

MANUFACTURING AND DEVELOPMENT IN COUNTRIES AND AREAS OF AFRICA, 2000-2010

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Abstract. In this study we analyze the evolution of economic development in 6 areas and 38 countries of Africa for the period 2000-2010. We find that industrialization in Africa shows little increase with an average value added of Manufacturing per head, at constant prices, of only 278 in year 2000 and 282 in year 2010, clearly below World average. Northern Africa and Southern Africa are the areas with the highest levels in Africa, but with relatively low values, below 1000 Dollars per head, in comparison with World average. North West Africa and Eastern Africa have low values although with a positive evolution for that period, while Sahel-Central Africa and North East Africa show very low values and stagnation for the period 2000-2010. We find that it is of great importance to foster the educational level of human capital, health assistance, infrastructures and conditions to favour industrial development and tourism in many countries and areas of Africa. As seen in this and other studies, empirical evidence shows the great importance of Kaldor's views on the positive impact of industrialization on economic development. We estimate an econometric model that shows the positive impact of manufacturing on economic development of African countries. International cooperation through foreign investment and official development aid is interesting but we must have into account other ways of international cooperation like private foundations, foreign trade of goods and tourism, accordingly to Guisan, Aguayo and Exposito(2015), and other studies that quantify and analyze several ways of international cooperation to foster socio-economic development in low income countries.

Keywords: Kaldor, Industry, Manufacturing, African countries, Development for 2000-2010, Econometric Model.

JEL codes: C5, L6, N16, O14, O51, O54

1. Introduction

In this study we analyze the evolution of economic development in countries and areas of Africa for the period 2000-2010, following previous studies published by Guisan and Exposito(2001) and (2003) for the evolution of the period 1980-1999, and the analysis of Guisan(2014) and Guisan and Exposito(2014) by areas.

Section 2 presents a comparative table of the degree of economic development, investment and savings in 6 areas of Africa together with other groups of areas of the World and the total average.

Section 3 analyzes the evolution of manufacturing and non-manufacturing real value-added per head in countries of Africa. We may notice that several countries, in spite of a positive evolution for the period 2000-2010, have yet very low values of these variables and conclude that international cooperation should be favoured in order to foster economic development in those countries.

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Section 4 presents the estimation of an econometric model that quantifies the positive impact of Manufacturing on Non-Manufacturing in African countries. The model shows the important impact of manufacturing on economic development, in agreement with other empirical studies and Kaldor's perspectives. For that reason, it is important to foster international cooperation in order to provide support to infrastructures, the educational level of population, and other factors that are necessary to favour manufacturing and development in many African countries.

Section 5 presents the main conclusions, and the Annex some supplementary data.

2. Manufacturing, Investment and Development in 6 Areas of Africa, 2000-2010.

Table 1 indicates the list of countries included in each area of this study, together with the evolution of Population (million people) and table 2 shows the evolution of Manufacturing real value-added per capita (qmh), for the period 2000-2010, together with real Gross Domestic Product per capita (GDPH), investment per capita (IH) and Savings per capita (SH), in 6 areas of Africa, in comparison with other areas and with World average.

Table 1. Areas of Africa: countries and population (Pop) (million)

Area	Countries and territories	Pop 2000	Pop 2010
1. N Africa	2 Algeria, 37 Egypt AR, 77 Mauritania, 81 Morocco, 119 Tunisia	138	162
2. NW Africa	12 Benin 31 Cote d'Ivoire 46 Ghana 49 Guinea 90 Nigeria 104 Senegal, 105 Sierra Leone 118 Togo	190	246
3.Sahel-Central Africa	17 Burkina F. 18 Burundi 20 Cameroon 22 C.African R 23 Chad 28 Congo DR, 29 Congo 76 Mali 89 Niger 102Rwanda	130	172
4. NE Africa	39 Eritrea 41 Ethiopia	68	88
5. EasternAfrica	63 Kenya 73 Madagascar 116 Tanzania 122 Uganda	106	139
6.Southern Africa	3 Angola 14 Botswana 70 Lesotho 74 Malawi 82 Mozambique 84 Namibia 109 South Africa 131 Zambia 132 Zimbabwe	116	139
Total Africa		748	946

