

Structural transformation of Sub-Saharan Africa: Does the quality of institutions matter in its industrialization process?

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Abstract - Structural transformation seems to have "bypassed" the secondary sector in Africa. Unfortunately, the national experiences of "factory less" development are very scarce and idiosyncratic to serve as a model (Cadot et al., 2016). This study contributes to a better understanding of the structural transformation of Sub-Saharan African countries by evaluating the impact of institutions on their industrial performances. Data used to estimate the different dynamic panel models specified within the period 1997-2016 are from the Worldwide Development Indicators and the World Governance Indicators. The results of this study shed light on the role of institutions as key determinants of industrial performances of African countries. The strong relationship found between the two variables is robust to various specifications and institutional measures. The following institutional measures seem to have the highest impacts on industrialization: Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality and Rule of Law. Improving the quality of African institutions will therefore allow the continent to perform better than its current 1.6% share of the world wide's manufacturing value added.

JEL Classification

C23, E02, O14, O55

Key-words

Institutions
Industrialization
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1. INTRODUCTION

Defined as the reallocation of economic activity across the three broad sectors of agriculture, manufacturing, and services, that accompanies the process of modern economic growth (Herrendorf et al., 2013), structural transformation is viewed as an indispensable way to a sustainable and inclusive economic growth. The classical sense of structural transformation as defined by Lewis (1954) and Kuznets (1955) refers to the movement of population and economic activity from agriculture to industry (Kanbur, 2017). Since productivity is higher in the manufacturing sector than in the agricultural sector, transfer of resources into manufacturing should normally provide the basis for higher rates of productivity-induced growth structures (Oyebanji and Kaushalesh, 2017). Globally, the contribution of the industry to structural change is at three levels: First, the industry is a high value-added sector into which labour can flow. Secondly, the important difference in productivity among industrial firms of a same branch offers the scope for further labour reallocation from less efficient to more efficient firms. Finally, the diversification and the sophistication of manufactured products influence the productivity's change and growth (Page, 2012).

Till date, national experiences of development without factories are very scarce and idiosyncratic to serve as a model (Cadot et al., 2016). Industrialization is a key determinant of economic growth in Africa (Opoku and Yan, 2019). In this way, industrialization of African countries constitutes a compulsory way to their economic development. Unfortunately, the structure of most Sub-Saharan economies has not changed much over the past forty years (African Center for Economic Transformation, 2014). Moreover, though structural transformation in most developed countries took the form of a transfer of resources from the primary sector to the secondary and tertiary sectors, it seems to have "bypassed" the secondary sector in Africa (Cadot et al., 2016). Consequently, the size of the industrial sector remains very small in Africa. Although the manufacturing value added created on the continent has evolved positively from \$ 79 billion to \$ 144 billion between 1990 and 2014, this evolution remains very modest compared to the world's manufacturing value added, which almost doubled during the same period (from \$ 4753 billion to \$ 9228 billion). Statistics show that Africa's share of global manufacturing value added is only about 1.6% in 2014 (UNIDO, 2016).

Therefore, what are the factors that justify such a slow industrialisation process in Africa? The economic literature provides some answers regarding the factors that explain the level of industrialization. Newman et al. (2016) in a comparative analysis between Africa and East Asia, highlight the key role of policy choices in explaining the difference in industrialization outcomes between the two groups. Martorano et al. (2017) found that a country's initial economic conditions, its factor endowments as well as other characteristics, such as demographic structure and geography are the drivers of industrialization in developing countries. Their study also sheds light on the role of factors that can be controlled by policy makers such as the financial sector development and the promotion of macroeconomic stability. The role of institutions in explaining nations' industrial performances is also documented. The successful industrialization and structural change of some Asian economies over recent decades was favoured by the setting up of a set of policies and institutional favourable conditions (Martorano et al., 2017). Good institutions improve business climate and stimulate investments. On the other hand, poor institutions could render difficult the building up of a solid industrial sector and complicate the leading of appropriate industrial policies (Beji and Belhadj, 2016).

The analysis of the impact of institutions on economic growth has been at the heart of a prolific literature (see Lloyd and Lee, 2016; for a review). By particularly stressing on the impact of institutions on economic growth, the pioneer works of North (1990) and Williamson (1995) provided a major breakthrough in the growth literature. In return, studies that test the impact of institutions on industrialization outcomes are rare. Moreover, there is no consensus on the magnitude of the industrial impacts of institutions in the literature. In fact, while some authors found a strong positive effect of institutions on industrialization outcomes (Anaman and Osei-Amponsah, 2009; Martorano et al., 2017), other authors concluded to an insignificant impact (Mensah et al., 2016; Beji and Belhadj, 2016; Guadagno et al., 2016). Regarding these mixed results and the few existing studies which analyse the implications of institutional quality on industrialization outcomes, more studies using different techniques and measures of institutional quality are useful in order to better understand the relationship between institutions and industrialization. This study is in line with this preoccupation and aims at assessing the impact of institutions on industrialization in Sub-Saharan Africa (SSA). The study makes several contributions: Firstly, unlike most existing works that use individual dimensions of institutional quality in their analysis, our study uses the principal component analysis to build a composite measure of institutional quality. Such measure seems to be more appropriate and more complete as it takes into account the multifaceted dimensions of institutions. To our knowledge, only Beji and Belhadj (2016) used such aggregate composite index built from the data of the International Country Risk Group database. However, we have gone beyond what these authors did by further breaking down the aggregate index into individual components, in order to check the effects of each component on industrialization. We analyse the effects of six individual institutional measures on industrialization assuming that, the nature and magnitude of the effects may vary. Secondly, this study uses 5-years average data to limit the noise in high frequency data originating from measurement error. Indeed, Dollar and Kraay (2003) demonstrate that annual fluctuations in macroeconomic variables are noisy indicators of the true underlying changes in these variables. Not taking into account such issue as it is the case in previous studies might yield biased estimates. Finally, the large coverage of the Worldwide Governance Indicators (WGI) used in the analysis allows us to consider 45 Sub-Saharan African countries.

