The Determinants Of Industrialization: Empirical Evidence For Africa

Beji Samouel
University of Sousse, FSEGS-MoFID, Tunisia
Belhadj Aram
University of Carthage, FSEGN-ENVIE, Tunisia
University of Orléans, LEO, France

Abstract

In this paper, we run dynamic panel model describing the relationship between industrialization and different socio-economic, financial and institutional determinants for 35 African countries over the period 1970-2012. We conduct also sub-regional and sub-period analysis in order to check the robustness of the results.

Our main results are the following: (i) As generally found in the literature, Human capital, Labor Market conditions, Real Effective Exchange Rate and GDP per capita are clear determinants of industrialization in Africa; (ii) The determinants of industrialization vary between regions in the continent and evolve over time; (iii) policy interdependencies are significant and positive for industrialization in Africa.

Keywords: Industrialization, Industrial policies, Panel Model, GMM, Africa.

1. Introduction:

It is well documented in various literatures that industrialization has several advantages, especially in the long run, such as economic diversification, unemployment reduction, technology transfer and welfare improvement. This statement seems to be reinforced after the recent economic crisis and the considerable expansion of the financial service sector that brought manufacturing back in the spotlight.

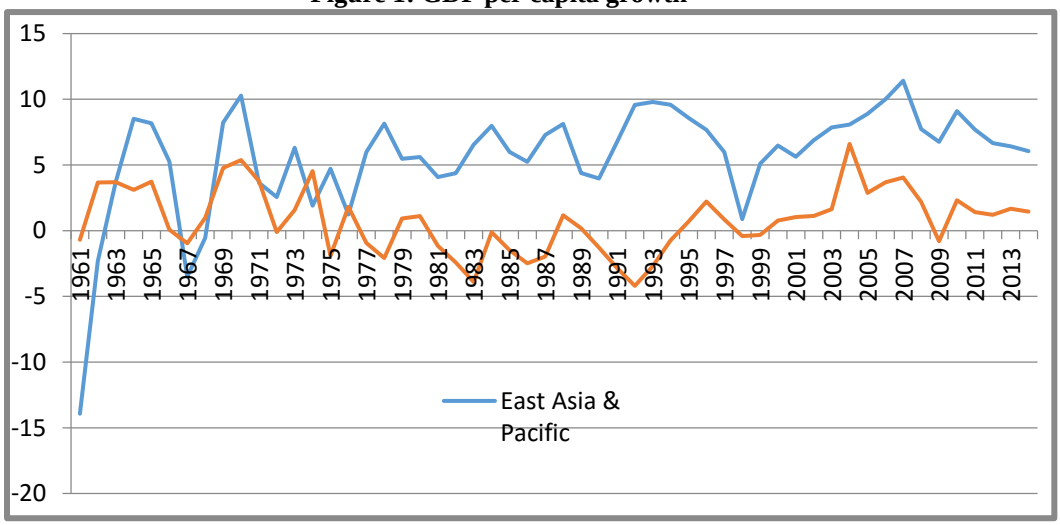
East and South East Asian countries as well as some Latin American ones have experienced remarkable growth linked notably to a switch in their industrial strategy[7]. This switching, manifested by an early mutation from

[7] These countries are called Newly Industrialized Economies (NIEs). Even that there is no commonly agreed criteria for membership to this group, the countries most frequently stated

import substituting approach to export promotion one has been accompanied by an extraordinary prosperity of the industrial sector. Indeed, as shown in figure 1, starting from the 80's, GDP per capita growth in East Asian Countries fluctuated between 6 and 10%.

However, in Africa, industrial policies were not linear, starting from import substitution strategy in the 60's, moving to a combination of the latter one with an export substitution approach in the 70' and 80' before choosing a market oriented strategy in the 90'. The results were disappointing given that the changes from one strategy to another was not translated by an economic transformation and then by an industrial take-off of the continent (Kouassi 2008). Indeed, as figure 1 illustrates, GDP per capita growth was always by far inferior from the one registered in the East Asian and Pacific Countries.

Figure 1: GDP per capita growth



Source: WDI (2014)

The connotation which considers Africa as an agriculture and mining continent remains given the inability of the governments to build up a structural transformation of their economies. Even countries that achieved macroeconomic stability and evidenced good governance seemed unable to attract much investment outside of the extractive sector.