Table 2 presents data, by area, of the real values of the following variables, in Dollar of the United States at 2005 prices and Purchasing Power Parities (PPPs), for they years 2000 (00) and 2010 (010):

QMH= Value added of Manufacturing per head (QMH00, QMH10)

QNMH = Value added of Non-Manufacturing per head (QNMH00, QNMH10)

PH = Gross Domestic Product per head in years 2000 and 2010 (PH00, PH10)

IH = Investment per head, in years 2000 and 2010 (IH00, IH10)

SH = Savings per head in year 2000 and 2010 (SH00, SH10)

We may notice the low average capacity for Saving and Investment in Africa, around 600 Dollars per head in year 2010 while the World average was around 2400 in that year.

Table 2. Production, Investment and Savings, per inhabitant in Areas of Africa and in the World.
(Dollars at prices and Purchasing Power Parities of year 2005)

Area	qmh 00	qmh 10	qnmh 00	qnmh 10	ph 00	ph 10	ih 00	ih 10	sh 00 *	sh 10
1. Northern Africa	659	752	3753	5099	4412	5851	1012	1657	1206	1427
2. North West Africa	94	144	1265	1750	1359	1894	80	412	403	567
3.Sahel-Central Africa	87	86	642	792	729	878	118	170	95	120
4. North East Africa	33	38	501	869	534	907	108	193	81	146
5. Eastern Africa	100	124	865	1122	965	1246	168	293	126	213
6. Southern Africa	645	529	3279	4330	3924	4859	659	931	673	810
Africa	278	282	1802	2356	2080	2638	413	620	471	578
Asia-Pacific	903	1443	3101	4890	4004	6333	1093	2115	1213	2315
America	3312	3052	16553	18856	19865	21908	3977	3811	3602	3094
Europe and Eurasia	3220	3191	14188	17637	17408	20828	3722	4151	3857	4195
World	1494	1728	6411	8124	7905	9852	1788	2403	1834	2422

Note: Data by Area have been elaborated by Guisan(2014) from country data of World Bank(2014). In case of non available data, we have included our provisional estimations. Note: * Data of Sh00 by area updated on 30th June of 2018.

In tables A1.1 to A1.6 of the Annex 1, we include data of Investment and Savings per capita, at constant prices for the period 2000-2010, in countries of each area.

The average investment per head in Africa. in 2010, was very low, with only 620 Dollars clearly below World average of 2403. Given that the savings capacity of many African countries is very low, the increases of cooperation from abroad may be helpful to foster economic development. In Guisan, Aguayo and Exposito(2015) we recommend several ways of international cooperation in this regard.

Guisan(1997) presented an interesting econometric model related with the impact of investment and the educational level of population in World development, presenting a comparison of African areas with other areas of the World. In this line, Guisan, Aguayo and Exposito(2015), and other studies cited in the bibliography, analyse several channels for international cooperation.

Some recent studies related with the great important of industrial development, educational level of population and other main factors (investment, tourism, international cooperation, foreign trade, etc.), in order to diminish poverty and increase health assistance and life expectancy in many African areas are the following ones:

Published in the period 2001-2010: Guisan and Exposito (2005), Guisan and Exposito (2007), Kamgnia (2009),

Published in the period 2011-2017: Warburton(2012), Ferreira and Simoes (2013), Elhiraika and Mbate(2014), Guisan and Exposito (2016), Aka and Guisan(2017),

3. Manufacturing and development in 38 countries or territories of Africa

Tables 3.1 to 3.6 shows the evolution of QMH, QNMH and PH, for the period 2000-2010, in countries of each area.

In the Annex we include a table with the evolution of real Gdp per head, of African countries, for the period 1980-2015.