In our study, several dynamic models are estimated. The data used cover the period 1997 to 2016. The findings clearly shed light on the positive and significant impact of institutional quality on industrial performances in Africa. The breaking down of the composite measure of institutional quality used in its different components which are: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption also suggests that they are individually correlated to industrial performances.

The remainder of the paper is organised as follows. Section 2 presents some related stylised facts. Section 3 presents the econometric specification and Section 4 the results. Section 5 concludes the study.

2. SOME STYLISED FACTS IN AFRICA

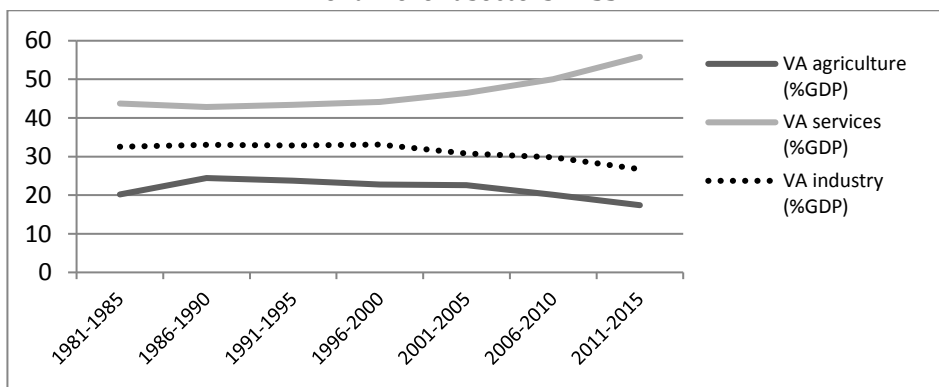
2.1. Structural transformation

Busse et al. (2019) demonstrate that structural transformation contributes significantly to growth in SSA. Though there are few countries like Mauritius and South Africa that have enjoyed structural changes in their economies from 2000 onwards, the transformation has been slow and limited in most of the countries

because of lack of economic diversification, especially in countries that are over-dependent on natural resource extraction, and which are therefore vulnerable to external shocks (UNECA, 2016). If indeed, SSA suffers on average from a lack of diversification, it is largely due to countries rich in natural resources (Cadot et al., 2016). Some countries such as Tanzania, Uganda, and Kenya have experienced significant export diversification in recent times while many others have not (International Monetary Fund, 2014). The Theil index of export diversification developed by the International Monetary Fund shows that Equatorial Guinea, Republic of Congo, Nigeria, Libya, Sudan, and Angola are among the ten countries of the world with the smallest export products diversification in 2010. These countries are heavily dependent on oil rents.

Diversification is closely related to structural transformation, particularly in countries in the early stages of economic development (IMF, 2014). The evolution of the structure of the African economy over the past decades shows that in terms of sectorial composition, the industrial sector has registered poor performances. Figure 1 gives the evolution of the 5-years average real value added (% of GDP) of the different sectors in SSA.

Figure 1. Trend of the 5-years average real value added (% of GDP) of different sectors in SSA



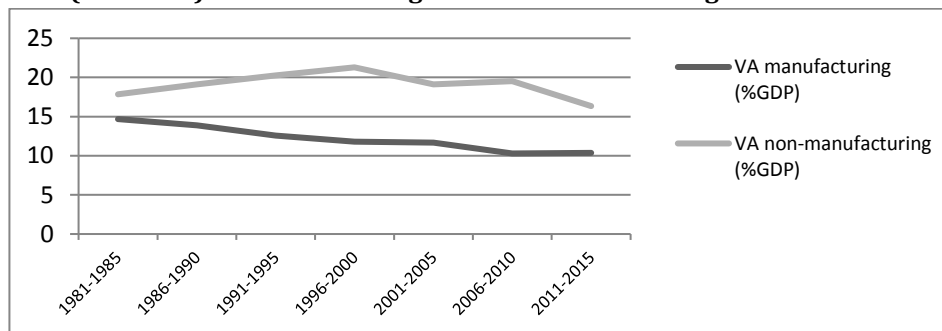
Source: Authors, based on data from the World Development Indicators.

Figure 1 shows that the service sector remains the dominant sector in Sub-Saharan economies. More so, it shows an increasing trend of the real value added of the services in SSA since 1990 after a relative constancy before that date. In contrast, the region has known a decreasing trend of the agriculture and industry value added in the overall period. As stated by Page (2012), Africa has deindustrialised since the 1970s. Data from the World Development Indicators (WDI) show that in 2016, the Sub-Saharan African countries with respectively highest and lowest industry value added (% of GDP) are Mauritius (76 %) and Sierra Leone (34%). The economies that had the most dynamic industrial sector in 2016, that is, the highest annual growth rate in proportion of the industrial value added in the GDP, are Tanzania, Cote d'Ivoire, Guinea, Ethiopia and Sierra Leone (11%, 15%, 16%, 20.55% and 27% respectively). Those with the lowest growth rates are Liberia, Equatorial Guinea, Nigeria, Namibia and Chad (-14%, -12%, -9%, -7% and -6% respectively).

