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In the search of the driving force of sub-Saharan Africa's economy: a cross-country approach using Orbit Analysis

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Abstract: Using the technique of Panel Orbit Analysis, this paper investigates the long run dynamic driving forces of 38 countries in sub-Saharan Africa (SSA), from the perspective of aggregate demand and seeks to understand whether differences or similarities exist when taking into consideration sub-regional context, geographical conditions and the fact of being part of the recent G8 program to tackle food security. It also draws some policy implications to establish the missing linkages between agriculture and the modern sector in the region and argues that the World Bank categorization: 'agriculture-base country' is sending wrong signal that might inhibit the development of the modern sector of the economy.

Keywords: sub-Saharan Africa, Orbit-Analysis, structural change, driving-force

1. Introduction

The economy of sub-Saharan Africa (SSA) has been one of the most dynamic in recent years, albeit the financial turmoil paralysing the majority of the countries in the advanced financial society. As a matter of fact, SSA recorded an annual average growth rate of 5-6 percent since 2000 and continues to grow steadily. Yet, despite this robust economic performance, the region still counts a great number of poor and indebted countries.

This sustained economic growth stems from various sources. The McKinsey Global Institute (2010), for instance, issued a report explaining that one third of the recent positive performance is due to the rise of commodity prices. The rest two third, from the increase in productivity in wholesale and retail sectors accounting for 13 per cent, transport and telecommunications: 10 percent and manufacturing: 9 per cent. Moreover, not only, the report highlights the sustainability of this growth due to the emergence of the new demands of primary commodities from emerging economies such as China and India, but also, emphasis on the importance of the size of African consumers estimated to reach an important maturity by 2030 (McKinsey Global Institute, 2010). In addition, other accounts for this growth underscore the importance of seven factors, namely: political stability, intensity of interregional trade, young, growing labour force, a better education

and schooling achievement, the booming of the mobile industry, and the potential for commercial agriculture with the enormous stock of arable lands.

By the end of 2007, just before the global food crisis, the World Bank published its World Development Report 2008 (*WDR2008*) focusing on the topic of agriculture and development. The report came with three new concepts classifying countries according to their potential. SSA was categorised as an agriculture-based economy given the growing commercial potential of its Agriculture. Not only such narrative was defended on the account that the majority of SSA population is rural, but also, due to the fact that growth stemming from agriculture produced a more positive effect on poverty reduction relative to other sectors of the economy (World Bank, 2007, p.22; De Janvry & Sadoulet, 2010). People respond to incentives, and consequently, the World Bank's call resulted in a strong signal to private sectors as well as rich countries to invest in agriculture beyond their borders. Despite the fact that African agriculture has often suffered from a lack of investment, the major turning point of 2008 led to a considerable inward capital flow into the region. The G8 at the Aquila summit in 2009 for example, committed to raise its support up to $20 billion to support agriculture and food security in the world and created in May 2012 at the Camp David Summit a public-private partnership led initiative called the *New Alliance for Food Security and Nutrition*. Yet, two major problems arise from this turnaround. The first is related to the negative externalities engendered by these investment flows, particularly with the problem of land and water grabbing and the rights of the poor. And the second is related to what the famous development economist Easterly (2014) described as '*technocratic solutions to technical problems*' – a policy fix without a consideration of the prevailing historical and dynamic conditions in the continent, this second type of problem is related to the fact that SSA is today categorised as an agriculture-based albeit all the economies in the region already shifted to a different stage of their development as presented by the McKinsey reports or by other academic publication advancing evidences on the existing structural changes in Africa (IMF, 2011; OECD, 2013).

Given the fact that most of the SSA countries already experienced a structural transformation with the missing agricultural linkages, this paper considers that such changes are accompanied by one or more driving forces that support and boost the recent economic performance of the region and therefore rejects the World Bank classification as it might send the wrong signal to policy making. Accordingly, the objectives of this

paper are twofold: firstly, to investigate the long-run driving forces of the SSA economy from the perspective of the leading-following role played by aggregate Demand – to understand whether differences or similarities exist when taking into consideration sub-regional context, geographical conditions (coastal or landlocked), political freedom and business environment, but more importantly, the fact of being part of the G8 New Alliance for food security and nutrition, a model of public-private-partnership aiming at transforming African agriculture. Second, to discuss, draw some policy implications to establish the missing linkages between agriculture and the modern sector in SSA.