Obviously, despite the gap of industrial performances between Africa and the other emerging countries, industrial development seems to be given less weight than deserved in African countries. Most political leaders have indeed underestimated the real potential of industrialization for the continent. At the same time, only few researchers have dealt with the reasons that lie

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are: Hong Kong, Singapore, Korea, Taiwan, Argentina, Brazil, India, China with Malaysia, Indonesia and Thailand sometimes included as well (Weiss 2002).

behind the delayed emergence of Africa as an industrialized bloc. Therefore, understanding the underdevelopment of industry in African countries and paving the way for an appropriate industrial policy to them seems challenging.

The aim of this paper is twofold. It first tries to fill the aforementioned void by emphasizing the main determinants of the (de) industrialization process in a sample of African countries. It subsequently tries to use the results to address the implications for the continent and map out the way for a genuine emergence of Africa.

The rest of the paper is structured as follows: Section 2 reviews the theoretical determinants of Industrialization and points out some findings in the literature related to these determinants in developing countries, African countries in particular. Section 3 highlights the empirical methodology. Section 4 presents the main estimation results. Section 5 tries to carry out some robustness analysis. Finally, Section 6 concludes and offers some policy recommendations.

2. Industrialization vs. De-Industrialization: the main factors

Basically, many factors could promote or hinder industrialization process. Some of them are socio-economic, others are financial while others are institutional. Though the literature is extensive in this frame, we consider here only some of the important determinants of industrialization while stating each time, the mainly empirical approach used in this frame.

Internal vs. external demand

There is a significant positive relationship between manufacturing expansion and internal demand so that, other things being equal, larger countries tend to have a higher manufacturing share. In others words, as incomes per capita raise, share of manufacturing in national income increases.

However, small countries are often open, so, level of economic activity in developed economies could have a major impact on growth prospects in developing countries, particularly through changes on export demand. Therefore, changes in formers economies' GDP could influence industrial activity in the latter ones.

Guadagno (2012), basing on Cornwall (1977) model in order to estimate a manufacturing growth equation for a sample of developing countries, shows that the size of the domestic market as well as trade openness are a constant determinants of industrialization.

Economic openness

Following outward-looking industrial strategy allow access to large markets and a growing demand which encourage a large scale industrialization programs (case of East Asian New Industrialized Economies such as Hong Kong, Singapore, Taiwan and Korea). Moreover, trade liberalization allows access to imported inputs at free trade prices, access to technology and capital as well as a more competitive exchange rate which boost industry growth. This is the case for developing countries in so much as closer integration with the world economy in the second half of the last century was associated with higher economic growth, disapproving predictions of the emergence of stagnationary global forces holding back their material progress (Weiss 2002).

In the other hand, flow of FDI, especially in manufacturing, by transferring capital, technology, management, stable financing and marketing techniques could act positively on growth and exports and then reinforce the industrialization process for the host country. Inversely, in a relatively closed or protected economy, enterprises will be both less aware of technical change internationally and will have less incentive to adopt best practice innovation. Fostering obsolete technology and high cost activities lead to low attractiveness of FDI and hamper the opening to the world markets which affects negatively the industrialization process.

Babatunde (2009), basing on a panel least squares estimation as well as time/series cross-section techniques in a large sample of Sub-Saharan Africa (SSA) find that trade liberalization can stimulate export performance albeit marginally and indirectly.

Likewise, Seetanah and Khadaroo (2007), by extending Cobb Douglas production function whereby investment is disaggregated into its different types and employing both static and dynamic panel data estimates, found that FDI is an important element in explaining economic performance in these countries, though to a lesser extent as compared to the other types of capital.

However, one cannot necessarily deduce from this evidence support for the generalization that outward-looking trade strategies and complete liberalization of FDI represent the most effective policy for all developing countries at all times[8]. State policy intervention, notably in favor of infantile industry seems to be inevitable in so much as it offers a protection from hard competition, especially during the earlier period of industrialization. In Taiwan and Korea for instances, import-substitution strategy (import quotas, tariffs, export taxes…) has not disappeared with the shift toward export intensive industries. Likewise, the state constantly intervened with

[8] See Boone (1994) for example.

inducements to encourage international capital to move up the industrial ladder (Stein 1995).

Shafeddin (2005) prove that, on the contrary to the NIEs, trade liberalization has led to de-industrialization of low income countries that has not adopt selective protection policies, particularly the Sub-Sahara African countries. Indeed, industrialization has been accompanied by increased vulnerability of the economy, particularly the manufacturing sector that relayed heavily on imports.