The industrial sector includes the manufacturing and non-manufacturing sectors. The non-manufacturing sector mainly consists of the extractive industry. Studies tend to show that the manufacturing sector is the branch of activity which

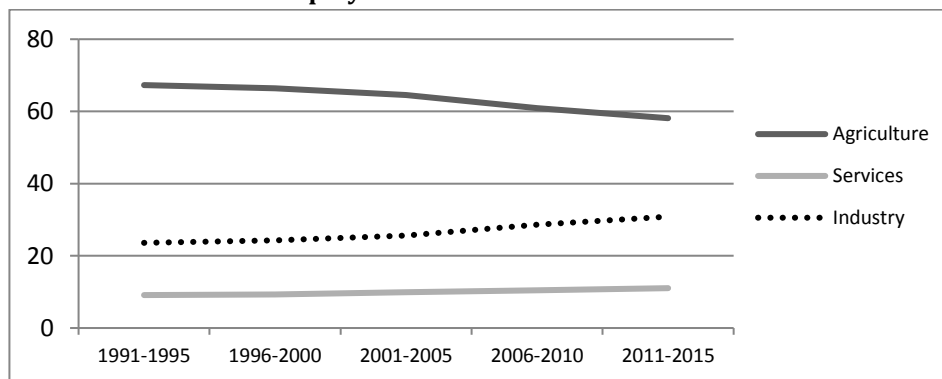
offers the most of opportunities in terms of sustainable growth, jobs and poverty reduction in Africa (UNCTAD and UNIDO, 2011). It is therefore interesting to see how the different sub-components of the industrial sector in general, and the manufacturing sector in particular has varied over time. Figure 2 shows that the trend of the 5-years average real value added (% of GDP) of the manufacturing sector is decreasing between 1981 and 2015.

Figure 2. Industrial sector: Trend of the 5-years average real value added (% of GDP) of manufacturing and non-manufacturing sectors in SSA



Source: Authors, based on data from the World Development Indicators.

Figure 3. Trend of the 5-years average share of employment in total employment for each sector in SSA



Source: Authors, based on data from the World Development Indicators.

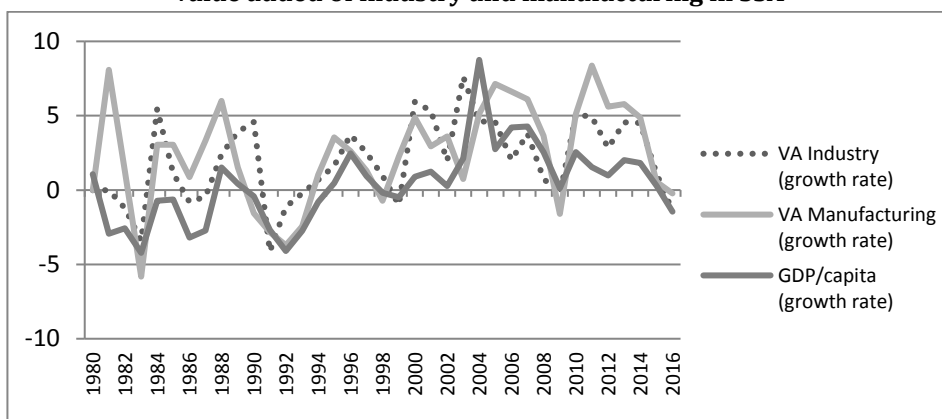
It is also worth noting that the manufacturing sector accounts for the lowest share in the industrial sector. Its curve is below that of the non-manufacturing sector. Data from the World Development Indicators indicate that the average share of the manufacturing value added (% of GDP) over the period of 1981 to 2015 is only 12% (about 39% of the average share of the industry value added over the same period) while that of the non-manufacturing sector is 19% (about 61% of the average share of the industry value added over the period). The relative importance of the non-manufacturing sector is justified by the fact that most African countries have an economy which is scantily diversified and heavily dependent on mining.

Regarding the deployment of resources across different sectors, Figures 3 shows the trend of the 5-years average share of employment in total employment for each sector. Even if agricultural activities still involve most of the labour factor

(57% in 2015), there is a net decrease in the trend of the agricultural sector. In contrast, the proportion of employment in the services is in constant increase. The employment in the industrial sector has not varied significantly around its average of 10% over the period of 1991 to 2015.

Regarding the living standards of the population, industrialization in SSA seems to have evolved parallel to the living standard of the population. Figure 4 shows a correlation between the annual growth rates of the real value added of the industry, manufacturing and the real GDP per capita growth rates in SSA. The continent has registered interesting economic performances during the past few years. It has been growing at a rate of at least 5% over the past 15 years with leading countries such as Angola and Ethiopia, second only to the East and South Asian region (UNECA, 2016). Nevertheless, it turns out that Africa remains the poorest region of the world. Table A1 in the annex gives the classification of Sub-Saharan African countries according to their GNI per capita in 2016. It shows that of the 48 countries considered, 27 are classified as low-income countries, 15 as lower-middle-income economies, 5 as upper-middle-income economies, and only one as a high-income economy¹. Such poor economic results translate into poor social and sustainable human development. For instance, excluding North Africa, Africa remains the most food deficient and has the lowest youth literacy rates of all regions of the world (UNECA, 2016).

