Recovering the finance-growth nexus

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1. Introduction

In the last decade or so, empirical evidence showing that the nexus between finance and growth has weakened has gained prominence (e.g. Rousseau and Wachtel, 2011). Recent studies, in fact, suggest that once a certain threshold of financial development has been reached, finance has negative effects on growth (Arcand et al., 2015; Samargandi et al. 2015).

The current paper shows that it is possible to recover the finance-growth nexus by using quality adjusted measures of financial development. Specifically, we utilize three World Bank financial fragility indicators - the Z-score, a measure of liquidity and a measure of impaired loans - which enable us to construct quality adjusted measures of private credit to GDP.

We conclude that the finance-growth nexus is very much alive and kicking, as long as banks use sound lending practices to avoid the buildup of non-performing loans. We also show that the results remain valid in Sub-Saharan Africa – a region of the world where the finance-growth nexus could potentially make a big difference.

2. Data and Methods

Our study utilizes data from an unbalanced panel of 102 countries over 1998-2017, including financial and macroeconomic aggregates from the *World Development Indicators* and financial fragility data from the *Global Financial Development Database.* The summary statistics are shown in Table 1 and the benchmark fixed-effects model is outlined in Equation 1. In the fixed effects regressions, we set the lagged dependent variable equal to zero.

$$Y_{i,t} = \rho\, Y_{i,t-1} + \alpha_i + \beta\, FD_{i,t} + \lambda\, X_{i,t} + \delta_t + \eta_{i,t} \qquad (1)$$

The dependent variable *(Y)* is the GDP per capita growth rate in country *(i)* at time *(t)* and our variables of interest are the indicators of financial depth *(FD)*. Our preferred measure of financial deepening is

private credit to GDP, known to best capture the intermediation process of financial development.

We adjust private credit to GDP by multiplying it with one of three indicators of financial fragility: (i) the Z-Score, which measures the number of standard deviations asset returns need to fall before wiping out all bank equity; (ii) liquid assets divided by customer deposits and short-term funding and (ii) the inverse of the number of impaired loans to gross loans in the economy. Therefore, we can think of the adjusted financial development indicator as "good" credit, corresponding to sound banking practices, measured by profitability, liquidity or credit quality, respectively.

Matrix *(X)* includes variables shown to determine economic growth commonly used in the literature. They include: the inflation rate, population growth, secondary school enrolment rates, government expenditure to GDP and trade openness, measured by the total value of imports and exports to GDP.

In order to allow for the persistence of economic growth $(Y_{i,t-1})$ and filter out business-cycle effects we fit a dynamic panel data model using System GMM, (Blundell and Bond, 1998). This estimator further allows us to reduce simultaneity bias by instrumenting all explanatory variables using the estimator's internal instruments and we ensure that the number of instruments does not exceed the number of cross-sections, (Baltagi, 2008). All our estimates include country-specific effects (α_i) and time fixed effects shown in Equation 1 as (δ_t).

3. Results

Table 2 reports our benchmark findings. It shows that a negative relationship is observed between finance and growth using the unadjusted indicator of financial development in column 1. This is no longer a novel finding, as the relationship between finance and growth is known to have weakened over time (Rousseau and Wachtel, 2011; Demetriades and Rousseau, 2016).

However, once we utilize our new measures of quality-adjusted credit the relationship now becomes positive, recovering the original finance-growth nexus. In column 2, an increase in financial deepening alongside stable banking systems proxied by the Z-Score is shown to reverse the sign in column 1. These findings are confirmed in the next two columns, where the adjusted measure of

financial development reflects liquidity and good credit, respectively. Across the three columns the results indicate that a standard deviation increase in quality adjusted credit may increase economic growth by approximately 0.13 standard deviations.

One region of the world where the finance-growth nexus has never taken off is Africa (Murinde, 2012; Menyah et al., 2014). As Demetriades and James (2011) propose, although bank balance sheets grow with GDP, bank credit does not lead or follow growth in Africa, indicating a broken link. In column 5, the insignificant coefficient on private credit appears to confirm this finding. As in the preceding columns, once we use our new indicators, the results reveal a positive and significant coefficient in two out of the three regressions. Hence quality adjusted financial development appears to restore the broken link.

Moreover, columns 6-8 directly answer the plea of Murinde (2012) to test the quality of financial deepening in Africa rather than its pure quantity. When the Z-Score and the number of performing loans measures of financial stability are used to measure credit quality – on average, a standard deviation increase in quality adjusted credit may on average increase economic growth by 0.6 standard deviations. This is a large and economically significant finding.

Naturally, these findings need to be treated with caution for two reasons. First, due to the reduction in sample size arising because of limited data availability, and second, because we do not imply any causality here. Simply we just recover the positive and significant association between finance and growth in Africa. However, this is an important new result that offers a promising avenue for future research.

Table 3 attempts to extend our benchmark findings by modelling for persistence and addressing the simultaneity bias in our findings. We do this by using the internal instruments available via the System GMM estimator. The findings are reported for the full sample of countries in columns 1-4, mainly as the estimator is designed for a large number of cross sections. Given that our sub-

sample of African economies is small, the estimator's assumptions would be violated when investigating this sub-sample.

The results confirm our prior findings. In column 1, unadjusted private credit shows a negative and significant relationship between finance and growth. The long run estimate suggests a standard deviation increase in credit may depress economic growth by approximately 0.9 standard deviations. In comparison, quality adjusted private credit is positive and statistically significant in columns 2-4, albeit at the 10% level in the final two columns. The results suggest that in the long run, a standard deviation increase in quality adjusted credit may increase economic growth by almost 0.4 standard deviations on average. Across all specifications the lagged dependent variable is positive and statistically significant.