In the same frame, Agosin and Mayer (2000), by testing the effect of FDI on domestic investments for three developing regions (Africa, Asia and Latin America), found that this effect is various. In particular, FDI are crowding-in for Ivory Coast, Ghana and Senegal, neutral for Gabon, Kenya, Niger, Morocco and Tunisia while it is crowding-out for Central African Republic, Nigeria, Sierra Leone and Zimbabwe. So, evidently, FDI are by no means always favorable and simplistic policies for this kind of investments are unlikely to be optimal.

Macrostability

Generally, a stability of the macro environment encourages growth given that it leads firms to act in a rational manner. That's because, in a context of low inflation, suitable deficit and public debt, more risk-averse investment behavior is limited and access to financial and capital markets is less difficult. This is especially important in African countries where there may be a dearth of entrepreneurship[9].

In the other hand, maintaining stable exchange rates prove to be important insofar as it affects long run growth. Indeed, avoiding exchange rate misalignments could protect exporters from an overvaluation phenomenon that affects competitiveness as well as importers from undervaluation that affects purchases and investment programs. Moreover, exchange rate volatility makes difficult and expensive for developing countries to hedge their exchange rate risks, especially small and medium sized firms.

Rodrik (2008), by using both inflation and terms of trade as additional exogenous covariates in a panel model explaining economic growth in manufacturing, finds a negative and significant relationship between growth and inflation in developing countries.

In the same way, Greenwald and Stiglitz (2006) prove that, in developing countries, low exchange rates help export sectors like manufacturing to compete, especially sectors which have higher learning elasticities and generate more learning externalities. That's way many

[9] See Reinhart and Rogoff (2003) for more details.

countries have managed to lower their real exchange rate for an extended period of time, and have done so at the same time that they have promoted growth.

Human capital

Human capital development in the form of sufficient technically and scientifically qualified personnel allows coping with the increase of demands and industrial development. Indeed, creating immobile national assets, notably through education, training and healthcare spending could provide the base for competitive industrial sector and improve the attractiveness of investments. Therefore, increasing government support to education, improving vocational training and guaranteeing access to healthcare are prerequisites for any form of industrialization.

Zelleke et al. (2013), by using growth accounting approach to identify the sources of economic growth and by resorting to Pritchett (2001) and Weil (2013) conceptual frameworks, show that human capital have positive effects in SSA countries (they account for 22% of real GDP) but much lower than in high-income countries.

Governance

The presence of institutions capable of guaranteeing better rule enforcement, transparency, absence of corruption and government stability could improve doing business climate and stimulate entrepreneurial spirit. On the contrary, the existence of significant governance deficiencies could render difficult the building up of a solid industrial sector and complicate the leading of appropriate industrial policy[10].

In the other hand, government interventions in an inconvenient way could create distortions and lead to economic inefficiency. Maintaining rigid rules, such as considerable labor market regulation for example, could hinder the well-functioning of the markets and deter industrialization efforts.

Clague et al (1997), using a cross-country regression model, prove that differences across countries in property relations and contract enforcement lead to high transaction costs and thus have a negative impact on growth.

Similarly, by employing a structural regression model similar to that used by Sachs and Warner (1998) for analyzing the sources of economic growth in Africa, Ng and Yeats (1999) found that governance regulations (plus national trade) explain over 60 percent of the variance in some

[10] For deep analysis, see among others Collier (2000), Curry and Weiss (2000) and Williamson (2000).

measures of economic performance and thus, country's own national policies shape its rate of development, industrialization, and growth.

Financial development

The presence of financial institutions insuring better allocation of resources could affect the industrialization process. In particular, existence of efficient banking system insuring careful financing to firms, notably small and medium sized firms, reinforce domestic entrepreneurship capabilities[11].

Much attention could also be given to the functioning of financial markets and the ability of firms to obtain adequate financing. Generally, a well-developed system of financial institutions could transfer efficiently funds from savers to investors and monitor the effectiveness of investments.

Ghirmay (2004) for instance, provide evidence of the existence of a long-run relationship between financial development and economic growth in almost all (12 out of 13) of SSA countries using a Vector autoregression (VAR) framework based on the theory of cointegration and error-correction representation of cointegrated variables.

3. Empirical Methodology:

Basic Objective

In this paper, we try to verify if the aforementioned determinants matter for the industrialization process in Africa. To do that, we run panel model for 35 African countries[12] over the period 1970-2012, describing the relationship between an industrialization index and different regressors which include a variety of socio-economic indicators (GDP per capita, importance of foreign direct inflows, degree of openness to trade, financial deepening and human capital development) as well as institutional ones (magnitude of labor market rigidity and good governance).