Figure 4. Annual growth rates of the real GDP/capita and the real value added of industry and manufacturing in SSA



Source: Authors, based on data from the World Development Indicators.

2.2. Quality of institutions

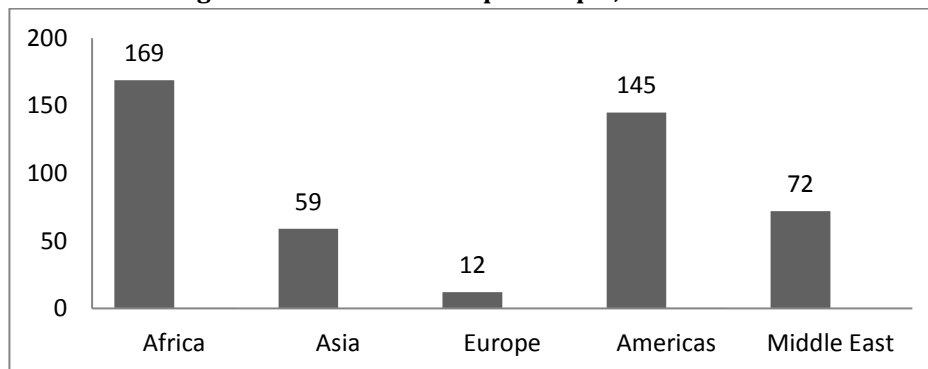
Probably because of the natural resource curse that most African countries are experiencing due to their over-dependence on natural resource rents, they are usually looked upon as countries with weak institutional quality. Policy and institutional quality weakened in SSA amid a difficult global economic landscape and challenging domestic conditions (World Bank, 2017). Siba (2008) suggests that the poor institutional quality in Africa is due to factors such as colonial heritages, re-

¹ For the current 2018 fiscal year, low-income economies are defined as those with a GNI per capita (calculated using the World Bank Atlas method) of \$1,005 or less in 2016; lower-middle-income economies are those with a GNI per capita between \$1,006 and \$3,955; upper middle-income economies are those with a GNI per capita between \$3,956 and \$12,235; high-income economies are those with a GNI per capita of \$12,236 or more.

source curse and foreign aid dependence, political competition and constraints, and ethnic fractionalization.

Regarding *political stability*, it is said that the economic problems of Africa possess political origins (Humphreys and Bates, 2005). As shown in figure 5, Africa is the region of the world that has experienced the most important number of successful and attempted coups d'Etat in the world, followed by America. The continent recorded 37% (169 out of 467) of coups and attempted coups in the world between 1950 and 2010. Countries that have faced successful coups d'Etat in recent years include among others, Guinea-Bissau and Mali in 2012, Central African Republic and Egypt in 2013. Data from the Worldwide Governance Indicators show that the most unstable countries in 2016 (those that registered the lowest scores in terms of political stability) are, in increasing order: Burundi, Democratic Republic of Congo, Somalia, Sudan and South Sudan.

Figure 5. Instances of coup attempts, 1950 to 2010



Source: Authors, based on data from Powell and Thyne (2011)

Regarding another indicator of institutional quality such as *corruption*, it turns out that it is one of the main indicators of institutional weakness of most African countries. Corruption has been presented in the literature as having fierce impacts on economic and social outcomes (see Dimant and Tosato, 2018 for a review). *Transparency International's Global Corruption Perceptions Index* shows that in 2016, most African countries had a score below 50%, indicating an endemic corruption situation. In particular, 39 Sub-Saharan African countries are characterized by endemic levels of corruption. In the *Worldwide Governance Indicators*, 34 of the 48 Sub-Saharan African countries belong to the lower half of countries classified according to low level of corruption. This ranking included 209 countries and territories. Table 1 below gives the scores and the ranking of the three highest and lowest corrupted Sub-Saharan African countries in 2016.

The *Worldwide Governance Indicators* ranking shows that in terms of *good governance*, the top less corrupted countries in SSA are: Botswana, Cape Verde, and Seychelles while in the *Transparency International* ranking which include 176 countries, it is Botswana, Cape Verde, and Mauritius². It is also worth noting that the two world's most corrupt countries in the two rankings are from SSA.

Although it is a world's phenomenon, there are some evidences that corruption is widespread and increasing in the third world countries, particularly in Africa (Musila and Sigué, 2010). The increasing level of corruption in Africa is due to the level of institutional weakness in many African countries, the continuous decline in

² The Seychelles are absent from the Transparency International index in 2016.

the living standards of public servants associated with poor incentives in many African countries, and the blind eye often turned to corruptors by western countries. Therefore, the implementation and practice of principles of good governance is critical to achieving the structural transformation of Africa as they define the interaction among the various economic actors and stakeholders (UNECA, 2016). Good governance constitutes a pre-requisite in building an enabling environment for economic diversification (OECD and United Nations, 2011).

Table 1. Top three of the highest and lowest Sub-Saharan African corrupt countries in 2016

Transparency International Index	Countries	Somalia	South Sudan	Sudan	Mauritius	Cap. Verde	Botswana
	Score	10	11	14	54	59	60
	Ranking	176	175	170	50	38	35
Worldwide Governance Indicators	Countries	Eq. Guinea	Somalia	Sudan	Seychelles	Cap. Verde	Botswana
	Scores ³	-1.81	-1.69	-1.61	0.79	0.88	0.93
	Ranking	209	208	206	49	44	42

Source: Authors, based on data from Transparency International and Worldwide Governance Indicators.