Table 3.1. Area 1. Northern Africa: Manufacturing and Non-Manufacturing, 2000-2010
(Dollars per inhabitant at 2005 prices and PPPs)

Country	Qmh00	Qmh10	Qnmh00	Qnmh10	Ph00	Ph10
Algeria	426	530	5661	7035	6087	7564
Egypt AR	800	832	3411	4712	4211	5544
Mauritania	208	88	1389	2115	1597	2203
Morocco	507	634	2473	3593	2980	4227
Tunisia	980	1456	4464	7110	5444	8566
Area 1	659	752	3753	5099	4412	5851
Africa	278	282	1802	2356	2080	2638

Notes: Manufacturing(QMH), Non-Manufacturing (QNMH), Production (PH=QMH+QNMH).
Source. Elaborated by M.C. Guisan from World Bank statistics.

Table 3.2. Area 2. N.W. Africa: Production, Investment and Savings per head, 2000-2010
(Dollars at 2005 prices and PPPs)

Country	Qmh00	Qmh10	Qnmh00	Qnmh10	Ph00	Ph10
Benin	94	114	1084	1310	1178	1424
Cote d'Ivoire	317	204	1444	1499	1761	1704
Ghana	102	88	914	1386	1015	1475
Guinea	40	76	972	1005	1012	1081
Nigeria	58	151	1398	2002	1456	2152
Senegal	210	243	1193	1493	1403	1736
Sierra Leone	15	15	366	727	381	742
Togo	69	72	700	824	769	895
Area 2	94	144	1265	1750	1359	1894
Africa	278	282	1802	2356	2080	2638

Notes: Manufacturing, Non-Manufacturing and Production per head. See Sources in table 3.1.

Table 3.3. Area 3: Sahel-Central Africa: Production, Investment and Savings per head, 2000-2010
(Dollars at 2005 prices and PPPs)

Country	Qmh00	Qmh10	Qnmh00	Qnmh10	Ph00	Ph10
Burkina Faso	143	68	753	1059	896	1127
Burundi	41	33	297	333	338	366
Cameroon	385	432	1447	1626	1832	2058
Central African R	44	42	690	665	734	708
Chad	79	25	799	1204	878	1229
Congo Dem. Rep.	26	31	230	280	255	311
Congo Rep.	91	152	2930	3656	3021	3808
Mali	34	38	823	917	857	955
Niger	40	39	528	614	568	653
Rwanda	45	52	595	991	640	1044
Area 3	87	86	642	792	729	878
Africa	278	282	1802	2356	2080	2638

Notes: Manufacturing, Non-Manufacturing and Production per head. See Sources in table 3.1.

Table 3.4. N.E. Africa:

Country	Qmh00	Qmh10	Qnmh00	Qnmh10	Ph00	Ph10
Eritrea	68	49	613	441	681	490
Ethiopia	32	37	494	896	526	934
Area 4	33	38	501	869	534	907
Africa	278	282	1802	2356	2080	2638

Notes: Manufacturing, Non-Manufacturing and Production per head. See Sources in table 3.1.

Table 3.5. Area 5: Eastern Africa

Country	Qmh00	Qmh10	Qnmh00	Qnmh10	Ph00	Ph10
Kenya	154	148	1133	1333	1287	1481
Madagascar	103	104	755	765	858	869
Tanzania	78	129	786	1158	864	1286
Uganda	62	103	713	1039	775	1141
Area 5	100	124	865	1122	965	1246
Africa	278	282	1802	2356	2080	2638

Notes: Manufacturing, Non-Manufacturing and Production per head. See Sources in table 3.1.

Table 3.6. Area 6: Southern Africa

Country	Qmh00	Qmh10	Qnmh00	Qnmh10	Ph00	Ph10
Angola	79	333	2554	5216	2633	5549
Botswana*	587	748	9196	11715	9783	12463
Lesotho	167	187	1029	1250	1196	1437
Malawi	92	95	613	696	705	791
Mozambique	61	127	445	718	506	845
Namibia	509	755	3407	5053	3916	5808
South Africa	1421	1137	6059	8340	7480	9477
Zambia	113	126	916	1275	1029	1401
Zimbabwe	441	70	2318	430	2759	500
Area 6	645	529	3279	4330	3924	4859
Africa	278	282	1802	2356	2080	2638

Notes: * In the case of Botswana the high value of QNMH, in spite of moderate value of QMH, is mainly explained by important mining production. Manufacturing, Non-Manufacturing and Production per head. See Sources in table 3.1.

