Original Research Article

Banking competition and industrialization: evidence from some African countries

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ABSTRACT

The relationship between bank competition and industrialization remains controversial and scarce in studies related to African countries. Using a sample of 26 African countries from 1996 to 2017, the objective of this paper is to analyze the effect of banking competition measured by non-structural measures (Lerner index and Boone indicator) on industrialization. Using the GMM, we obtained two different results. When measured by the Lerner index, competition evolves in the same direction as industrialization while the opposite effect is observed when using the Boone index. Following these results, we found that the relationship between bank competition and industrialization is non-linear. Bank competition should be encouraged but it should also be regulated so as not to become a brake on industrialization.

Keywords: *Banking competition, Industrialization, Lerner index, Boone indicator, African countries*

JEL Classification: G21, L10, O55

1. INTRODUCTION

Industry plays a key role in economic development. It drives economic activity across value chains, from raw materials to finished products. According to [1] growth in Africa is neither sustainable nor inclusive. This is because growth is heavily dependent on exports of raw materials that have little value added. Over the past two decades, the average growth rate in Africa has been around 5% [1]. However, this rate could grow much more in the coming decades if African countries invest more in structural projects. The priority for African countries is therefore to find ways to take advantage of the positive growth rates they have enjoyed since the 1990s [2]. To this end, only a massive industrialization effort would enable Africa to achieve this goal, including eradicating poverty and achieving sustainable development.

In a more contemporary context, industrialization is a dynamic sequence of production or purchase of raw materials, their transformation into finished or semi-finished products and their commercialization on a domestic or foreign market [3]. It is usually accompanied by technological and organizational change leading to increased productivity levels, improved living standards, population growth, urbanization, but also cultural changes and changes in the balance of power between nations [4].

[5] and [6] already stressed the importance of banks in the industrialization process. Indeed, they contributed to capital accumulation not only by serving as intermediaries between financeable agents and investors, but also directly and indirectly through their own lending activities. Banks contributed to the changes in economic structure required by industrialization and to the acceleration of the rate of growth of the economy by providing the bulk of financing [7]. Some authors consider them to be catalysts of economic [8]. In their study, they highlight the creative role of financial intermediaries in promoting new industries, while warning of the potential costs. Indeed, the conditions of size and market power that allow banks to coordinate financing activities also imply inefficient oligopolistic market

structures, capable of fostering industrial concentration and stunted growth once coordination is complete.

For the banking system to play its role effectively, its structure must also be taken into account. In a concentrated banking sector, it is difficult for new entrants to obtain finance, as opposed to a sector dominated by competition [9]. Moreover, when the market is less competitive, the amount of funds is reduced and development is penalized [10]. The structure of the banking market has been at the center of several debates in the history of economic thought but rarely explicitly linked to the role of banks as industrial promoters. This is one of the main motivations of the work of [8]. For the latter, large banks with high market power have an interest in preserving monopolistic behavior within firms. On balance, a competitive banking sector leads to a competitive industrial sector.

Indeed, there are two opposing theories in the literature on the role of the structure of the banking market on the growth of industries. On the one hand, less bank competition would be detrimental to the growth of industries that depend on external financing; moreover, such industries are more likely to grow if the banking sector is more competitive [11, 12, 13] .On the other hand, moderate banking competition would encourage the growth of the industrial sector, while its increase would suppress economic growth[14,15,16,17]. At the heart of these contradictions lies access to credit, which is the main channel through which the structure of the banking market affects economic growth and industrialization. It is essential to incorporate this in order to understand why bank competition is to be encouraged by some authors and proscribed by others.

With this in mind, the objective of this work is to verify what would be the best situation in 26 African countries over the period 1996-2017. The method used is the [18] System Generalized methods of Moments (GMMs). The results show that, depending on the competition indicator used and the behavior of banks, competition and concentration are favorable to industrialization up to a certain threshold where the effect is reversed. There would therefore be non-linear effects between the dependent and the independent variable. Other variables that are important for industrialization include human capital, public expenditure, number of years in power and stability of the financial system. Based on these results, we suggest that public spending should be directed more towards infrastructure, health and education so that industrialization is the domain of the private sector. Also, we suggest that emphasis be placed on technical education to provide an adequate workforce for the manufacturing sector.

The rest of this paper presents the literature review (2), stylized facts (3), methodology, results and discussion (4). The last section allows us to conclude.

2. LITERATURE REVIEW

As mentioned above, there are two conflicting approaches in the literature on the role of the structure of the banking market on the growth of industries. These conflicting views are theoretical and empirical. Before this presentation, it is important to revise the conceptual framework.

2.1. Conceptual framework

The importance given to the notion of industrialization really took shape during the English industrial revolution. Indeed, several theories are used to describe this industrialization, including Rostow's growth model and Gerashchenko's economic backwardness. The former states that development is a process that takes place in five stages: the traditional society, the preconditions for take-off, the take-off, the drive towards to maturity and finally the age of mass consumption. For Rostow, the development of a country follows a linear trajectory and countries that are lagging behind should apply this theory to achieve an industrial boom like the first industrialized countries. Gerschenkron, on the other hand, sees the strategies to be

implemented for the industrialization of a country differently. For him, governments and banks were the determining factors. The rest of this work is then based on this last point.