Political Economy is used as a general framework to look at the Positive Analysis School arguments on agriculture and structural transformation. And to avoid the static view of the nature of these changes, the method of Panel Orbit Analysis is applied to 38 countries of SSA.

The organization of this paper is as follows: the second section reviews some literature that informs the subject. The third section describes the procedures, including the methods, the data and its calibration. Section four reports the results of the data analysis. Section five discusses the results and tries to draw the implications for development policies for the region. The last section concludes this paper.

2. Literature review

Development experts have always been fascinated by the quest of the driving forces that can induce economic development through growth. With the recent advances, both in theoretical and empirical studies, it is becoming increasingly evident that economic growth can reduce poverty, and that such process, can only happen through the cycle of structural transformation (Barrett, Carter, & Timmer, 2010). For many years, technical solutions were advocated to developing countries, without considering the right of the poor (Easterly, 2014). The effect of growth on the economic development of a country differs from time and space, from one country to another, from one case to another and from one effect to another one. Stylised fact presented by Nallari and Griffith (2011, p.58-59) summarizes different positive empirical results on economic growth, which comes from several sources: education, financial development, government slow, infrastructure, governance, openness to trade, macroeconomic stabilization (Barro, 1991; Mankiw, Romer, & Weil, 1992; Levine, Loayza, & Beck, 2000; Lee & Barro, 2001; Easterly, 2001; Dollar & Kraay, 2002; Loayza & Raddatz, 2010).

Structural transformation is characterised by a decline in the share of agricultural GDP and the rise of the modern sector, a demographic shift, accompanied by a migration to urban area (Timmer, 2009, p.5). Agriculture in Africa, unlike East Asia has missed the *Green Revolution* that has made possible the increase of productivity and the improvement of food security conditions. African Agriculture experienced a paradox characterised by a concept described by Lipton (1977) as 'Urban Bias' in which development policies weighted in favour of the urban areas albeit the rural majority. Under such condition, lack of investments and heavy taxation system was mainly paralysing the farmers.

A turning point occurred after 2008, investments are now flying to Africa especially in arable land. This, however, gave rise to social and economic consequences, as many facts and tragic episodes were criticising the nature of the resource-seeking behaviour of the investments tagged as 'new colonialism' in favour of the transnational corporations and foreign countries, but not to the local farmers (De Schutter, 2011; Deininger, 2011; Li, 2011; Matondi, 2011).

3. Model, method and data calibration

This section explains the procedures and assumptions on which this study is built on. It gives information on the procedure and the choice of the method of orbit analysis used in a cross-country data. Second, it explains the model tested as well as the collection, treatment and description of the data.

3.1. *Method of Orbit Analysis and its extension to a cross-country analysis*

The concept of '*leading-following*' relations is adopted as a general approach to underline the driving forces of the sub-Saharan Africa economy. In this regards, orbit analysis is adopted as a technique applied to cross-country data. Orbit analysis is a statistical technique developed by Itaki (2014) to reveal leading following relations between two or multiple variables in a consistent time series. Several simple forms of application of the orbit analysis are used in economic, financial, political or business analyses with their historical conundrum. Cairo (2013, p. xix) for instance, illustrates the relationship between the GINI index versus the GDP in Brazil in 1980-2011 under different presidency, the results indicates that across time inequality was falling as GDP was increasing, particularly under President Lula. Parlapiano and Giratikanon (2013, October)

use an orbit chart to exemplify the US Federal Reserve System's Chairman Janet Yellen's long run analysis of inflation and unemployment in the US. Vucevic and Yaddow (2012, p. 64-67) show the example of Tufte to exhibit the Napoleon's disastrous campaign in Russia in 1812-1813. In agriculture, the WDR2008 shows the declining share of agricultural employment as share of agricultural GDP increases (World Bank, 2007. p.28) similar graphics are also used by De Janvry and Sadoulet (2010) and the CFS (2013).

Adapted to a more sophisticated level, the method assumes that a 'pulling and being pulled' relationship exists between the analysed variables. That is to say, there is a traction force between two variables *x* and *y* which interaction across time, puts forth the position of being a 'leading' or a 'following' variable. As the method traces the points across time, thus, a minimum of three points is needed to identify the trajectories of each variable. Six possible trajectories can be noticed from this calculation: 1) Positive correlation and an anticlockwise movement in which *x* is leading and *y* following; 2) Positive correlation and clockwise movement, *y* leading and *x* following; 3) Negative correlation and clockwise movement, *x* leading and *y* following; 4) Negative correlation and anticlockwise movement, *y* leading and *x* following; 5) Clockwise circular movement; and finally, 6) Anticlockwise circular movement.