3. ECONOMETRIC SPECIFICATION

3.1. Estimation strategy

Following Guadagno et al. (2016), Mensah et al. (2016), Beji and Belhadj (2016), we adopt a dynamic specification to analyze the effects of institutions on industrialization in SSA. The use of a dynamic specification allows us to account for catch up or cumulativeness in the industrialization process and delayed effects of explanatory variables. The full sample comprises 45 SSA countries covering the period 1997-2016.

The baseline dynamic model is given by the following equation:

$$Y_{it} = a + \alpha Y_{it-1} + \beta Inst_{it} + X'_{it}\gamma + \varepsilon_{it} \quad (1)$$

where a , α , β , γ are the vectors of parameters to estimate. ε is an error term. Y_{it} is the dependent variable capturing industrialization and Y_{it-1} is the lagged variable. The manufacturing value added (% of GDP) is the main measure of industrialization used in the study. $inst_{it}$ is the variable of interest capturing the institutional quality. X_{it} is the set of the control variables.

Our model as defined by equation (1) gives rise to an endogeneity issue that should be addressed. Not taking it into consideration might lead to biased estimates. Institutions are assumed to be endogenous in the model due to the causality that may run from institutions to industrialization and from industrialization to institutions. For instance, if good institutions may favour industrial development, industrialization and the improvement of the living standard that it entails is likely to make people less corrupt, and in general, more willing to set up better institutions. Because of such causality that may run in both directions, the explanatory variables of the model may be correlated with the error term. Measurement errors constitute another source of bias. Indeed, variables capturing institutions contain errors due to their subjective nature (Edison, 2003). Furthermore, the quality of institutions is not random in general. Rather, they are correlated to some unobserved characteristics that also determine the industrial performance. For all these

³ The scores range from -2.5 (most corrupted) to 2.5 (least corrupted).

reasons, the estimation of our model by the ordinary least squares (OLS) technique is inconsistent. To cope with these issues, the estimation strategy will consist of using a Generalized Method of Moments (GMM) estimator suggested for the dynamics of adjustment that were developed by Arellano and Bover (1995) and Blundell and Bond (1998). The GMM addresses endogeneity among the variables by instrumenting them with their own lagged values.

3.2. The variables

Data on industrialization are from the *World Development Indicators*. As said earlier, the *manufacturing value added* (% of GDP) is the main measure used as proxy for industrialization. Since the industrial sector also involves activities other than manufacturing, we further used the *total industry value added* (% of GDP) to verify the robustness of our results. Total industry value added (% of GDP) and manufacturing value added (% of GDP) are the two main measures used in similar studies (Anaman and Osei-Amponsah, 2009; Adejumo et al., 2013; Guadagno, 2016; Beji and Belhadj, 2016...).

Our variable of interest is institutional quality. Defined by North (1991) as the “*humanly devised constraints that structure political, economic and social interaction*” institutions may be informal (sanctions, taboos, customs, traditions, and codes of conduct) or formal rules (constitutions, laws, property rights). In this study, we deal only with formal political institutions. Related data are from the *Worldwide Governance Indicators*. Several other datasets that capture institutions are used in previous studies. However, these datasets focus either on few dimensions of institutional quality (for instance, Transparency International’s dataset focuses on corruption and Freedom House Index dataset focuses on political rights and civil liberties) or economic institutions (Heritage foundation dataset for instance). The WGI has the advantage to contain 6 variables measuring the quality of political institutions since 1996 with related values ranging from around -2.5 (worst institutional quality) to 2.5 (best institutional quality). It covers a wide range of countries and territories (200 precisely) contrary to the International Country Risk guide (ICRG) which only involves 140 countries and the widely used database Polity IV that only concerns 167 countries. The Principal Component Analysis (PCA) is used to build a composite measure of institutional quality. This composite index is calculated by applying the PCA to the following 6 variables: *Voice and Accountability*, *Political Stability and Absence of Violence/Terrorism*, *Government’s Effectiveness*, *Regulatory Quality*, *Rule of Law*, and *Control of Corruption*. These different variables are subjective measures of institutions as they are based on data sources reporting the perceptions of governance of a large number of survey respondents and expert assessments worldwide. According to Kaufmann et al. (2010), *Voice and Accountability* refers to the extent to which the citizens are involved in the choice of their government, as well as freedom of expression, freedom of association, and free media. *Political Stability and Absence of Violence/Terrorism* refers to the likelihood of destabilizing or overthrowing of the government by unconstitutional or violent means, including politically-motivated violence and terrorism. *Government Effectiveness* is related to the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies. *Regulatory Quality* captures the ability of government to formulate and implement sound policies and regulations that permit and promote private sector development. *Rule of Law* refers to the level of confidence and observation of the citizens vis-à-vis the rules of society, and in particular the quality of contract enforcement, property rights, the police, and

the courts, as well as the likelihood of crime and violence. Finally, the *Control of Corruption* measures the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

The institutional quality index constructed using the PCA is the first principal component of the vector of the six indicators of institution quality. This first principal component represents about 82% of the total variance in the original data. The construction of the institutional index has therefore reduced the dimension of the institutional quality indicator by five while preserving 82% of the information in the data. The results of the PCA are reported in table A2 in the annex.