For a long time, the literature has focused on economic growth rather than on the mechanisms likely to drive it. Some of these mechanisms concern industrialization and intermediated finance. Indeed, this issue had already been raised by [6] for whom the main challenge faced by European countries in the 19th century to ensure rapid economic growth was the coordination of industrial activity. As a result of the large economies of scale generated by countries embarking on the process of industrialization, the presence of a well-developed banking system is a prerequisite to ensure the mobilization of the capital necessary for such a project to be successful [6]. Thus, finance is seen as a catalyst for structural transformation [7]). In this vein, the work of [8] presents the historical role of banks in stimulating industrialization in several European countries during the 19th century. They do so through the construction of a model in which they show that banks act as catalysts for industrialization by providing important means of investment to non-financial industries and by ensuring coordination between them. However, for a bank to act as a catalyst, its size and market power must be large enough to bear the costs of coordination. Finally, they note that the role of banks as catalysts is not just a matter of history, but central to the debate on the role of banks in emerging economies, especially in promoting new industries.

2.2. Theoretical review

The first approach is that industry growth is low in a non-competitive banking sector because access to credit is limited; this results in a lower rate of economic growth [11,12]. The underlying idea is that a more competitive banking system facilitates access to finance and affordability, thus encouraging firms to seek more credit and invest more [19]). In addition, the lower economic growth that would result from less competition would lead to a decline in the creation of new firms [9,20]. Thus, the high market power that a concentrated banking system confers on banks pushes them to increase lending rates, making the cost of financing more expensive for firms, which leads to a decrease in investment [21]. Finally, for [13], industries that are more dependent on external financing grow faster in a competitive banking environment. To expect to benefit from the structure of the banking market according to this first theoretical approach, the level of competition between banks should be sufficiently high.

As for the second approach, [14] warn against excessive competition between banks as, in their view, it would be incompatible with long-term relationships. They argue that a concentrated market would provide more investment opportunities for new industries by providing more credit. In order to increase the availability of credit to even the most impenetrable agents, a non-competitive system should therefore encourage the establishment of long-term relationships in order to promote macroeconomic productivity and hence growth. In this respect, the creation of new firms is faster and more developed in economies with a more concentrated banking [17]. However, when competition is high, banks pay little attention to the selection of profitable projects and set high interest rates [16]. Ultimately, industries that are more dependent on external financing grow faster in a less competitive banking environment [15].

The lack of consensus on the best approach to take makes this literature even more complicated. Indeed, while it is recognized that the structure of the banking market is an important determinant of industrialization, it is still necessary to judge the best situation for reaping its benefits. On this aspect, we hope for a better outcome of the empirical literature.

According to [22], it is the choice of the different indicators of bank competition that determines the different results obtained. Indeed, each proxy captures a particular aspect of the market structure and has its advantages and disadvantages. As such, it is normal that the results obtained with structural measures are different from those obtained with non-

structural measures or between different proxy groups. However, the fact remains that the results of the empirical work support one or the other theory.

2.3. Empirical review

The structure of the banking market affects the real sector through access to credit. To this effect, a less competitive and therefore more concentrated sector would increase financing constraints and decrease the probability of having access to bank financing. This is at least suggested by the results of [23] for a sample of 74 countries in which they propose a restriction on banking activities as a possible mitigation of the adverse effects of concentration. Furthermore, [13] show that a more competitive sector would promote access to credit and have a positive effect on the growth of industries dependent on external financing. This is also the view of [24] when they combine individual firm and country data in a panel model and measure bank competition by non-structural measures such as the Lerner and Boone indices. Indeed, high bank concentration can slow down the growth of industries dependent on external financing, whereas the latter would grow much faster in a competitive environment [19,25,26].
In contrast, other works argue for a moderation of competition and thus for a more concentrated banking system. In doing so, concentration positively affected the growth of manufacturing firms in the United States between 1899 and 1929 [27], yet competition increased the financing constraints for these firms [28]. Indeed, bank concentration should be encouraged because it leads to high performance in industries that are more dependent on bank financing, as opposed to a competitive environment that is detrimental to them [29]. Regarding access to credit, a competitive system is undesirable because it increases the cost of credit which is aggravated for new firms [30,31].
However, bank concentration can facilitate access to credit but be detrimental to industrial growth [15] or it can coexist with competition and act positively on this growth [25]. In any case, the empirical literature does not reach a consensus. As we can see, studies on the subject are very few and almost non-existent in the African sector. Nevertheless, many studies have been conducted in the field of banking competition mainly with regards to financial stability and economic growth. Main while, to our knowledge, those in relation with our principal variable of interest are still very scarce. This is the main motivation of this scientific contribution, which aims to analyze whether or not bank competition would be favorable to the industrialization of African countries. However, this absence could be justified by the multitude of competition indicators and samples used in different studies.