In practice, the variable are computed in the an Excel spreadsheet programmed by Itaki, this treatment reports the change in direction, the slope, the rotations in radian and in degree as well as the 5, 7 and 9 years moving average of each variable. Besides, Itaki added that, if the angle is between 0 and π in radians (*i.e.* between 0 and 180 in degrees), the rotation is anticlockwise; if the angle is between 0 and -π in radians (*i.e.* between 0 and -180 in degrees), the rotation is clockwise (Itaki, 2014).

As mentioned earlier, this study also seeks to extend the analysis across different countries and therefore construct cross-country data from the results of 9 years moving average of the reported output of the earlier treatments. Nonetheless, the initial application of the method of orbit analysis applies to two or multiple variables if they are time series but not to a panel data. Thus, to construct a cross-sectional data, first, orbit analysis is replicated individually for each country and then, the results of this process are used to construct new datasets treated with STATA. A new series of descriptive and graphical analysis are conducted with the new data sets in order to highlight the dynamics of the GDP aggregates, and to draw implications for policy discussions.

3.2. *The model of structural transformation*

This study selected to explore a simple model of structural transformation proposed by Syrquin (2006). The elements of the structural transformation are written according to the following identity:

$$Y = (C + I + G) + (E - M) = D + T, \qquad (1)$$

Where Y is GDP, C is the private consumption, G *is* the government consumption, I is the Gross Investment, E is the exports of goods and services, M imports of goods and service, D is final domestic demand and T the net trade.

3.3. *Data, geographical definition and calibration*

The data were retrieved from the United Nations database under the section *National Accounts* Main Aggregates *Database* for 38 countries described in table 5 in the appendix. These countries were divided and categorise into four geographical regions composed by Western, Southern, Middle and Southern Africa. Data are in current account in $US for 1558 observations for the period 1970-2012 for the following variables: Household consumption expenditure (including Non-profit institutions serving households (C); General government final consumption expenditure (G); Gross capital formation (I); Exports of goods and services (E); Imports of goods and services (M).

In addition to the main data highlighting '*leading-following*' relations, other categorical variables such as sub-regional location, landlocked or coastal, the fact of being part of the G8 New Alliance for Food Security and Nutrition (G8NA), political freedom and the ease of doing business were appended to the main dataset. In the first step of this analysis, SSA is considered as a single economic bloc, that is to say, no categorical variables are applied to the analysis. In the second step, categorical variable related to geographical relations are applied to the analysis couple with the conditions of being a landlocked or coastal country. The third step considered the geographical and political condition with the use of the political and civil liberty index. In the fourth step, geographical analysis is coupled with the ease of doing business to highlight what is driving the economy of SSA across the region, time and different conditions. The following table summarizes the data structures and sources and specifications necessary for the procedures.

Table 1 - List of 38 SSA countries and their geographic distributions

Western Africa	Southern Africa	Eastern Africa	Middle Africa
Angola, Benin, Burkina Faso, Cote D'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo	Botswana, Lesotho, Namibia, Swaziland	Burundi, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Uganda, Tanzania, Zambia	Cameroon, Central Africa Republic, Chad, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon

Coastal	Landlocked
Angola, Benin , Cameroon , Congo , Cote D'Ivoire , Democratic Republic of Congo , Equatorial Guinea , Gabon , Gambia , Ghana , Guinea , Guinea-Bissau , Kenya , Liberia , Madagascar , Mauritania , Mozambique , Namibia , Nigeria , Senegal , Sierra Leone , Togo , Tanzania	Botswana, Burkina Faso, Burundi, Central Africa Republic, Chad, Ethiopia, Lesotho, Malawi, Mali, Niger, Rwanda, Swaziland, Uganda, Zambia, Zimbabwe