In addition, given that the aforementioned indicators can interact with each other, we add some combined terms in order to capture this interaction. In particular, we consider here that the effect of financial development on industrialization could be influenced by the institutional environment (interaction between financial development and governance). Likewise, the

[11] See among others Liedholm and Mead (1999).

[12] Our sample contains: Algeria, Angola, Botswana, Burkina Faso, Cameroon, Congo Republic, Congo Democratic Republic, Côte d'Ivoire, Egypt, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Liberia, Libya, Malawi, Mali, Morocco, Mozambique, Namibia, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia and Zimbabwe.

effect of trade openness (imports and exports) on industry could be influenced by the degree of development of financial systems (interaction between trade openness and financial development).

Therefore, we estimate a model of the form:

$$\begin{aligned} INDUSTRY_{it} &= \gamma_0 + \gamma_1\, INDUSTRY_{it\text{-}1} + \gamma_2\, FIN_{it} + \gamma_3\, FDI_{it} + \gamma_4\, LAMRIG_{it} \\ &+ \gamma_5\, GOV_{it} + \gamma_6\, REER_{it} + \gamma_7\, GDP_{it} + \gamma_8\, TRADE_{it} + \gamma_9\, HUMAN_{it} \\ &+ \gamma_{10}\, GOV \times FIN_{it} + \gamma_{11} FIN \times TRADE_{it}\; U_{it} \end{aligned} \quad (1)$$

$$\text{With: } U_{it} = \mu_i + \varepsilon_t + \nu_{it} \quad \text{where } \nu_{it} \to N(0, \sigma_\nu^2) \text{ (i.i.d)}$$

Baltagi et al. (2009) stipulate that the inclusion of the lagged dependent variable in the empirical model implies that there is correlation between the regressors and the error term since lagged INDUSTRY depends on U_{it-1} which is a function of the μ_i, the country specific effect. Because of this correlation, dynamic panel data estimation of (1) suffers from the Nickell (1981) bias, which disappears only if T tends to infinity. The preferred estimator in this case is GMM suggested by Arellano and Bond (1991), which basically differences the model to get rid of country specific effects or any time-invariant country specific variable[13].

For a better use of the GMM system method, Roodman (2006) suggests the introduction of time dummies variables. Moreover, for the endogenous variables, only their lagged values of at least 2 periods are considered as valid instruments. The number of instruments should not exceed the number of groups, so, the p-value of the Sargan test of overidentifying restrictions as well as the Arellano-Bond test for serial correlation in the second-differenced errors should be above 0.1[14].

Other authors instrument endogenous variables with fewer lags because, they consider that, if all the lags are used, the number of instruments surpasses the number of groups and this makes Sargan test weak and estimations unreliable.

In equation (1) the coefficients γ_1, γ_2, γ_3, γ_4, γ_5, γ_6, γ_7, γ_8, γ_9, γ_{10} and γ_{11} measure the long-run response of INDUSTRY respectively to changes in INDUSTRY lagged variable by one period, financial system development (FIN), foreign direct investment net inflows as share of GDP (FDI), labor market rigidity (LAMRIG), governance index (GOV), real effective exchange rate (REER), GDP per capita (current$) (GDP), trade

[13] An additional advantage of the GMM estimator is the following: by differencing, it helps ensuring the stationnarity of all the regressors.

[14] Sargan test indicates whether the instruments are jointly valid, i.e. if they are not correlated with the error term. So, if these tests are weakened, it is hard to gauge the validity of the instrumental estimation.

openness (TRADE), human capital indicator (HUMAN), interactive term between financial development and governance (GOV*FIN) and interactive term between financial development and trade openness (FIN*TRADE). The instrumental variables for the linear model in (1) are FIN{1}, FDI{1}, LAMRIG{1}, GOV{1}, REER{1}, HUMAN{1}, GOVFIN{1}, FINTRADE {1}, GDP{2} and TRADE{2} where {1} and {2} denote the lag-length of a variable. GDP and TRADE were instrumented by 2 lags variables since they are considered as endogenous. In panel data, regressors in other periods are considered valid instruments for period-t regressors if the latter are either endogenous or introduced in the model as lags of the dependent variable. These instruments permit consistent estimation even if the assumption of strict exogeneity fails[15].

Definition of variables and Data

The variables used in our regression are the following:

INDUSTRY: Industry value added as share of GDP. It comprises value added in mining, manufacturing, construction, electricity, water and gas. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources.

FIN: Financial development indicator approximated by the share of domestic credits provided by the financial sector. It includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The financial sector includes monetary authorities and deposit money banks as well as other financial corporations. Examples of other financial corporations are finance and leasing companies, money lenders, insurance corporations, pension funds and foreign exchange companies.