We may notice a positive evolution in some countries, but unfortunately there was little advance in several developing countries of Africa, particularly in those with very low levels of manufacturing and without other important resources for development (energy, mining, tourism or other factors).

4. Econometric model of the impact of Manufacturing on Non-Manufacturing in African countries in year 2010.

Table 4 presents the estimation of a mixed-dynamic model, relating QNMH of year 2010, in Dollars at Purchasing Power parities of year 2005, with its lagged value in year 2000 and with the increase of real value of Manufacturing for the period 2000-2010.

The model is based on the approach to macro-econometric models seen in Annex 2 of Guisan(2014) and in other studies, where real GDP per head (PH) is explained by the minimum of three relationships (demand, supply of primary inputs and supply of intermediate inputs). The approach to the supply of intermediate inputs, in a more completed model shown in Guisan(2014) and in other studies, also includes the impact of foreign, but here we present a more simple model which is enough to show the important impact of manufacturing on economic development.

We include several dummy variables (D3, D17+D23+D37, D77, D109, D132) to have into account the particular effects of missing explanatory variables with a particular positive or negative impact in some countries. The number of the dummy variables correspond to the number of the alphabetical list of 132 countries of the World presented in Guisan(2014), Guisan(2017) and other studies.

The estimated coefficient of the lagged value of the dependent variable is 1.20, indicating an average increase of 20% for the period 2000-2010 due to other variables not included in the model. The explanatory variable, increase of QMH for the period 2000-2010, has a positive and significant impact of 3.58, indicating that for each unity of increase in QMH there is an average increase of nearly 4 unities in QNMH.

The positive impact of QMH on economic development implies also positive impact on real productivity, as expected by Kaldor, and also in real income per head. As seen in several studies, the increase of real income per head usually lead to diminution of poverty and increase of expenditure on sanitation and health assistance, and thus has a very important impact on quality of life.

Table 4. Non-Manufacturing per head in 38 African countries: Mixed dynamic model

Dependent Variable: QNMH10PP05. Method: Least Squares				
Sample: 1 132 IF DAF=1. Included observations: 38				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
QNMH00PP05	1.203963	0.015889	75.77503	0.0000
QMH10PP05-QMH00PP05	3.582825	0.349117	10.26253	0.0000
D3 Angola	1231.040	169.0106	7.283805	0.0000
D17+D23+D37 Burkina Faso, Chad, Egypt	449.0880	96.23817	4.666423	0.0001
D77 Mauritania	872.6339	166.1947	5.250671	0.0000
D109 South Africa	2062.708	237.7603	8.675578	0.0000
D132 Zimbabwe	-1031.559	221.1065	-4.665439	0.0001
R-squared	0.996992	Mean dependent var		2275.816
Adjusted R-squared	0.996410	S.D. dependent var		2590.288
S.E. of regression	155.1960	Akaike info criterion		13.09208
Sum squared resid	746659.6	Schwarz criterion		13.39374
Log likelihood	-241.7495	Hannan-Quinn criter.		13.19941
Durbin-Watson stat	1.079364			

Note: Data of the period 2000-2010, in USD Dolares at 2005 Prices and PPPs.

In Guisan(2017) we present a comparison of the estimation of this mixed dynamic model (where the explained variable depends on the its lagged value and the increase of the explanatory variable) with other areas of the World and with a sample of 132 countries of the World.

5. Conclusions

Manufacturing per head evolved from 659 to 752 Dollars, at constant prices, for the period 2000-2010 in Northern Africa, below World average which evolved between 1494 and 1728 for the same period. Southern Africa in table 1, presents a diminution of manufacturing production per head, from 645 in year 2000 to 529 in year 2010. Both areas present an average value of real Gross Domestic Product per capita higher than 4800 (5851 in Northern Africa and 4859 in Southern Africa).