The aggregate institutional quality index is normalised in order to obtain positive values that will allow us to have only positive values ranging from 0 to 1. This normalization is based on the following formula:

$$\text{Inst}_N = \frac{\text{Inst}_G - \min(\text{Inst}_G)}{\max(\text{Inst}_G) - \min(\text{Inst}_G)} \quad (2)$$

where Inst_G is the gross indicator and Inst_N the normalized indicator.

In our analysis, the institutional index is further broken down into its different components to take into account the fact that each institutional component may have differentiated effects on industrialization.

Regarding the control variables, related data are from the *World Development Indicators*. The control variables include the *GDP per capita*. It is assumed that countries' industrial performances increase with GDP. Economic boom offers more opportunities for industries in terms of increasing purchasing power of consumers (and thus, the demand) that might boost their activities. However, to deal with the potential endogeneity of GDP per capita in the regressions, we consider its value at the beginning of the period (year 1997). This should help reduce a possible reverse causality bias that may arise from the share of manufacturing value added in the GDP to the subsequent levels of GDP/capita in each country. The inflation measured by the *annual growth of consumer prices* is also considered in the study. It is used as an indicator of macroeconomic instability. By assuming that investors prefer to invest in more stable economies that reflect a lesser degree of uncertainty, a negative impact of inflation on industrial output as found by Otalú and Anderu (2015) is expected. Another variable used in our analysis is the *total natural resource rents as share of GDP*. As largely documented in the resource curse literature, a high dependence on natural resources has detrimental effects on economic development (see Van Den Ploeg, 2011; Frankel, 2012; Roy et al., 2013; Papyrakis, 2016; for a review). Other control variables suggested by the literature that we consider in our study are: *Population size*, *Human capital* measured by the net school enrolment in the primary, *financial development* measured by the domestic credit to private sector (% of GDP) and the level of *infrastructures* measured by the Mobile cellular subscriptions (per 100 people). These four variables are expected to positively affect industrial performances. For instance, human capital is known as a key determinant of industrial development, unemployment reduction and increase of the supply of entrepreneurs in any economy (Adejumo et al., 2013).

Table A3 in the annex describes and provides descriptive statistics on the different variables. They show that the manufacturing value added (% of GDP) varies from 0.24% to 39% with an average of 11%. Also, the value added (of GDP) of the whole industrial sector ranges from 3% to 84% with a mean of 26%. As regards to institutional measures, Table A3 shows that the Political Stability and Absence of Violence/Terrorism is the institutional component with the highest average score (60%). The average composite index of institutional quality is 53%.

4. RESULTS

This section presents and discusses the results of our analysis. This analysis is carried out on a panel of 45 Sub-Saharan African countries (see the list of the 45 countries in Table A1 in annex). We begin by fitting a restricted version of our model where the explanatory variables are the institutions and the lagged of the dependent variable. The period of study (1997-2016) is divided into four sub-periods of five years each⁴. In our basic specification, all the variables are measured at the average of each sub-period.

Table 2 below presents the results of our first estimates. The dependent variable is the logarithm of the total manufacturing value added (% of GDP) and the variable of interest is the aggregate index of institutional variable. Estimates were carried out using both annual and 5-years average data.

Tableau 2. System-GMM estimates of composite index of institutional quality on manufacturing sector

Dependent variable: Logarithm of the manufacturing value added (% of GDP)		
	Annual data	5-years average data
Lag of manufacturing value added (% of GDP)	0.946*** (0.002)	0.908*** (0.001)
Institutional quality	0.635*** (0.152)	2.228*** (0.194)
Constant	0.095 (0.098)	-0.372*** (0.118)
Observations	611	717
Number of countries	43	43
Hansen test of overid. restrictions	39.39	27.24

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results show that the coefficients associated with the lagged dependent variable and the institutional variables are positive and statistically significant at 1%. These results suggest that there is persistence in the structural change and industrialization process. They also suggest that good institutions positively affect industrialization. This confirms previous results suggesting a strong relationship between institutions on industrialization (Anaman and Osei-Amponsah, 2009; Martorano, 2017). Therefore, the enhancement of governance and related institutions are crucial for the industrial development in SSA. It has a central place in improving the quality of growth in many African countries (UNECA, 2016).

The industrial sector involves manufacturing and non-manufacturing activities. For robustness check and to test whether the effect of institutions also concern the whole industrial sector, we have replicated the estimates presented in table 2 using the logarithm of the total industry value added (% of GDP) instead of the manufacturing value added (% GDP). Such measure was also used by Adejumo et al. (2013), Otalú and Keji (2015) and Beji and Belhadj (2016). Mensah et al. (2016) used the logarithm of the real value added. The results of our replication are reported in table 3.

Table 3 also shows that the institutional variables have positive and statistically significant coefficients. This is a strong support to the evidence we have found so far about the positive correlation existing between the quality of institutions and the industrialization outcomes. The positive correlation between past and current levels of industrialization is also confirmed.

⁴ The sub-periods are 1997-2001; 2002-2006; 2007-2011 and 2012-2016.