FDI: Foreign Direct Investment in net inflows as share of GDP. Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) from foreign investors, and is divided by GDP.

LAMRIG: Labor Market Rigidity Index. This index captures the rigidity of employment protection legislation. LAMRIG is high when the labor market is rigid and vice versa.

[15] Hossain and Mitra (2013): "A Dynamic Panel Analysis of the Determinants of FDI in Africa", *Economics Bulletin*, 33(2), p. 1608.

GOV: Governance index which measures the political and institutional development. We calculate it by applying principle component analysis for 12 other sub-indicators: Government Stability, Socioeconomic Conditions, Investment Profile, Internal Conflict, External Conflict, Corruption, Military in Politics, Religious Tensions, Law and Order, Ethnic Tensions, Democratic Accountability and Bureaucracy Quality.

However, the problem with the construction of the institutions quality indicator stems from the heterogeneous scale of the sub-indicators. Indeed, Corruption, Law and Order, Military in Politics, Religious Tensions, Ethnic Tensions and Democratic Accountability are scaled between 0-6, whereas Government Stability, Socioeconomic Conditions, Investment Profile, Internal Conflict and External Conflict are scaled between 0-12 and Bureaucratic Quality between 0-4. Therefore, we unified all the proxies to obtain an indicator scaled between 0-6. To do that, we multiplied the proxies scaled between 0-4 by 3/2 and divided by 2 those scaled between 0-12.

REER: Real effective exchange rate. It measures the development of the real value of a country's currency against the basket of its trading partners. It is calculated from the nominal effective exchange rate and the relative CPI (Consumer Price Index) between the country and its trading partners.

GDP: GDP per capita in current dollar is a proxy for the economic development. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

TRADE: Trade openness indicator which is the sum of exports and imports as a share of GDP. But, we decompose here this variable into two sub-indicators in order to verify if industrialization process is more determined by imports or exports.

HUMAN: Human capital indicator is the gross secondary school enrollment ratio. It is the share of number of actual students enrolled at secondary school by number of potential students enrolled.

The variables INDUSTRY, FIN, FDI, GDP, TRADE (Exports and Imports) and HUMAN are subtracted from the World Development Indicators database (2014). REER variable is extracted from the International Financial Statistics database (2014). GOV indicator is constructed basing on the International Country Risk Group database (2014). Finally, LAMRIG is deduced from the work of Campos and Nugent (2012)[16].

[16] Campos, N.F and Nugent, J.B (2012) 'The Dynamics of the Regulation of Labor in Developing and Developed Countries since 1960' IZA DP N°6881.

Ramsey Reset Specification Test

Before running up our model estimation, we started by testing the specification of our equation with the Ramsey Reset specification test. The aim of this test is to check whether the model estimated is well-specified or mis-specified. The procedure of the Ramsey Reset test takes place in three steps:

a. Estimating the equation and retrieving the predicted value of the dependent variable;
b. Estimating the structural equation by adding the squared, the cubed and power 4 predicted dependent variable to the covariates (explanatory variables);
c. Applying the Fisher test to check the global significance of the three additional variables.

The result of this test is reported below (Table 2) and shows that our model is well specified.

4. Empirical results:

Before moving to empirical results, we show first some main descriptive statistics for all the model variables.

Table 1. Summary Statistics (1970-2012)

Variables	Observations	Mean	Standard Deviation	Min	Max
INDUSTRY	1313	28.49	14.43	1.88	78.51
Lagged INDUSTRY	1290	28.44	14.46	1.88	78.51
FINANCE	1302	33.36	35.7	-79.09	319.53
FDI	1296	2.72	7.65	-82.89	91
HUMAN	1086	27.35	21.75	1.05	112.62
LAMRIG	1016	1.48	0.37	0.6	2.45
GOVERNANCE	863	2.78	0.77	0.38	5.04
TEER	536	170.11	222.2	37.97	3579.12
GDP	1402	1047.24	1570.85	62.93	15853.46
TRADE					
Exports	1375	29.83	16.64	2.52	91.51
Imports	1372	35.07	15.24	2.98	144.72

As shown in table 1, the majority of our regressors show evidence of important volatility except the institutional ones (Governance and Labor market regulation). It is an expected result since these variables vary very little in time. The standard deviation of GDP is very large which attests the heterogeneity of our sample.

Secondly, following Baltagi et al. (2003), Jacob and Osang (2007) and Szirmai and Verspagen (2011), we separately inspected each single explanatory variable of the panel model adopted by means of endogeneity tests (not reported here) in order to identify which variables are endogenous.