Other areas of Africa present lower values of manufacturing and non manufacturing production per head. For the period 2000-2010 manufacturing per head evolved from 94 to 144 Dollars, at constant prices in North West Africa, presented stagnation at a very low level in Sahel-Central Africa, evolving from 87 to 86. In North East Africa there is little manufacturing activity, evolving from 33 to 38, and in Eastern Africa the values were also low, with a little increase, evolving from 100 Dollars in year 2000 to 124 in year 2010.

Other factors of development as energy, mining and tourist sectors are also important, but in many countries there are not a high impact of those sectors and manufacturing is the main sector to foster sustainable development.

The econometric model estimated shows that manufacturing has usually a highly positive impact on non manufacturing activities and thus on economic development, given support to Kaldor's views on the great importance of industrial development for productivity and development. The educational level of population usually has a positive impact on manufacturing per head and development, accordingly to Denison(1967) and other studies.

We find that it is of great importance to improve human capital, infrastructures and condition to favour industrial development and tourism in many countries and areas of Africa. As seen in Guisan, Aguayo and Exposito(2001), Guisan(2014) and other studies, empirical evidence shows the great importance of Kaldor's views on the positive impact of industrialization on economic development. Savings and Investment per head is very low in many African countries, with low level of income per head, and thus international cooperation is of great importance to contribute to increase the educational level of population, health support and production per head.

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Annex 1: Investment and Savings per capita in African countries

Real values in Dollars at 2005 prices and Purchasing Power Parities (PPPs). Sources see table 1. Provisional estimations are indicated with *.

Table A1.1. Area 1. Northern Africa

Country	Ih00	Ih00	Sh00	Sh10
Algeria	1522	3132	2090*	2597
Egypt AR	842	1047	758	986
Mauritania	303	602	383*	572*
Morocco	775	1484	715	1300
Tunisia	1470	2258	1252	1738
Area 1	1012	1657	1206*	1427
Africa	413	620	471*	578

Note: Investment and Savings per head, 2000-2010 (USD 2005 PPPs). Source: See table 1, Note: * provisional estimations for Algeria and Mauritania. Data of SH00 of Area and Africa of table 1 updated on 30th June of 2018.

Table A1.2. Area 2: North West Africa

Country	Ih00	Ih10	Sh00	Sh10
Benin	224	367	118	103
Cote d'Ivoire	194	236	141	200
Ghana	244	394	152	302
Guinea	202	214	152	105
Nigeria	465	465	NA	777
Senegal	281	503	196	191
Sierra Leone	27	117	-15	97
Togo	138	167	8	9
Area 2	80	412	403	567
Africa	413	620	471	578

Note: Investment and Savings per head, 2000-2010 (USD 2005 PPPs). Source: See table 1

Table A1.3. Area 3: Sahel-Central Africa

Country	Ih00	Ih10	Sh00	Sh10
Burkina Faso	152	211	45	93
Burundi	20	45	14	0
Cameroon	311	339	275	324
Central African R	73	64	NA	34
Chad	202	452	NA	119
Congo Dem. Rep.	8	45	NA	20
Congo Rep.	695	782	937	1694
Mali	214	184	137	94
Niger	62	115	28	30
Rwanda	115	249	83	107
Area 3	118	170	85	120
Africa	413	620	471	578

Note: Investment and Savings per head, 2000-2010 (USD 2005 PPPs). Source: See table 1

Table A1.4. Area 4: North East Africa

	Ih00	Ih10	Sh00	Sh10
Eritrea	163	73	27	0
Ethiopia	105	201	84	155
Area 4	108	193	81	146
Africa	413	620	471	578

Note: Investment and Savings per head, 2000-2010 (USD 2005 PPPs). Source:See table 1.

Table A1.5. Area 5: Eastern Africa

Country	Ih00	Ih10	Sh00	Sh10
Kenya	219	286	180	231
Madagascar	129	176	77	48
Tanzania	156	371	112	272
Uganda	147	271	109	214
Area 5	168	293	126	213
Africa	413	620	471	578

Note: Investment and Savings per head, 2000-2010 (USD 2005 PPPs). Source:See table 1.