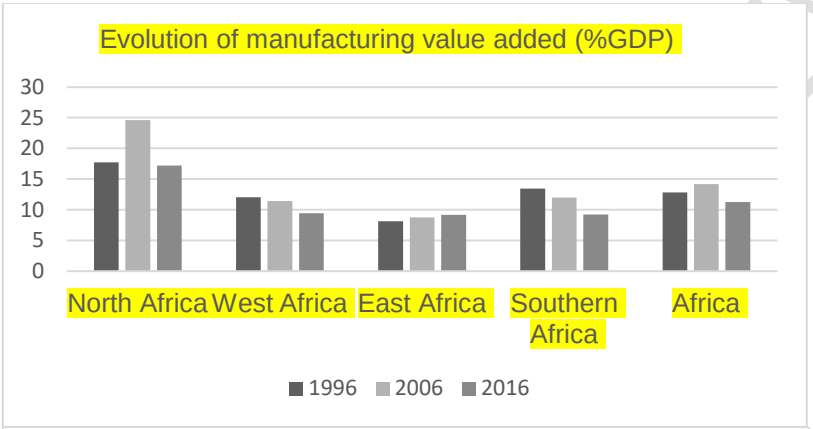
3. STYLIZED FACTS

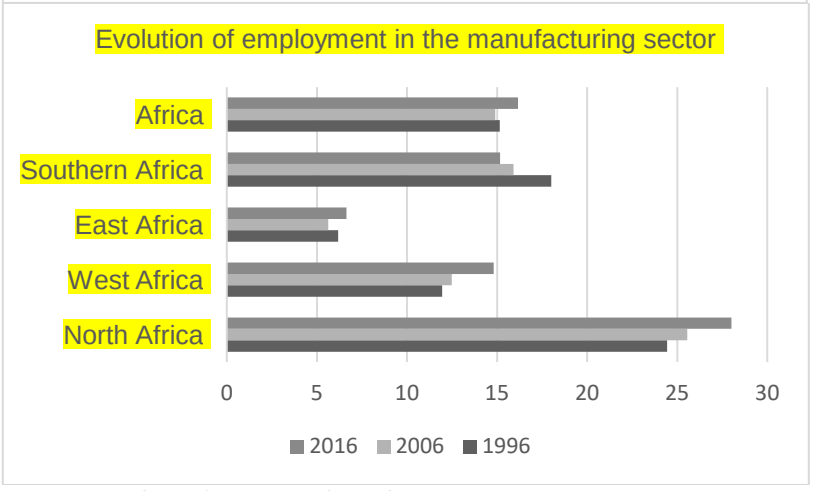
In this section, it is appropriate to present the evolution of the manufacturing sector in Africa before analyzing possible correlations with banking competition.

3.1 Some indicators of the manufacturing sector in Africa.

Although the level of industrialization remains low in Africa, mainly due to the dependence of several countries on natural resources, some countries are still managing to stand out. These are mainly the North African countries, which have the highest manufacturing value added (MVA) over our study period observed at 10-year intervals. The analysis of figure 1 below shows that these countries do not evolve at the same pace as countries in other regions. While MVA has been declining in the latter over the years considered here, i.e. 1996, 2006 and 2016, it peaked in 2006 at over 20% of GDP before falling 10 years later in North Africa. These observations suggest that African countries are further de-industrializing at a time when the industrialization process has barely begun. As for jobs in the manufacturing sector, their evolution shows some disparities. The northern and western

regions show the same trend and have been growing steadily since 1996, while the eastern regions are declining. Finally, whatever the indicator used; the level of industrialization remains low in Africa.



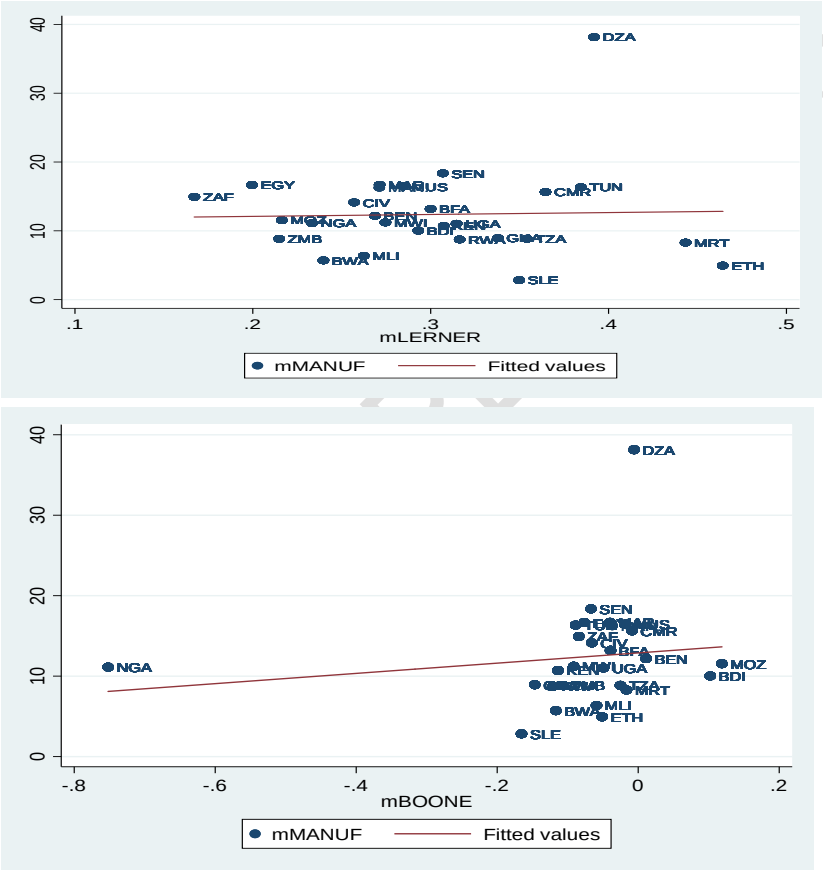


Source: Authors from WDI (2019)

Fig. 1. Evolution of the manufacturing sector in Africa

3.2 Analysis of the correlations between industrialization and banking competition in Africa

Measuring banking competition by two non-structural measures (Lerner index and Boone index), we find that there is a positive correlation between our two variables of interest. However, the interpretation of the resulting graphs can be tricky.
In figure 2, we see that manufacturing value added is associated with positive values of the Lerner index and therefore with less banking competition. Thus, a less competitive banking environment would be conducive to the evolution of industrialization in our sample countries. While this positive correlation is difficult to observe for the first measure, this is not the case for the second where the direction of the correlation is clearly observed. Thus, as we move closer to the axis, bank competition decreases because high values of negative sign of the Boone index indicate a high level of bank competition. In doing so, industrialization would be associated with low levels of competition as before and therefore strong bank competition would be discouraged in our sample. Thus, a low competitive banking sector would perhaps allow bank-dependent industries to have easy access to credit and to develop more quickly. However, correlation is not causation and it is important to use empirical analysis to confirm or not these results.