Table 2 – Data sources

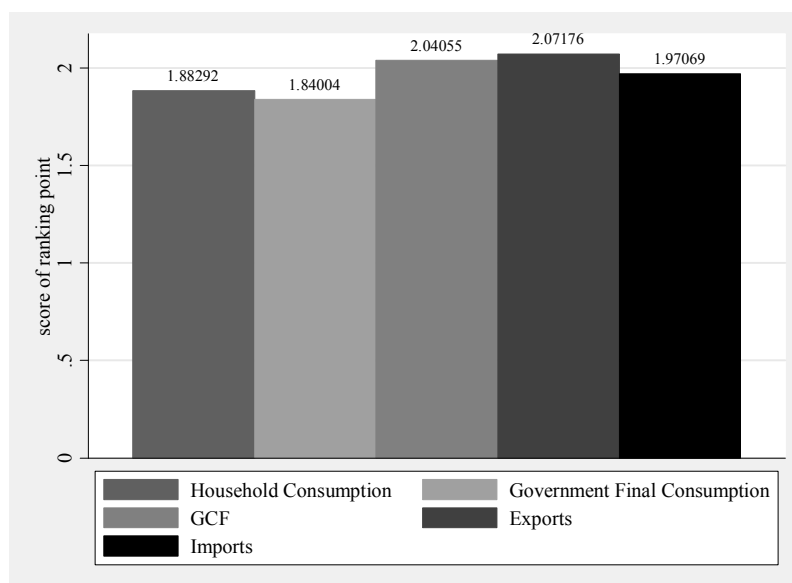| Data	Sources
National Accounts Main Aggregates Database	In US$ current account 1970-2012; source: UNSTAT (2014)
G8 New Alliance for Food Security and Nutrition	List of countries; source: https://new-alliance.org/
Political Freedom	Civil liberties and political rights of the Freedom house, category: Free; Partly free and not free; Source: Freedom House (2014)
Ease of Doing Business	Doing Business Index sub-Saharan Africa (2014), divided into five ranking categories [0, 10]; [10,20];[20,30];[30,40];[40,50], source: http://www.doingbusiness.org/rankings#

Source: Author

4. Results

This section reports the results of the orbit analysis applied to 38 countries of SSA. The

first part of this section reports the results of orbit analysis in general for the 38 countries, without any application of a specific categorical variable. The results of the application of the second categorical variables such as the sub-regional category and geographical condition constitute the second series of reports. The third results reported here consider if any particularity exists between the New Alliance countries with respect to the others. The fourth series of results indicates the importance of political freedom and the last series, takes into consideration the investment environment.

4.1. *The driving forces of SSA economy: in general*

On average and without any geographical distinction, Exports was leading the economy, followed by the gross capital formation, imports, household consumption and finally the government expenditures, all in a sense of orbit analysis. These results are depicted in figure 1 below.

Figure 1- Mean of the 9 years moving average for 38 SSA countries, 1970-2012

Source: Author's calculation

Figure 1 indicates that, albeit exports were leading and gross capital formation following, ranking points among variables do not show a big difference across time. The second stage of the first step of orbit analysis depicts the kick-starters and the last performers with the help of the first and last non-missing points described in figure 2 below.

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Figure 2 – extreme points, kick-starters and last-performers, 38 countries SSA, 1970-2012

Source: Author's calculation

Figure 2 also indicates that across the 38 countries, investments and exports were playing the role of kick-starters at the beginning of the period of analysis. At the end of the period of study, show different changes implying structural change. At the end of the period of the study, imports and exports, are simply trade, are leading the economy supported by investments. Four major important periods can be noticed from the long run dynamics across countries, namely: 1974-1983; 1989-1991; 1994-2000 and finally, 2003-2011.

(1) **1974-1983**: this period was marked by the oil shock of 1973 and 1979. In major SSA countries, the position of the imports and the government expenditures were rising while exports and private investment were falling.

(2) **1989-1991**: this period coincides with the implementation of the Structural Adjustment Policy (SAP) in Africa, and is marked by a significant rise of the rank of the government expenditures.

(3) **1993-2000**: private investment was leading in many countries during this period, and household consumption was significantly rising while export tumbling. New price cycle of the commodity, particularly the non-fuel commodity.

(4) **2002-2010**: exports were losing its pace, whereas public and private investments picked-up. Major convergence, that is to say, the all the variables pointing towards one point, Africa growth started to be robust surpassing the world growth.

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With respect to the degree of variation, across time and countries, gross capital formation, exports, government expenditures, household consumption, and finally imports are respectively, recording a variation from a greater to a lesser extent.