Tests showed that Trade Openness variables and GDP per capita are both endogenous.

Table 2. Empirical Results

Variables	Coefficients	
L.INDUSTRY	(-)	0.56 (0)***
FINANCE	(+)	0.09 (0.15)
FDI	(+) or (-)	-0.05 (0.44)
HUMAN	(+)	0.13 (0)***
LAMRIG	(-)	-14.32 (0)***
GOVERNANCE	(+)	-0.27 (0.68)
REER	(-)	-0.003 (0.04)**
GDP	(+)	0.001 (0)***
EXPORTS	(+)	0.16 (0)***
IMPORTS	(+) or (-)	-0.13 (0)**
GOVERNANCE*FINANCE	(+)	0.02 (0)***
FINANCE*TRADE	(+)	0.001 (0)***
Intercept		35.51 (0)***
AR(2)		1.16 (0.24)
Sargan Test		230.85 (0.13)
Ramsey Rest Test		0.62 (0.66)

Figures in parentheses are robust standard errors, except for Sargan test and Autocorrelation errors test of Arellano-Bond (AR2) which are p-value. For AR(2), Sargan test and Ramsey Reset test, null hypotheses is respectively absence of second order autocorrelation, validity of lagged variables as instruments and right specification of the model. ***, ** and * denote significant at 1%, 5% and 10%, respectively.

According to Table 2, it is visible that, for the sample taken as a whole, Human capital indicator (HUMAN), Labor Market Rigidity (LAMRIG), Real Effective Exchange Rate (REER), GDP per capita (GDP) and Exports are clear determinants of industrialization. However, Financial development and FDI are not significant. A possible explanation for the first variable is the absence of a well-developed financial system threshold that

allows an efficient transfer of funds from savers to investors and a better monitoring of investments effectiveness. For the second variable, it probably means the failure in pursuing convenient industrialization openness strategies. Most FDI are then oriented toward based-resources sectors instead of manufactured ones.

Table 2 shows also that the interaction term grouping Finance and Trade (FINTRADE) is positive and significant which reflects the importance of policy interdependencies that are likely to play an important role in Africa. In particular, even if financial development seems to exert no effect on industry when taken as single determinant, the interaction between Financial development and Trade is beneficial for industrial development in Africa. In other words, openness to trade affects industrialization process when resources allocation is guaranteed by efficient banking and financial systems[17].

Similarly, even if governance seems to exert no effect on industry when taken as single determinant, the interaction between Financial development and governance is beneficial for industrialization process in Africa. Put differently, institutional environment seems to play an important role in shaping the effect of financial development on industrialization in the continent.

5. Robustness Analysis:

We conduct here sub-regional and sub-periods analysis in order to check the robustness of the results. We first divided the sample into 5 sub-samples: North Africa (Algeria, Egypt, Libye, Morocco and Tunisia), West Africa (Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo), Central Africa (Cameroon, Congo Dem Rep, Congo Rep, Gabon), East Africa (Ethiopia, Kenya, Sudan, Uganda) and South Africa (Angola, Botswana, Mozambique, Malawi, Namibia, Tanzania, South Africa, Zambia and Zimbabwe). This division is linked to the heterogeneity of the African economies. We next subdivided the time span into 2 sub-periods: 1970-1990 and 1991-2012. This subdivision is linked to the fact that, since the 1990's, almost all African countries have moved from an inward oriented industrial strategy to an outward oriented ones.

[17] The results do not change even if we divide Trade into imports and exports.

Sub-regional analysis

Table 3a. Empirical Results

	North Africa		South Africa	
L.INDUSTRY	(-)	0.38 (0)***	(-)	1.12 (0)***
FINANCE	(+)	0.74 (0)***	(+)	0.96 (0)***
FDI	(+) or (-)	0.27 (0.36)	(+) or (-)	2.21 (0)***
HUMAN	(+)	0,15 (0.78)	(+)	0.21 (0.21)
LAMRIG	(-)	-15.82 (0)***	(-)	8.1 (0.2)
GOVERNANCE	(+)	5.07 (0.05)**	(+)	2.21 (0)***
REER	(-)	-0.02 (0)***	(-)	0.07 (0.05)**
GDP	(+)	-0.001 (0.536)	(+)	-0,007 (0.22)
EXPORTS		0.75 (0)***		0.11 (0.567)
IMPORTS		0.09 (0.57)		0.45 (0)***
GOVERNANCE*FINANCE	(+)	0.14 (0)***	(+)	0.1 (0.02)**
FINANCE*TRADE	(+)	-0.002 (0.2)	(+)	0.02 (0.02)**
Intercept		-4.5 (0.72)		
AR(2)		0.3 (0.76)		0.39 (0.54)
Sargan Test		54.95 (0.17)		46.89 (0.23)

Figures in parentheses are robust standard errors, except for Sargan test and autocorrelation errors test of Arellano-Bond (AR2) which are p-value. For AR(2) and Sargan test, null hypotheses is respectively absence of second order autocorrelation and validity of lagged variables as instruments. ***, ** and * denote significant at 1%, 5% and 10%, respectively.