Table 3. System-GMM estimates of composite index of institutional quality on industrial sector

Dependent variable: Logarithm of the industry value added (% of GDP)		
	Annual data	5-years average data
Lag of Industry value added (% of GDP)	0.952*** (0.002)	0.948*** (0.000)
Institutional quality	3.976***	0.186***
Constant	-1.064*** (0.046)	1.237*** (0.059)
Observations	679	780
Number of countries	45	45
Hansen test of overid. restrictions	41.69	20.87

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4. Difference-GMM estimates with different components of institutional quality

Dependent variable: logarithm of the manufacturing value added (% of GDP)						
	1	2	3	4	5	6
Lag of manufacturing value added	0.938*** (0.00)	0.926*** (0.003)	0.934*** (0.002)	0.923*** (0.003)	0.914*** (0.001)	0.930*** (0.001)
Control of corruption	0.421*** (0.054)					
Government's effectiveness		1.855*** (0.227)				
Political Stability			1.224*** (0.243)			
Regulatory quality				2.552*** (0.270)		
Rule of law					1.699*** (0.114)	
Voice and Accountability						0.341** (0.162)
Constant	0.341*** (0.0429)	-0.248 (0.149)	-0.141 (0.152)	-0.665*** (0.148)	-0.151* (0.083)	0.444*** (0.113)
Observations	717	717	717	717	717	717
Number of countries	43	43	43	43	43	43
Hansen test of overid. restrictions	25.73	24.64	26.32	23.24	26.68	26.78

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In the following, we break down the aggregate index of institution into its individual components to check the robustness of our findings and the individual effects of these different components on industrialization. The nature and magnitude of the effects of each component on industrialization could be different. One could guess for instance that the extent to which the citizens are involved in the choice of their government, as well as freedom of expression, freedom of association, and free media (Voice and Accountability) matter less than Political Stability and Absence of Violence/Terrorism in the investment decisions. This conjecture is supported by some empirical evidences. For instance, most studies that use a democ-

racy index as proxy for institutions conclude that its impact on industrial performances is not significant (Mensah et al., 2016; Guadagno et al., 2016). In contrast, studies using an indicator of political stability as proxy for institutions conclude to a strong association with industrialization (Anaman and Osei-Amponsah, 2009; Martorano et al., 2017). The individual dimensions of institutions used in the next estimates are: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government's Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. These variables are also normalised from 0 to 1. Therefore, the more their value is high, the more the quality of institutions is good. The results of the estimations carried out are reported in Table 4. The dependent variable is the logarithm of the manufacturing output and the 5-years average data are considered.

Table 4 shows that the six individual measures of institutional quality have positive and statistically significant coefficients. The variables that account the most in determining industrialization in SSA are Rule of law, political stability and absence of violence/terrorism, government's effectiveness and regulatory quality. Voice and Accountability is the institutional variable that seems to matter the least in the industrialization process of Sub-Saharan African countries.

Table 5: System-GMM estimates with control variables

Dependent variable: logarithm of the manufacturing value added (% of GDP)				
	1	2	3	4
Lag of manufacturing value added	0.904*** (0.002)	0.870*** (0.004)	0.867*** (0.009)	0.882*** (0.009)
Institutional quality	0.507*** (0.077)	0.340** (0.164)	1.256** (0.517)	1.584*** (0.578)
Natural resource rents	-0.023*** (0.002)	-0.034*** (0.002)	-0.040*** (0.005)	-0.027*** (0.003)
Ln GDP0		0.089*** (0.017)	0.115 (0.084)	0.086* (0.049)
Consumer price index		-0.006*** (0.0004)	-0.008*** (0.001)	-0.006*** (0.002)
Population size			0.428*** (0.111)	0.192** (0.085)
Human capital			0.003* (0.001)	0.004*** (0.001)
Financial development				-0.010 (0.007)
Infrastructure				0.0005 (0.002)
Constant	0.922*** 0.057	1.533*** (0.189)	-5.905*** (2.179)	-2.636* (1.492)
Observations	717	682	667	653
Number of countries	43	42	42	41
Hansen test of overid. restrictions	32.900	37.350	35.320	33.590

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

So far, we have not considered the role of the control variables. Previous studies shed light on some possible variables that may have an impact on manufacturing output. We consider seven control variables in our next analysis: financial

development, consumer price index, population size, GDP/capita, natural resource dependence, human capital and infrastructures. Population size and GDP/capita are expressed in their logarithmic form. The set of control variables are added gradually. The dependent variable remains the logarithm of the manufacturing output and the 5-years average data are considered for all the variables except the GDP. Table 5 reports the results.

In general, the results are consistent with the expectations. As with the results of the restricted model, the coefficients of the institutional and the lagged dependent variables remain positive and statistically significant in the different specifications. In column 1, only the resource dependency measure is introduced as additional explanatory variable in the model specified. The results show that heavy dependence on natural resources (approximated by the share of the natural resource rents in the GDP) has a negative impact on industrialization of Sub-Saharan African countries. Indeed, since the seminal works of Sachs and Warner (1995, 1999), several studies have shed light on the negative relation between natural resource and economic performances. The reason is not that natural resources are themselves detrimental to economic development; rather, they cause some distortions that serve as “transmission mechanisms” which in turn negatively affects economic growth (Behbudi, 2010). In column 2, the variables capturing the economic environment which are: initial GDP per capita and consumer price index, are added. As expected, the results suggest that countries with high levels of GDP per capita have high industrial performances. In contrast, having a bad macroeconomic stability (approximated by the consumer price index) has a detrimental impact on industrialization. In column 3, the variables on population (population size and level of human capital) are introduced. The coefficients of these variables are positive and statistically significant. Such results are justified by the fact that population size offers more market opportunities and developed human capital offers more skill workers that attract industrial investments. In column 4, the variables measuring the financial development and the level of infrastructure are introduced. The results show that their coefficients are however not statistically significant.

