Capital Markets, International Monetary Fund, Washington, DC.
- Espinoza, Raphael, and Ananthakrishnan Prasad. 2010. "Nonperforming Loans in the GCC Banking System and their Macroeconomic Effects." IMF Working Paper 10/224, International Monetary Fund, Washington, DC.
- European Central Bank (ECB). 2017. "Guidance to Banks on Non-Performing Loans." Frankfurt.
- Fofack, Hippolyte. 2005. "Nonperforming Loans in Sub-Saharan Africa: Causal Analysis and Macroeconomic Implications." World Bank Policy Research Working Paper WPS3769, World Bank, Washington, DC.
- Ingves, Stefan N., Steven A. Seelig, and Dong He. 2004. "Issues in the Establishment of Asset Management Companies." IMF Policy Discussion Paper 04/3, International Monetary Fund, Washington, DC.
- International Finance Corporation (IFC). 2020. "Distressed Assets Recovery Program (DARP). Overview." Washington, DC.
- International Monetary Fund (IMF). 2015. "South Africa: Financial Sector Assessment Program. Detailed Assessment of Compliance on the Basel

- Core Principles for Effective Banking Supervision.” IMF Country Report 15/55, Washington, DC.
- International Monetary Fund (IMF). 2018a. “United Republic of Tanzania: Financial System Stability Assessment.” IMF Country Report 18/346, Washington, DC.
- International Monetary Fund (IMF). 2018b. “The Macprudential Policy Survey.” Washington, DC. <https://www.elibrary-areaer.imf.org/Macprudential/Pages/Home.aspx>
- International Monetary Fund (IMF). 2019a. “Financial Soundness Indicators Compilation Guide.” Washington, DC.
- International Monetary Fund (IMF). 2019b. “State-Owned Banks, Privatization, and Macrofinancial Performance in Sub-Saharan Africa.” Togo: Selected Issues, IMF Country Report No. 19/206, Washington, DC.
- International Monetary Fund (IMF). 2019c. *Regional Economic Outlook for Sub-Saharan Africa. Navigating Uncertainty*. Washington, DC, October.
- International Monetary Fund (IMF). 2020a. *Regional Economic Outlook for Sub-Saharan Africa. COVID-19: An Unprecedented Threat to Development*. Washington, DC, April.
- International Monetary Fund (IMF). 2020b. *Regional Economic Outlook for Sub-Saharan Africa. A Difficult Road to Recovery*. Washington, DC, October.
- Jobst, A., J. Portier, and L. Sanfilippo, 2015, “Capital Relief and New Lending Capacity from NPL Disposal.” Technical Background Note in IMF Staff Discussion Note “A Strategy for Resolving Europe’s Problem Loans.” International Monetary Fund, Washington, DC.
- Klein, Nir. 2013. “Non-Performing Loans in CESEE: Determinants and Impact on Macroeconomic Performance.” IMF Working Paper 13/72, International Monetary Fund, Washington, DC.
- Koetter, Michael, James W. Kolari, and Laura Spierdijk. 2012. “Enjoying the Quiet Life Under Deregulation? Evidence from Adjusted Lerner Indices for US Banks.” *Review of Economics and Statistics* 94: 462–80.
- Kongsamut, Piyabha, Dermot Monaghan, and Luc Riedweg. 2021. “Unwinding COVID-19 Policy Interventions for Banking Systems.” IMF Money and Capital Markets Special Series on COVID-19. <https://www.imf.org/en/Publications/SPROLLS/covid19-special-notes>.
- Laeven, Luc, and Fabian Valencia. 2018. “Systemic Banking Crises Revisited.” IMF Working Paper 18/206, International Monetary Fund, Washington, DC.
- Love, Inessa, and Lea Zicchino. 2006. “Financial Development and Dynamic Investment Behavior: Evidence from Panel Vector Autoregression.” *The Quarterly Review of Economics and Finance* 46: 190–210.

- Manz, Florian. 2019. "Determinants of Nonperforming Loans: What Do We Know? A Systematic Review and Avenues for Future Research." *Management Review Quarterly* 69 (4): 351–89.
- Monaghan, Dermot, and Nolvica Saca Saca. 2016. "Dealing with High Nonperforming Loans." IMF MCM Policy Position Note PPN/2016/3, International Monetary Fund, Washington, DC.
- Mpofu, Trust R., and Eftychia Nikolaidou. 2019. "Macroeconomic and Bank-Specific Determinants of Non-Performing Loans in Sub-Saharan Africa." School of Economics Macroeconomic Discussion Paper Series 2019–02, School of Economics, University of Cape Town, Cape Town.
- Nelmes, John, Sergei Antoshin, Yesim Aydin, Heedon Kang, Roland Meeks, Dermot Monaghan, Antonio Pancorbo, Thomas Piontek, and Thierry Tresselt. 2021. "COVID-19 and Corporate-Sector Stress: Macro-Financial Implications and Policy Responses." IMF Money and Capital Markets Special Series on COVID-19. <https://www.imf.org/en/Publications/SPROLLs/covid19-special-notes>
- Nkusu, Mwanza. 2011. "Nonperforming Loans and Macrofinancial Vulnerabilities in Advanced Economies." IMF Working Paper WP/11/161, International Monetary Fund, Washington, DC.
- Standard Bank. 2018. Year End Results Summary. <https://reporting.standardbank.com/>
- Svirydzenka, Katsiaryna. 2016. "Introducing a New Broad-based Index of Financial Development." IMF Working Paper WP/16/05, International Monetary Fund, Washington, DC.
- Sy, Amadou N, Rodolfo Maino, Alexander Massara, Hector Perez-Saiz, and Preya Sharma. 2019. "FinTech in Sub-Saharan African Countries: A Game Changer?" IMF Departmental Paper 19/04, International Monetary Fund, Washington, DC.
- Verkoren, Constant. 2019. "Financial Stability on the Road to Recovery." Ghana—Selected Issues Paper, IMF Country Report 19/368, International Monetary Fund, Washington, DC.
- World Bank. 2018a. "United Republic of Tanzania—Non-performing Loans." Technical Note, Financial Sector Assessment Program, Washington, DC.
- World Bank. 2018b. *Doing Business 2018: Reforming to Create Jobs*. Washington, DC.
- World Bank. 2019. *Doing Business 2019: Training for Reform*. Washington, DC.