4.2. *Changes across sub-regional category and geographical conditions*

The decomposition at a sub-regional level indicates that the leading-following relation is changing across time and countries. Regional decomposition, are organised according to table 1 above. Table 3 reports these variations across sub-regions, the kick-starters and last performers, as well as the degree of variation across-time. Distributions of data are as follows: 42.11; 10.53; 28.95 and 18.42 percent respectively for the regions of the western, southern, eastern and middle Africa.

Table 3 – leading-following relations across sub-regional category, 38 SSA countries 1970-2012

Rank	Western Africa	Southern Africa	Eastern Africa	Middle Africa
1	E	I	E	I
	(2.07)	(2.12)	(2.15)	(2.10)
2	I	E	M	M
	(2.05)	(2.02)	(1.99)	(2.01)
3	M	C	I	E
	(1.96)	(1.96)	(1.95)	(1.98)
4	C	M	G	C
	(1.91)	(1.90)	(1.89)	(1.84)
5	G	G	C	G
	(1.82)	(1.82)	(1.84)	(1.82)
		Kick-starters		
1	I	I	I	I
	(2.31)	(2.54)	(2.39)	(2.21)
2	E	E	E	E
	(2.13)	(2.21)	(2.06)	(2.05)
3	M	C	C	G
	(1.94)	(2.04)	(1.94)	(1.76)
4	G	M	M	M
	(1.83)	(1.71)	(1.94)	(1.71)
5	C	G	G	C
	(1.79)	(1.50)	(1.67)	(1.67)

	Last performers			
1	C	I	E	M
	(1.68)	(2.10)	(2.00)	(1.97)
2	I	M	M	E
	(1.66)	(1.85)	(1.78)	(1,83)
3	E	G	I	C
	(1.63)	(1.70)	(1.47)	(1.46)
4	M	C	G	I
	(1.56)	(1.20)	(1.42)	(1.46)
5	G	E	C	G
	(1.48)	(1.15)	(1.33)	(1.29)
	Degree of variations			
1	E	E	I	G
	(0.517)	(0.519)	(0.542)	(0.542)
2	I	C	E	I
	(0.499)	(0.450)	(0.497)	(0.518)
3	G	G	G	C
	(0.483)	(0.447)	(0.495)	(0.482)
4	M	I	C	E
	(0.450)	(0.446)	(0.495)	(0.453)
5	C	M	M	M
	(0.439)	(0.442)	(0.473)	(0.394)

Source: Author's calculation   with E: exports, I: gross capital formation, M: imports; C: Household consumption; G: government expenditures.

Table 3 shows that on average, Exports was leading in Western and Eastern Africa, whereas, gross capital formation takes the lead in the Southern and Middle regions. At the initial periods, Imports were the kick-starters for Western and Middle Africa, whereas, gross capital formation and household consumption were respectively ranked in the first position in Southern and Eastern Africa. In the final period, household consumption, gross capital formation, and imports are prevailing respectively in Western, Southern and East Africa, while consumption and gross capital formation are playing an important role in the Middle region. With regards to the degree of variability: the variables exports accounted for the greater changes in Western and southern Africa while, gross capital formation and government expenditures were the most changeable respectively in the East and the Middle region.