5. CONCLUSION

This study provides empirical evidence on the impact of institutions on industrialization in Sub-Saharan Africa. In a context where the development of industrial activities in Africa is still marginal, such analysis is important in the perspective of a harmonious structural transformation of the continent’s economy. The study covers the period from 1997 to 2016. The principal component analysis was used to construct an aggregate index of institutional quality based on the six institutional variables from the Worldwide Governance Indicators. These variables are: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government’s Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. The index was further broken down in its different components to investigate the specific effect of each component on industrialization. Our findings confirm the expected result suggesting a strong positive correlation between institutional quality and industrialization. Our findings are robust to various specifications and institutional measures. Improving the quality of African institutions will therefore allow the continent to perform better than its current 1.6% share of the world’s manufacturing value added. In this perspective, a stable and peaceful environment favourable to industrial investments should be implemented. Such objective might be reached by putting in place an equitable social system of redistribution of the national wealth as well as a fair and transparent system of devolution of political

power. Indeed, it turns out that the confiscation of resource rents and power by individuals or group of individuals have been the main cause of past and current conflicts observed in African countries (civil wars in Central African Republic and Cote d'Ivoire for instance). Political instability creates an environment that increases risks and reduces investments (Totouom, 2018). To address the question of corruption that constitutes one of the main institutional failures of African countries, a systematisation of sanctions against indelicate civil servants and reward of those doing their job with honesty and efficiency is required. The business environment in Africa suffers cruelly from the weakness of public services and the lack of a competent and attractive judicial framework. Corrupt public services create a legal and regulatory environment that does not reassure investors about the security of their investments (Totouom, 2018). In addition, a clear separation should be maintained between the executive and the judiciary in order to let judges discharge their duties in total independence.

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ANNEX

Table A1. List of SSA countries

Low-income economies	Benin	Gambia	Rwanda
	Burkina Faso	Guinea	Senegal
	Burundi	Guinea-Bissau	Sierra Leone
	Central African Republic	Liberia	<i>Somalia*</i>
	Chad	Madagascar	<i>South Sudan*</i>
	<i>Comoros*</i>	Malawi	Tanzania
	Congo, Dem. Rep	Mali	Togo
	Eritrea	Mozambique	Uganda
	Ethiopia	Niger	Zimbabwe
	Lower-middle-income economies	Angola	Equatorial Guinea
Cameroon		Ghana	Sudan
Cabo Verde		Kenya	Swaziland
Congo, Rep.		Lesotho	Zambia
Côte d'Ivoire		Mauritania	
Upper-middle-income economies	Botswana	Nigeria	
	Gabon	Mauritius	South Africa
High-income economies		Namibia	
	Seychelles		

**Due to the lack of related data, these countries were not included in the empirical analysis. Source: World Bank (2018).*

Table A2. Principal components/correlation

Component	Eigenvalues	Difference	Proportion (%)
Comp1	4.929	4.531	0.822
Comp2	0.398	0.100	0.066
Comp3	0.298	0.069	0.050
Comp4	0.229	0.144	0.038
Comp5	0.086	0.025	0.014
Comp6	0.060	/	0.010

Table A3. Description and statistics on the variables

Variables	Obs	Mean	Std. Dev.	Min	Max
Manufacturing, value added (% of GDP)	725	10.821	6.599	0.237	39.465
Industry, value added (% of GDP)	798	26.395	13.887	2.595	84.283
Composite measure of Institutional quality	805	0.528	0.193	0	1
Control of Corruption	806	0.398	0.204	0	1
Government Effectiveness	805	0.480	0.181	0	1
Political Stability and Absence of Violence/Terrorism	805	0.602	0.207	0	1
Regulatory Quality	805	0.513	0.171	0	1
Rule of Law	805	0.512	0.183	0	1
Voice and Accountability	805	0.500	0.232	0	1
Ln GDP per capita (1997)	1080	5.661	2.696	0	9.377
Domestic credit to private sector (% of GDP)	878	19.486	23.452	0.410	160.125
Consumer price index (2010=100)	862	89.789	65.504	0.095	1592.385
Total natural resource rents (% of GDP)	917	13.417	13.169	0.001	74.403
Ln population size	955	15.720	1.564	11.256	19.041
Infrastructure	942	32.990	38.180	0	162.384
Human capital	753	96.197	23.341	23.548	149.307

La transformation structurelle de l'Afrique subsaharienne : la qualité des institutions est-elle importante dans son processus d'industrialisation ?

Résumé - La transformation structurelle semble avoir « contourné » le secteur secondaire en Afrique. Or les expériences nationales de développement « sans usines » sont très rares et idiosyncrasiques pour servir de modèle (Cadot et al., 2016). Cet article étudie la transformation structurelle des pays d'Afrique subsaharienne en évaluant l'impact des institutions sur leurs performances industrielles. Les données utilisées pour estimer les différents modèles de panel dynamique sur la période 1997-2016 proviennent du *World Development Indicators* et du *Worldwide Governance Indicators*. Les résultats des estimations mettent en évidence le rôle des institutions comme un déterminant clé des performances industrielles des Etats africains. Les indicateurs de la qualité des institutions qui semblent avoir les effets les plus significatifs sur l'industrialisation sont la stabilité politique et l'absence de violence/terrorisme, la qualité du service public, la qualité de la régulation et l'Etat de droit. Une amélioration de la qualité des institutions pourrait permettre au continent africain d'accroître sa part dans la valeur ajoutée manufacturière mondiale qui n'est que de 1,6%.

Mots-Clés

Institutions
Industrialisation
Afrique Subsaharienne