	East Africa		Central Africa		West Africa	
L.INDUSTRY	(-)	0.51 (0)***	(-)	-0.47 (0.02)**	(-)	0.67 (0)***
FINANCE	(+)	0.62 (0)***	(+)	-2.48 (0.03)**	(+)	0.38 (0.08)*
FDI	(+) or (-)	-0.51 (0.53)	(+) or (-)	0.21 (0.19)	(+) or (-)	-0.02 (0.82)
HUMAN	(+)	0.27 (0)***	(+)	0.62 (0)***	(+)	0.11 (0.08)*
LAMRIG	(-)	dropped	(-)	dropped	(-)	-6.69 (0.01)***
GOVERNANCE	(+)	-4.6 (0)***	(+)	2.42 (0.15)	(+)	-5.84 (0)***
REER		-0.05 (0)***	(-)	-0.05 (0.17)	(-)	-0.08 (0.07)*
GDP	(+)	0.02 (0)***	(+)	0.02 (0)***	(+)	0.01 (0)***
EXPORTS		0.19 (0)***		0.06 (0.79)		0.35 (0)***
IMPORTS		0.35 (0)***		0.08 (0.72)		-0.2 (0)***
GOVFIN	(+)	0.34 (0)***	(+)	0.34* (0.09)	(+)	-0.01 (0.47)
FINTRADE	(+)	0.01 (0)***	(+)	0.01 (0.03)**	(+)	-0.05 (0.13)
Intercept		-0.76 (0)***				18.56 (0.01)***
AR(2)		2.19 (0.16)		-0.34 (0.27)		0.28 (0.14)
Sargan Test		22.01 (0.12)		18.42 (0.33)		21.11 (0.13)

Figures in parentheses are robust standard errors, except for Sargan test and autocorrelation errors test of Arellano-Bond (AR2) which are p-value. For AR(2) and Sargan test, null hypotheses is respectively absence of second order autocorrelation and validity of lagged variables as instruments. ***, ** and * denote significant at 1%, 5% and 10%, respectively.

Basing on the above-mentioned results, we prove that the determinants of industrialization in Africa vary between regions. Indeed, Table 3a shows that financial development, governance, labor market conditions, REER and trade openness (exports rather than imports) are the most determining factors of industrialization in North African Countries. However, financial development, human capital and GDP matter much more for the Western and Eastern African Countries while FDI is the most important determinant in the Southern African Countries next to REER, financial development and governance.

We also notice that the complementarities between financial development and governance are active to boost industrialization in the

entire continent except in Western and Central Africa. Regarding the link between trade openness and industrialization, the results show that only in Southern and Central Africa, exports do not have a significant effect while imports do for the Southern countries. Finally, only in Eastern, Central and Southern African Countries, financial development interplays with trade while financial development interacts significantly with governance except in West Africa.

These results can reflect:

- The flexibility introduced on the labor and exchange markets, the signature of many free trade agreements as well as the several institutional reforms introduced in some North African countries (especially Tunisia, Egypt and at less extent Morocco).
- The efforts in promoting education and vocational training to raise the economy in Western and Eastern African Countries.
- The institutional reforms, the infrastructural efforts, the development of innovation patterns as well the targeting of more capital intensive FDI in Southern African countries.
- The success in boosting economic growth in central African Countries.

Table 3a shows also that governance is significant for Western and Eastern African Countries but with unexpected sign. A plausible explanation has been already introduced by Campos et al. (2010) and Méon and Weill (2011) who consider that corruption, for example, facilitates economic activity and trade that may not have happened otherwise and then promotes efficiency by allowing private sector agents to circumvent cumbersome regulations and restrictions.