4. Concluding Remarks

We show that by using quality-adjusted indicators of financial development, we can uncover the original finance-growth nexus. Our findings indicate that policy makers should persevere with their efforts to clean bank balance sheets from non-performing loans and ensure that banks follow sound lending practices. Our findings also suggest that exploring quality-adjusted financial development indicators is a promising avenue for future research. Last but not least, our results indicate that healthy banks could be a conduit for growth in Sub-Saharan Africa.

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Table 1: Summary Statistics

Variable Name	Mean	Standard Deviation	Minimum	Maximum
Growth Per Capita	2.34	3.60	-23.14	23.99
Private Credit	3.96	0.77	-1.66	5.54
Z-Score	14.48	9.13	0.02	61.16
Liquidity	31.57	15.64	5.26	130.63
NPLs	6.81	7.26	0.09	47.75
Schooling	89.19	24.19	15.70	163.93
Openness	91.17	60.04	20.72	442.62
Inflation Rate	4.90	6.81	-4.48	96.09
Government Spending	15.95	4.82	1.34	30.50
Population Growth	1.04	1.18	-3.85	7.35

Notes: The variables are from *World Development Indicators* and *Global Financial Development Database*. Private credit is measured as its natural logarithm. The Z-Score measures the number of standard deviations the return on assets needs to fall to wipe out bank capital. Liquidity is the ratio of liquid assets to customer deposits and short-term funding; non-performing loans are a ratio to gross loans in percent. Schooling is the secondary school enrolment rate in percent and trade openness is the sum of exports and imports to GDP. The inflation rate is in percentage terms and both maximum values for this variable and for trade openness have been accounted for when inspecting the raw data. Government spending is a ratio to GDP and population growth in percent.

Table 2: Fixed Effects Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Private Credit	-0.452***				0.081			
	(-2.98)				(0.13)			
Quality Adjusted Private Credit		0.166***	0.119**	0.126***		0.786***	-0.048	0.440**
		(4.53)	(2.56)	(3.43)		(3.14)	(-0.37)	(2.19)
Schooling	0.180*	0.176*	0.240**	0.180*	0.723	0.962	0.682	0.980*
	(1.97)	(1.85)	(2.39)	(1.81)	(0.88)	(1.47)	(0.78)	(1.90)
Openness	0.307***	0.267***	0.303**	0.327***	0.875	1.037**	0.834	0.263
	(3.01)	(2.67)	(2.56)	(2.85)	(1.30)	(2.16)	(1.21)	(0.75)
Inflation Rate	-0.216***	-0.212***	-0.203***	-0.232***	-0.706**	-0.803***	-0.696**	-0.895***
	(-3.56)	(-3.96)	(-4.23)	(-4.50)	(-2.39)	(-3.45)	(-2.72)	(-3.33)
Government Spending	-0.546***	-0.597***	-0.695***	-0.665***	-0.213	-0.204	-0.143	0.274
	(-3.88)	(-4.19)	(-4.56)	(-4.09)	(-0.46)	(-0.52)	(-0.31)	(0.75)
Population Growth	-0.171	-0.210	-0.213	-0.260*	0.745	0.622	0.755	1.737*
	(-1.30)	(-1.58)	(-1.65)	(-1.96)	(1.04)	(1.24)	(1.13)	(1.82)
Credit Measure	N/A	Z-Score	Liquidity	Loan Quality	N/A	Z-Score	Liquidity	Loan Quality
R-Squared	0.35	0.35	0.32	0.33	0.34	0.44	0.34	0.43
Cross Sections	102	102	102	102	16	16	16	16
Observations	1220	1220	1220	1220	105	105	105	105

Notes: Each column represents a different regression. Columns 1-4 represent the full sample and columns 5-8 the subsample of African economies. All variables are standardised. T-statistics are reported in parenthesis and inference is based upon standard errors clustered at the country level where (*)(**)(***) denotes the (10)(5) and (1) statistical significance levels. A constant, country and time fixed effects are included in the regression but unreported for brevity.

Table 3: Dynamic Panel Regressions

	(1)	(2)	(3)	(4)
Lagged	0.405***	0.323***	0.440***	0.438***
Growth	(4.30)	(3.28)	(5.08)	(4.25)
Private	-0.563**			
Credit	(-2.09)			
Quality Adjusted		0.262***	0.265*	0.133*
Private Credit		(3.53)	(1.75)	(1.64)
Schooling	0.371	0.649*	0.598	0.380
	(0.87)	(1.91)	(1.42)	(1.18)
Openness	0.054	0.013	-0.134	0.044
	(0.24)	(0.06)	(-0.68)	(0.25)
Inflation Rate	-0.032	-0.065	-0.012	-0.118
	(-0.24)	(-0.66)	(-0.08)	(-0.94)
Government	0.015	-0.423*	-0.318	-0.303
Spending	(0.07)	(-1.95)	(-1.35)	(-1.56)
Population	-0.044	-0.124	-0.133	-0.055
Growth	(-0.46)	(-0.92)	(-1.02)	(-0.37)
Adjusted Credit Measure	N/A	Z-Score	Liquidity	Loan Quality
AR(1) P-Value	0.00	0.00	0.00	0.00
AR(2) P-Value	0.56	0.29	0.53	0.54
Instrument Count	59	59	59	59
Hansen P-Value	0.03	0.11	0.14	0.14
R-Squared	0.35	0.35	0.32	0.33
Cross Sections	102	102	102	102
Observations	1220	1220	1220	1220

Notes: Each column represents a separate regression. All estimates use two step System-GMM treating all right-hand side variables as endogenous and using internal instruments. All variables are standardised with zero mean and standard deviation equal to one. A constant, time dummies and country fixed effects are included.