Table A1.6. Area 6: Southern Africa

Country	Ih00	Ih10	Sh00	Sh10
Angola	395	807	632	879
Botswana	3131	3531	4011	3293
Lesotho	502	402	275	161
Malawi	99	196	71	35
Mozambique	157	200	56	92
Namibia	666	1363	979	1971
South Africa	1197	1825	1197	1559
Zambia	175	314	-10	315
Zimbabwe	386	30	NA	0
Area 6	659	931	673	810
Africa	413	620	471	578

Note: Investment and Savings per head, 2000-2010 (USD 2005 PPPs). Source:See table 1

Highest values of investment per capita, by area, in year 2010

Area 1: The highest values of Investment per capita of this area , in year 2010, correspond to Algeria and Tunisia. There has been important increases in all the countries of the area.

Area 2: The highest values of this area correspond to Nigeria and Senegal. The ratio of the area on African average has increased for the period 2000-2010.

Area 3: The highest value correspond to Congo R. and the lowest to Burundi, Central African R. and Congo DR.

Area 4: Very low values of investment per capita in countries of table A1.4.

Area 5: Very low values of investment per capita in countries of table A1.5.

Area 6. The highest values of this area correspond to Botswana, Namibia and South Africa. The outstanding value of Botswana is explained by a very positive impact of mining on economic development of this country. Namibia and South Africa have experienced an important increase of IH for the period 2000-2010.

Annex 2: Evolution of real GDP per head for the period 1980-2015 in African countries

Table A2.1. Evolution of real production per head (PH) in 38 African countries, 1980-2015.

Area	N132	Country	PH80 PP05	PH00 PP05	PH10 PP05	PH15 PP05	Inc. 80-10	Inc 80-15
1	2	Algeria	6606	6087	7565	NA	1089	NA
6	3	Angola	3018	2633	5549	NA	2470	NA
2	12	Benin	1043	1178	1424	1574	531	396
6	14	Botswana	4155	9783	12463	14371	4776	4588
3	17	Burkina Faso	708	896	1127	1231	412	335
3	18	Burundi	523	338	366	359	-126	21
3	20	Cameroon	2004	1832	2058	2301	108	469
3	22	Central African R	825	734	707	498	74	-236
3	23	Chad	725	878	1229	1333	358	455
3	28	Congo Dem. Rep.	921	256	311	385	-349	129
3	29	Congo Rep.	3252	3021	3808	4078	401	1057
2	31	Cote d'Ivoire	2233	1761	1703	NA	151	NA
1	37	Egypt	2549	4211	5544	5681	2298	1470
4	39	Eritrea	772	681	490	NA	-138	NA
4	41	Ethiopia	515	526	933	1332	591	806
2	46	Ghana	883	1016	1474	1898	704	882
2	49	Guinea	809	1012	1081	1072	271	60
5	63	Kenya	1256	1287	1481	1705	266	418
6	70	Lesotho	820	1196	1437	1681	620	485
5	73	Madagascar	1096	858	869	NA	35	NA
6	74	Malawi	684	705	791	833	207	128
3	76	Mali	800	857	955	NA	219	NA
1	77	Mauritania	1484	1597	2203	2414	825	817
1	81	Morocco	2350	2980	4227	4775	1556	1795
6	82	Mozambique	275	506	845	1025	616	519
6	84	Namibia	4512	3916	5808	6817	2386	2901
3	89	Niger	909	568	653	NA	109	NA
2	90	Nigeria	1671	1456	2153	2376	853	920
3	102	Rwanda	1006	640	1043	1324	202	684
2	104	Senegal	1293	1403	1736	NA	521	NA
2	105	Sierra Leone	796	381	742	803	213	422
6	109	South Africa	7981	7480	9477	9808	2636	2328
5	116	Tanzania	831	864	1287	1523	566	659
2	118	Togo	949	769	896	1001	178	232
1	119	Tunisia	3754	5444	8566	8830	4551	3386
5	122	Uganda	545	775	1142	1255	679	480
6	131	Zambia	1417	1029	1401	1549	403	520
6	132	Zimbabwe	3104	2759	500	645	-2427	-2114

Note: Elaborated by M.C. Guisan from World Bank statistics. The last two columns present the increase for the periods 1980-2010 and 2010-2015.