Source: Author from WDI (2019) and GFDD (2019)
Fig. 2. Correlation between MVA and bank competition

4. METHODOLOGY

As a reminder, the objective of this study is to analyze the role of bank competition on industrialization. To this end, the methodology, variables, estimation methods and descriptive statistics are presented.

4.1. The empirical model

The empirical model is based on the work of [19,26] for China and 10 Asian emerging economies respectively. The model analyses the role of bank competition in general on industrial growth without considering the industry-specific effect such as external dependence. It is written as follows:

$$industry_{it} = \alpha + \beta_1 comp_{it} + \beta_2 Findev_{it} + \gamma_1 X_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

Where i=1,..., N and t=1,..., T represent the individual and time dimensions respectively. industry is the level of industrialization which is our dependent variable; $comp_{it}$is banking competition, our main variable of interest and $Findev$ the financial development variable. Xit is a vector of explanatory variables used in the literature. $\mu_i$controls for unobserved heterogeneous effects across countries and $\varepsilon_{it}$is the error term.

Dependent variable: our dependent variable is industrialization. As a proxy, we use manufacturing value added as a percentage of GDP which we denote as MANUF. The latter represents the wealth created by each branch of the manufacturing sector in the total production of each country. We use it following [15, 19, 26,29]. among others in studies on banking market structures. However, for robustness analyses, MVA will be replaced by a new indicator of industrialization namely employment in the industrial sector (as a percentage of total employment) noted EMPLOY. According to the [32], it can be defined as any person of working age who is engaged in any activity for the purpose of producing goods or providing services for remuneration or not for profit in the extractive, construction, manufacturing and utilities (gas, water and electricity) industries.

Explanatory variable: This is banking competition. It is measured here by the Lerner and Boone indices, which are first- and second-generation non-structural variables respectively. Unlike structural measures based on the SCP model in which structure determines behavior which in turn determines performance, the latter allow the level of competition to be gauged directly from behavior.

The Lerner index is obtained from the formula below. It is the difference between price and marginal cost as a percentage of price.

$$Lerner_{st} = \left(\frac{p_{st} - mc_{st}}{p_{st}} \right) \quad (2)$$

$p_{st}$is the average price of total assets approximated by the ratio of total revenues (interest and non-interest income) to total bank assets and $mc_{st}$the marginal cost of total assets of bank s at time t[1]. The marginal cost is obtained by estimating a translog cost function from which a derivative is obtained. The Lerner index is between 0 and 1, denoting pure and perfect competition and monopoly respectively. Higher values indicate less competition.

The Boone index is based on profitability which assumes that in the long run the least efficient firms are ejected from the market. This is the elasticity obtained by deriving the profit function with respect to marginal cost. The most efficient firms make the highest profits.

[1] In this study, the Lerner index is estimated by the methodology used by Demirguc Kunt and Martinez-Piera (2010).

Therefore, the more negative the Boone indicator, the higher the degree of competition because the reallocation effect is stronger. An increase in this index indicates a deterioration in competitive behavior among financial intermediaries [33]. In this study, the methodology adopted is that used by [35]. Here, marginal costs are replaced by average costs.

$$\pi_{it} = \alpha + \beta \ln(c_{it})$$
(3)

Where π_{it} is the profit of bank i in period t, β is the Boone indicator, cit is the marginal costs. Since marginal costs cannot be observed directly, [34][2] use average costs as a proxy. In order to obtain information on how performance covaries with costs, they regress the return on assets on average costs. The underlying idea is that an increase in costs normally leads to a reduction in profits; however, in a competitive market, an increase in costs by the same amount leads to a more than proportional decrease in profits. This is because less efficient firms are punished more severely. In order to control for heterogeneity in the model, the authors introduce bank-specific effects.

$$\pi_{it} = \alpha_i + \sum_{t=1,\ldots,T} \beta_t d_t \ln(c_{it}) + \sum_{t=1,\ldots,T-1} \gamma_t d_t + \mu_{it}$$

(5) Where π_{it} is the total profits earned by bank i at time t relative to total assets, $c_{it}$is the average variable costs, $d_t$is the dummy time variable and $\mu_{it}$is the error term. Banks with low marginal costs (β<0) have the highest profits. An increase in competition increases the profits of a more efficient bank relative to a less efficient one. The higher the value of β in absolute terms, the greater the competition.

The advantage of the Boone indicator is that the relationship between costs and profits is both continuous and monotonic [36]. Moreover, unlike other measures of competition that are static, this indicator captures the dynamism observed in the market. The Boone index offers many advantages in developing countries in that it mainly requires information on profits or market shares and costs. Furthermore, the calculation of the index does not require price data if average costs are used as a proxy for costs. In this sense, the Boone indicator is more robust than other non-structural measures from the new industrial economy.