Subperiod analysis

Table 3c. Empirical Results

	1970-1990		**1991-2012**	
	Coefficients		**Coefficients**	
L.INDUSTRY	(-)	0.99 (0)***	(-)	0.72 (0)***
FINANCE	(+)	-0.05 (0.54)	(+)	-0.09 (0.23)
FDI		-0.05 (0.48)		-0,03 (0.83)
HUMAN	(+)	-0.03 (0.55)	(+)	0.07 (0.01)***
LAMRIG	(-)	-2.37 (0.08)*	(-)	-3.82 (0)***
GOVERNANCE	(+)	2.43 (0.21)	(+)	0.45 (0.57)
REER	(-)	-0,004 (0.17)	(-)	-0.01 (0.07)*

GDP	(+)	0.001 (0.7)	(+)	0.002 (0.45)
EXPORTS		0.07 (0.15)		0.3 (0)***
IMPORTS		-0.04 (0.22)		-0.27 (0)***
GOVERNANCE*FINANCE	(+)	0.03 (0.18)	(+)	0.01 (0.07)*
FINANCE*TRADE	(+)	0 (0.85)	(+)	0.001 (0.05)**
Intercept		12.94 (0.02)**		15.87 (0)***
AR(2)		1.12 (0.26)		0.85 (0.39)
Sargan Test		63.14 (0.11)		96.22 (0.14)

Figures in parentheses are robust standard errors, except for Sargan test and autocorrelation errors test of Arellano-Bond (AR2) which are p-value. For AR(2) and Sargan test, null hypotheses is respectively absence of second order autocorrelation and validity of lagged variables as instruments. ***, ** and * denote significant at 1%, 5% and 10%, respectively.

Results on Table 3b prove that only LAMRIG is clear determinant of industrialization during the whole period 1970-2012. However, HUMAN becomes significant over the period 1991-2012. The latter result is probably related to the efforts taken during the last few years on the field of education, training, healthcare and technology as well as to the demographic evolution in the continent.

What is also worth noting is that exports and imports become significant in explaining the dynamics of industrialization in Africa only after 1990. This is probably due to the transition from inward looking strategy to outward looking ones.

Finally, policy interdependencies become clear determinant of industrialization from the beginning of the 1990's. In fact, the interaction term between trade and financial development as well as between financial development and institutional quality acts positively on industrialization during the period 1991-2012 and not before.

6. Conclusion and some policy implications:

In Africa, the industrial landscape continues to be poor. This gives the problematic of industrialization a very important interest. In fact, globalization and deep integration offers African countries considerable potential for future growth via industrialization.

This paper sheds some light on the main factors that helped or hindered the realization of such potential and the way for Africa to emerge. Thus, we run first a dynamic panel model describing the relationship

between industry and their main determinants found in the literature. We find that for the whole region, Human capital, Labor Market conditions, Real Effective Exchange Rate and GDP per capita are clear determinants of industrialization. However, we find positive effects of exports and negative effects of imports on industrial development. Finally, we find policy interdependencies significant and positive for industrialization in Africa.

It goes without saying that things have to be changed, especially given the low capacity of the industrial sector to upgrade and to offer enough jobs in Africa. Put it differently, to increase hopes for an effective industrialization and so for a real emergence of the continent, African countries should break up with old policies. This means essentially better mobilizing resources, improving business environment, building sound macroeconomic stability, insuring good governance and enhancing human capital to attract the adequate foreign direct investment from abroad (not just targeting the FDI based on the low wages in developing countries) which is an intermediate goal to achieve industrialization. This also means switching from bad financial and trade policies, building more efficient financial systems and better managing trade openness.

Secondly, we conduct sub regional analysis and we find that financial development, governance, labor market conditions, REER and exports are the most determining factors of industrialization in North African Countries. However, financial development, human capital and GDP matter much more for the Western and Eastern African Countries while FDI is the most important determinant in the Southern African Countries next to REER, financial development and governance.

We also notice that the complementarities between financial development and governance are active to boost industrialization in the entire continent except in Western and Central Africa. However, only in Eastern, Central and Southern African Countries, financial development interplays with trade while financial development interacts significantly with governance except in West Africa

Therefore, it is important to improve labor market flexibility and instigate good governance in Northern African Countries, reinforce the resilience of the financial systems in Eastern African countries, maintain macroeconomic stability and further enhance human capital in Western African countries, boost trade integration in Central African countries and finally encourage and better target FDI in Southern African countries.

Thirdly, we subdivided the time span into 2 sub-periods (1970-1990 and 1991-2012) and we find that the results obtained from the second period (1991-2012) do not differ substantially from those obtained during the whole period. Indeed, Human capital, Labor Market conditions, Real Effective Exchange Rate, trade variables as well as policy interdependencies

(interaction terms) are significant. Only labor market index is significant during the whole period.

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