However, we will also use a structural indicator, namely a Concentration Index (CR5). It represents the market share of the five largest banks in a country and has also been used in several studies on market structure and industrialization.

Financial development: This is included in the study to take into account the size of the financial sector including the financial market and the banking sector. Noted FINDEV, it is measured here by domestic credit to the private sector as a percentage of GDP[3]. We use it as well as [13] and [26] because the depth of the financial sector and its size would ensure an optimal allocation of private savings to the control variables: they are mainly drawn from the literature on industrialization and are likely to explain it in our sample countries.

[2] The data used on the Boone index in this study comes from the global financial development database (2019). The estimates follow the methodology used by Schaeck and Cihak (2010) with the difference that marginal costs are used instead of average costs.

[3] The financial sector remains underdeveloped in several countries in our sample. For this reason and in line with our study, we consider only the banking sector.

Control variables: these are mainly drawn from the literature on industrialization and are likely to explain it in the countries in our sample. They include the growth rate of GDP per capita. This variable is introduced to take into account economic divergences between countries. It has been used in particular in the work of [19] and [26] in the analysis of the effects of the structure of the banking market on industrialization. The expected sign is negative. We denote it as GDPpcg. Human capital noted HUMANCAP. Endogenous growth theories recommend investing in it in order to prevent the fall in capital, contribute to innovation and adapt to new technologies [36]. In this vein, the model of [37] shows that the speed of industrialization is determined by the accumulation of human capital. This is measured here by the gross secondary school enrolment ratio. We have also introduced the trade openness noted OPEN which allows us to show the importance of trade liberalization policies notably through capital, the acquisition of new technologies, and competitive exchange rates which allow to boost industrialization [38]. It is measured by the sum of exports and imports over GDP and the expected sign is positive. Another macroeconomic variable is the gross fixed capital formation as a percentage of GDP, noted GFCF, which makes it possible to take into account the role of domestic investments on industrialization.

In order to take into account the stability of the financial system, we introduce the z-score because industrialization is likely to be higher in a stable financial environment [25]. We denote it as Z-SCORE. In order to ensure macroeconomic stability, a low level of inflation is necessary to make access to financial services easy and make investors less risk averse. We denote it as INFL and the expected sign should be negative. The role of the state in industrialization is also taken into account through public expenditure, which we measure as a percentage of GDP. Indeed, as noted by GOVEXP, this expenditure can generate positive externalities on the manufacturing sector but also lead to a crowding out effect on private investments, which could negatively affect industrialization.

The institutional framework is also taken into account, as the above-mentioned elements will not be able to act effectively on industrialization without a stable institutional environment. First, the number of years under the current regime is used as a proxy for political stability [4]. The underlying idea is that a stable government is likely to ensure the implementation of a long-term project, which may be important in the promotion and development of new industries. Political stability is rated POLSTAB. Secondly, we consider property rights rated PROPTY. Property rights measure the degree to which a country's laws protect private property. The values range from 0 to 100, with higher values reflecting stronger protection.

4.2. Estimation method

The estimation method used is the system generalized method of moments (GMM). This methodology makes it possible to take into account the endogeneity of the variables, the simultaneity bias and potential heteroscedasticity. Indeed, there are two variants of GMMs in dynamic panels: the first difference GMM estimator and the system GMM estimator.

[39] first difference GMM estimator consists of taking the first difference of the equation to be estimated for each period in order to eliminate country-specific effects, and then instrumenting the explanatory variables of the first difference equation with their level values lagged by one period or more. The system GMM estimator of [18] combines the first difference equations with the level equations in which the variables are instrumented by their first differences. [18] have shown using Monte Carlo simulations that the system GMM estimator outperforms the first difference GMM estimator, the latter giving biased results in finite samples when the instruments are weak. Two tests are associated with the dynamic panel GMM estimator: the Sargan/Hansen over-identification test, which tests the validity of

lagged variables as instruments, and the [40] autocorrelation test, where the null hypothesis is the absence of second-order autocorrelation of the errors in the difference equation.

4.3. Data source and preliminary tests

26 African countries make up our sample. They are : North Africa (Algeria, Tunisia, Morocco, Egypt); Southern Africa (South Africa, Botswana, Malawi, Mauritius, Mozambique, Tanzania, Zambia); West Africa (Cote d'ivoire, Ghana, Nigeria, Benin, Burkina Faso, Mali, Mauritania, Senegal, Sierra Leone); East Africa (Burundi, Kenya, Uganda, Rwanda, Ethiopia) and Central Africa represented by Cameroon Even though these countries have several characteristics related to language, institutions and natural resources, among others, our choice was made solely on the basis of the availability of data. Our study period is from 1996 to 2017. Data on banking competition are taken from the Global Financial Development Database (GFDD, 2019) and data on macroeconomic variables from the World Development Indicator (WDI, 2019). Data on political stability are taken from the Worldwide Governance Indicators (WGI, 2019).

Preliminary tests include descriptive statistics, correlation matrix, cross-sectional dependence test and unit root tests.

Table 1. Descriptive statistics

Variables	observations	Mean	Stand. Dev	Min	Max
Manuf	572	12,293	6,713	1,532	50,037
Employ	572	14,093	8,94	2,2	39,25
Lerner	572	0,3006	0,116	-0,385	0,64
Boone	571	-0,08	0,197	-2,54	1,607
CR5	572	84,45	14,7	33,42	100
Findev	572	23,12	19,82	1,582	106,26
Gdppcg	572	2,434	3,376	-22,312	21,028
Open	557	61,25	23,208	20,722	132,2
Fbcf	513	21,57	7,728	-2,424	47,56
Zscore	572	14,47	9,32	2,55	96,68
Infl	558	7,31	7,33	-8,48	48,49
Govexp	558	13,98	5,453	-37,196	35,603
Polstab	550	13,58	13,51	0	52
Humancap	550	50,54	36,28	-0,43	302,88

Source: Authors from WDI (2019) and GFDD (2019)

The analysis of this table reveals important elements for the continuation of this work. Our dependent variables (manuf and employ) have means of 12.293 and 14.093 respectively, and standard deviations of 6.713 and 8.94. As for our main variables of interest, i.e. those of bank competition, the means are 0.3 (Lerner index), -0.08 (Boone index) and 84.45 (CR5). The standard deviations are 0.116, 0.197 and 14.7 respectively. The latter values are not very high and suggest that the data are not very scattered.

Concerning the correlation matrix, the dependent variables (manuf and employ) are positively correlated at the 5% threshold. Also, our competition variables are positively correlated with each other and therefore, they can be used as proxies without the SCP hypothesis being "violated". An important fact is the strong positive correlation between employ and findev (0.677), between employ and humancap (0.644) but also between findev

and humancap (0.669). These correlations are the highest. As the other correlations are relatively lower, we cannot fear a problem of multi-collinearity.

We have also carried out a test of cross-sectional dependence of the data, notably that of [40] The latter allows us to verify the hypothesis of strong data dependence. The results show that there is a strong overall dependence between the data in our sample. Then, two second generation unit root tests taking into account this dependence were carried out. These are the tests of [40] and [41]. Indeed, these two tests postulate an interdependence between individuals and data in a heterogeneous panel. The results show that most of the variables are stationary in level except for trade openness, public expenditure, and the proxy of financial stability which are stationary in first difference.

5. RESULTS AND DISCUSSION

5.1. Results of the baseline model

First, the bank competition variables are tested individually. We find that the Lerner and Boone indices are significant. The relationship is negative for the former and positive for the latter.

Table 2. GMM results with competition variables

	Dependent Variable: manufacturing value added (%GDP)		
Variables	(1)	(2)	(3)
BOONE	**5.543****		
	(2.619)		
CR5		0.0118	
		(0.0268)	
LERNER			**-8.019*****
			(1.412)
Constant	-0.332	-3.302	-0.221
	(0.396)	-(2.289)	(0.478)
Observation	477	478	478
Number of ID	23	23	23
AR(2)	0.294	0.757	0.956
Hansen P	0.210	0.242	0.702
Fisher	0	0	0

Notes: Values in brackets correspond to standard deviations and (***, **, *) indicate significance at the 1%, 5%, and 10% threshold respectively. Significant results are in bold.

Source: Authors from Stata 15

This positive relationship between the Boone index and manufacturing value added means in fact that a decrease in banking competition leads to an increase in industrialization. As for the Lerner index, its increase leads to a decrease in manufacturing value added, meaning that a decrease in banking competition leads to a decrease in industrialization. It can be seen that these two indicators give contradictory results. In order to verify the behavior of bank competition after the introduction of some control variables, we estimated three

equations with each of the indicators as dependent variable. Thus, the Lerner, Boone and concentration indices are used respectively for equations 1, 2 and 3 presented in Table 3 below. The probability associated with the Arellano [40] autocorrelation test indicates an absence of second order autocorrelation between errors. Similarly, the probability of the Hansen test implies that our instruments are valid. Finally, the probability of Fisher's test is zero, hence our model is globally significant.

As mentioned above, we obtain two results with the three competition indicators. Measuring the latter by the Boone index, we find that it is positive and significant at the 1% level and evolves in the same direction as manufacturing value added. However, this positive sign of the Boone index implies a decrease in banking competition which leads to an increase in MVA. Moreover, CR5 is also positive and significant at 5% indicating that an increase in concentration and thus a decrease in competition would be associated with an increase in industrialization captured here by MVA. These results support the theoretical predictions of [14] who estimate that a concentrated market would offer more investment opportunities to new industries by granting them more credit. Thus, a low-competition system should encourage the establishment of long-term relationships in order to promote macroeconomic productivity and hence growth. In the same vein, the creation of new firms is faster and more developed in economies where the banking system is more concentrated [18]. In sum, industries that are more dependent on external financing grow faster in a less competitive banking environment [15]. Our results are consistent with those of [27, 29, 30, 31].

In contrast, the Lerner index is negative and significant at the 10% level. This means that an increase in bank competition (a decrease in the Lerner index) leads to an increase in MVA. In this case, strong competition is desirable because a more competitive banking system facilitates access to finance and affordable costs, thus encouraging firms to apply for more credit and invest more [20]. Also, the growth of the industrial sector is low in an uncompetitive banking sector because access to credit is limited; this results in a lower rate of economic growth [11, 12]. Furthermore, [14] show that a more competitive sector would favor access to credit and have a positive effect on the growth of industries dependent on external financing. These results are also consistent with those of [19,24,25,26].

Finally, according to [22], it is the choice of different indicators of bank competition that determine the different results obtained. Indeed, each proxy captures a particular aspect of the market structure and has its advantages and disadvantages. As such, it is normal that the results obtained with structural measures are different from those obtained with non-structural measures or between different proxy groups.

Table 3. GMM results with manufacturing value added (MANUF)

	Dependent Variable: manufacturing value added (% du GDP)		
Variables	(1)	(2)	(3)
L.MANUF	**0.991*** **	**0.930*** **	**0.971*** **
	(0.0176)	(0.0228)	(0.0173)

LERNER	**-2.842***		
	(1.619)		
BOONE		**2.860*** **	
		(0.656)	
CR5			**0.0310** **
			(0.0130)
GFCF	-0.0111	-0.0260	-0.0172
	(0.0164)	(0.0207)	(0.0196)
GDPpcg	-**0.0878** **	-0.0187	-0.0440
	(0.0406)	(0.0615)	(0.0476)
GOVEXP	0.0141	**-0.0828** **	**-0.0632***
	(0.0369)	(0.0342)	(0.0373)
INFL	0.0267	0.0493	**0.0715*** **
	(0.0355)	(0.0416)	(0.0229)
HUMANCAP	-**0.0062** **	-**0.00499** **	0.000872
	(0.00290)	(0.00239)	(0.00272)
POLSTAB	0.0165	0.00799	0.0289
	(0.0158)	(0.0106)	(0.0196)
OPEN	0.00777	0.00736	0.000425
	(0.00857)	(0.00773)	(0.00817)
RISK	0.00373	**0.0415*** **	-0.00368
	(0.0127)	(0.0104)	(0.0231)
Constant	0.586*	1.616***	**-1.753** **
	(0.322)	(0.461)	(0.760)
Observations	471	470	471
Number of ID	23	23	23
AR (2)p	0.452	0.845	0.479
Hansen OIR	0.459	0.874	0.385
Fisher	0	0	0

Notes: *** *P*=.01, ** *P*=.05, * *P=0*.1, AR (2)p is the probability of Arellano and Bond's (1991) serial autocorrelation test and Hansen OIR is the test for instrument overidentification.

Source : Authors from stata 15

Several other variables are also significant. In particular, the annual growth rate of GDP per capita (GDPpcg) is negatively and significantly associated with manufacturing value added when competition is measured by the Lerner index. Indeed, when the growth rate increases by one unit, MVA decreases by 0.087. This result can be explained by the fact that growth is essentially driven by services to the detriment of industry in the countries in our sample. We also find that public expenditure (GOVEXP) is negatively and significantly associated with manufacturing value added at the 5% (Boone index) and 10% (CR5) thresholds. This result implies that government spending to stimulate industrialization may crowd out private investment, thus negatively affecting industrialization.

Two results are contrary to our predictions. The first is that inflation is significantly and positively associated with MVA in the concentration equation at the 1% threshold. Indeed, when the price index changes by one unit, MVA increases by 0.715, which is a fairly large change. The generalized increase in prices allows companies to anchor their expectations of price increases in the medium and long term. This encourages the decision to invest because the uncertainty about future income generated by the investment is thus reduced. This stimulates industrialization. Human capital is negatively and significantly associated with MVA in equations 1 and 2. This suggests that the level of education is not important enough to stimulate industrialization.

Finally, the RISK variable, which measures the risk of failure of the financial system, is positively and significantly associated with MVA. When this risk value increases by one unit, it changes by 0.042 in equation 2. Finally, the level of industrialization is higher in a stable banking system. The lagged variable is significant at the 1% level and positive in all equations, thus showing the persistence of industrialization over time.

5.2. **Robustness checks**

In order to analyze the results obtained above, some estimations have been carried out. In a first step, manufacturing value added is replaced by the employment rate of the manufacturing sector noted EMPLOY. In a second step, we introduced quadratic forms to check if there are non-linear effects between industrialization and bank competition.

Using EMPLOY as the dependent variable, the signs of our variables of interest (Boone index, Lerner index and CR5) do not change. Indeed, a 1% increase in the Lerner index leads to an opposite change in employment of 1.282. Since the increase in this index reflects a decrease in bank competition, we can conclude that industrialization decreases when competition decreases. The relationship between the Boone index and concentration is positive; a low-competition environment would therefore be favorable to an increase in the employment rate and therefore to industrialization. The presence of these results suggests the coexistence of the two hypotheses, hence the search for non-linear effects (Table 5). Before doing so, we note the significance of two new variables: gross fixed capital formation (GFCF) and the duration of leaders in power (POLSTAB). The first is positive and significant in all equations. It means that domestic investments stimulate the employment rate through the creation of new enterprises.

Table 4. GMMs Results with EMPLOY

	Dependent Variable: Employment in the industrial sector		
Variables	1	2	3
L.EMPLOY	0.932***	0.949***	0.950***
	(0.0165)	(0.0143)	(0.0133)
LERNER	-1.282**		
	(0.630)		
BOONE		0.150***	
		(0.0490)	
CR5			0.00980***
			(0.00268)
GFCF	0.0212**	0.0205***	0.0236***
	(0.00854)	(0.00716)	(0.00774)
GDPpcg	0.0432***	0.0436***	-0.0137
	(0.0108)	(0.0127)	(0.0242)
GOVEXP	-0.0270**	-0.0396**	-0.0363**
	(0.0113)	(0.0160)	(0.0173)
INFL	-0.0260***	-0.0116*	-0.00691
	(0.00772)	(0.00636)	(0.00484)

HUMANCAP	0.00292***	0.00336***	0.00154
	(0.00101)	(0.000738)	(0.00111)
POLSTAB	0.00804	0.00178	0.0152***
	(0.00516)	(0.00442)	(0.00521)
Constant	1.188***	0.743***	-0.331
	(0.202)	(0.281)	(0.216)
Observations	471	470	471
Number of countries	26	26	26
Number of instruments	21	16	17
AR (2)p	0.464	0.396	0.393
Hansenp	0.665	0.424	0.843
Fisher	0	0	0

Notes: The sign (***, **, *) indicates significance at the 1%, 5% and 10% level respectively. AR (2)p is the probability of serial autocorrelation test of Arellano and Bond (1991) and Hansen OIR is the test of over identification of instruments.

Source : Authors from stata 15

The duration of leaders in power is also significant and positive in the equation. It is assumed that when the banking system is concentrated, the increase in the employment rate is positively influenced by the number of years in power. It is also found that the negative signs previously associated with GDP per capita and inflation have become negative and human capital positive.

Examination of the latter table shows that there is indeed a non-linear relationship between competition, concentration and industrialization. The Lerner index is first negative, meaning that an increase in competition leads to an increase in industrialization. Then it becomes positive, this time showing that a decrease in competition leads to an increase in industrialization and vice versa. As an attempt to explain this, a competitive environment makes access to credit easier because the diversification of the service offer allows customers to "prefer" one bank to another, pushing the latter to have ever larger market shares. Except that the banks take advantage of this to take too many risks, thus endangering the whole system. As for concentration, the sign is first positive and then negative. In fact, this concentration is initially favorable because it allows the establishment of long-term relationships between banks and their clients [14]; then, it becomes harmful because the banks set very high rates, thus discouraging lenders and investments, hence the direct repercussion on industrialization.

Table 5. Results of the non-linear model with GMMs

	Dependent variable: manufacturing value added (% du GDP)				
Variables	1	2	3	4	5
L.MANUF	0.967***	0.941***	0.921***	0.931***	0.957***
	(0.0203)	(0.0135)	(0.0307)	(0.0210)	(0.0188)
LERNER	-13.1***				
	(4.481)				
Lerner2	16.92***				
	(5.614)				
BOONE		6.038***		3.848**	

		(2.140)		(1.893)	
Boone2		-0.746		1.006	
		(1.676)		(1.447)	
CR5			-0.0204		0.154**
			(0.102)		(0.0622)
CR52			0.000425		-0.000780**
			(0.000789)		(0.000349)
GFCF	-0.0109	-0.0226	0.0116	-0.0215	-0.0310
	(0.0162)	(0.0211)	(0.0301)	(0.0211)	(0.0230)
GDPpcg	-0.00170	-0.0366	-0.0372	-0.0417	-0.0413
	(0.0358)	(0.0432)	(0.0380)	(0.0517)	(0.0504)
GOVEXP	-0.0351	-0.105***	-0.172**	-0.0717**	-0.0863**
	(0.0331)	(0.0193)	(0.0715)	(0.0360)	(0.0394)
INFL	0.0345	0.132***	0.0602**	0.0403	0.0610**
	(0.0384)	(0.0384)	(0.0302)	(0.0441)	(0.0247)
HUMANCAP	-0.00136	-0.00559*	0.00372	-0.0076**	-0.00234
	(0.00300)	(0.00288)	(0.00706)	(0.00395)	(0.00346)
POLSTAB	0.00588	0.0144	0.00293	0.0104	0.0484**
	(0.0159)	(0.0159)	(0.0216)	(0.0116)	(0.0234)
OPEN	0.00474	-0.00235	-0.0154	0.00502	0.00575
	(0.00814)	(0.00776)	(0.0151)	(0.00745)	(0.00981)
RISK	0.0184	0.0459**	0.0229	0.0431***	-0.00863
	(0.0121)	(0.0195)	(0.0317)	(0.0100)	(0.0259)
Constant	2.560***	2.013***	2.011	1.731***	-5.934**
	(0.697)	(0.409)	(3.618)	(0.497)	(2.485)
Observations	471	470	471	470	471
Nombre of countries	23	23	23	23	23
Nombre of ID	22	20	19	20	21
AR(2)p	0.300	0.192	0.446	0.299	0.499
Hansenp	0.261	0.343	0.235	0.686	0.470
Fisher	0	0	0	0	0

Notes: Lerner2= Lerner*Lerner, Boone2=Boone*Boone; CR52=CR5*CR5; values in brackets are standard deviations and *** *P*=.01, ** *P*=.05, * *P=0*.1

Source : Authors from stata15

6. CONCLUSION

The objective of this paper was to analyze the effects of bank competition on industrialization in 26 African countries. To do so, we used system GMM over the period 1997-2017.The results found are of interest for economic policymaking. The indicators for measuring bank competition led us to two different results. Using the Lerner index, it evolves in the same direction as industrialization while the opposite effect is observed using the Boone index and concentration. These results led us to investigate the existence of potential non-linear effects. The coefficient associated with the Lerner index is negative and that of the quadratic form is positive. Indeed, competition varies in the same direction as industrialization to a point where a decrease in the former becomes the ideal for an increase in the latter and vice versa. Also, concentration acts positively on industrialization up to a level where it becomes detrimental. Following these results, some policy recommendations can be suggested. First, banking competition should be encouraged but it should also be regulated so that it does not become a brake on industrialization. Secondly, public spending should be directed towards health, infrastructure and education to allow private investors to easily expand into the manufacturing sector. Also, the level of education and the type of training must be adequate

for this human capital to be beneficial. finally, learners must be trained directly in "hard" jobs, which is why technical education institutions must be multiplied.

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