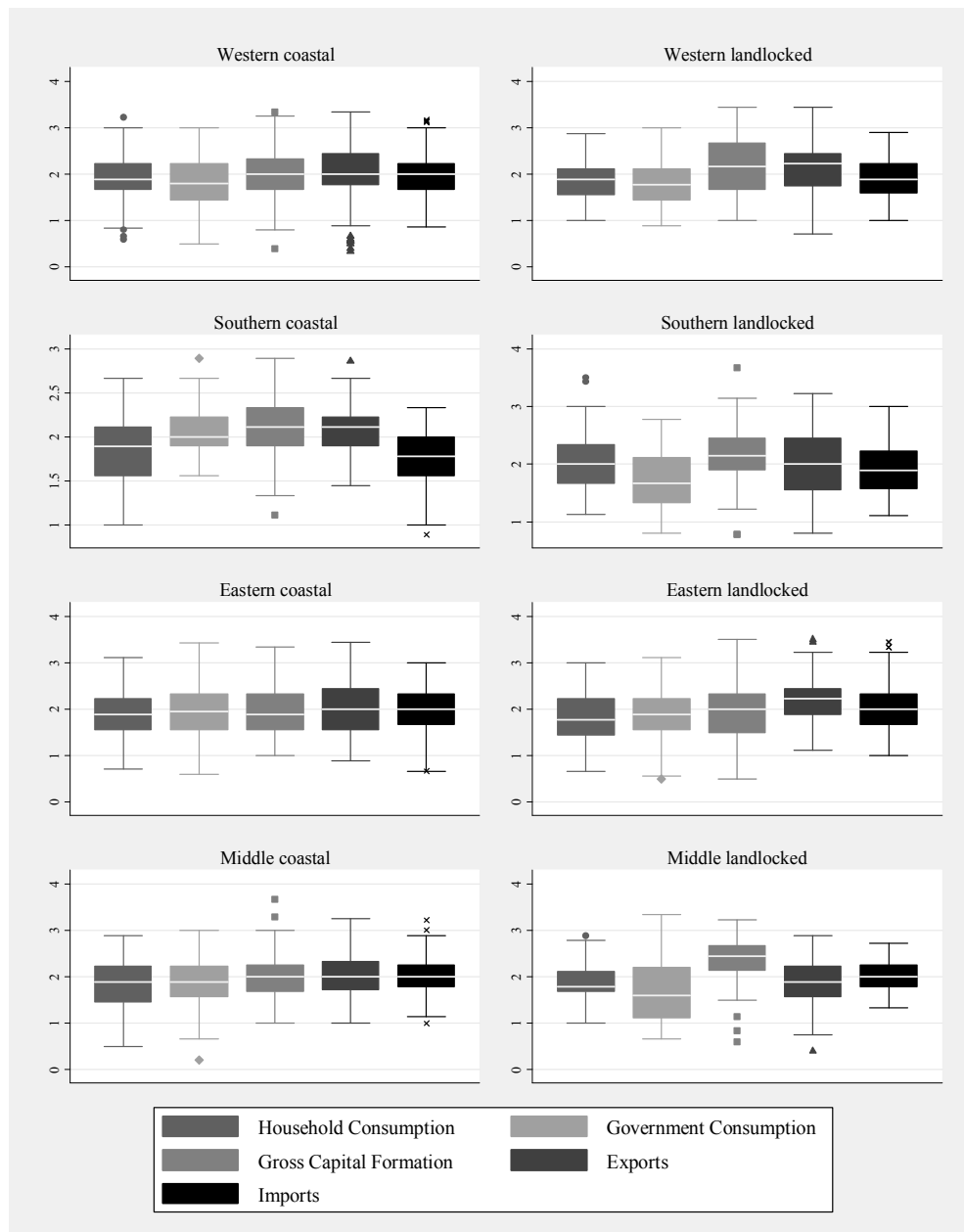## 4.3. Leading-following relations under coastal and landlocked conditions

This section reports the decomposition of the analysed variables according two categorical variables by sub-region: "0" being part coastal and '1' landlocked. Box Whisker diagrams are used to compare the variation of the leading-following across the region. The diagram makes it possible to visually compare the countries across the region based on five important information, namely: the lowest and highest value highlighted by the whisker, the lower and upper quartiles and finally the median.

- **Western coastal countries**: on average, exports are leading, followed by investments, imports, household consumption, and finally government expenditures. Across time, exports and government expenditures were the most changeable.

- **Western landlocked countries**: investments are leading, followed by export, imports, household consumption and finally, government expenditures. Across time, investment, exports and imports were the most changeable variables.

- **Southern coastal Africa**: Investments are, on average, leading, followed by exports, imports, household consumption and finally the government expenditures. In terms of variation, investments and exports are the most changeable variables across time.

- **Southern landlocked**: investment is leading, followed by exports, household consumption, imports and finally, government expenditures. Variation across time shows the following sequences: exports, consumption, government, investments and imports.

- **Eastern coastal Africa**: household consumption is leading, followed by exports, imports, investments and finally, government expenditures. In terms of the variation exports, government expenditures and investment are the most changeable.

- **Eastern Landlocked Africa**: export is the leading variables followed by imports, investments, government expenditures and finally household consumption. Variation across time indicate large variability for investments, household consumption

- **Middle coastal Africa**: on average, household consumption was leading the economy, followed by exports, imports, investments and governments. Variation

across time indicates that consumption as the most changeable followed by exports and imports.

- **Middle landlocked Africa**: consumption is leading the economy on average, followed by government expenditures, investments and finally by exports and imports. Variability across time shows, the household consumption is the most changeable followed by government expenditures, investments and the trade.

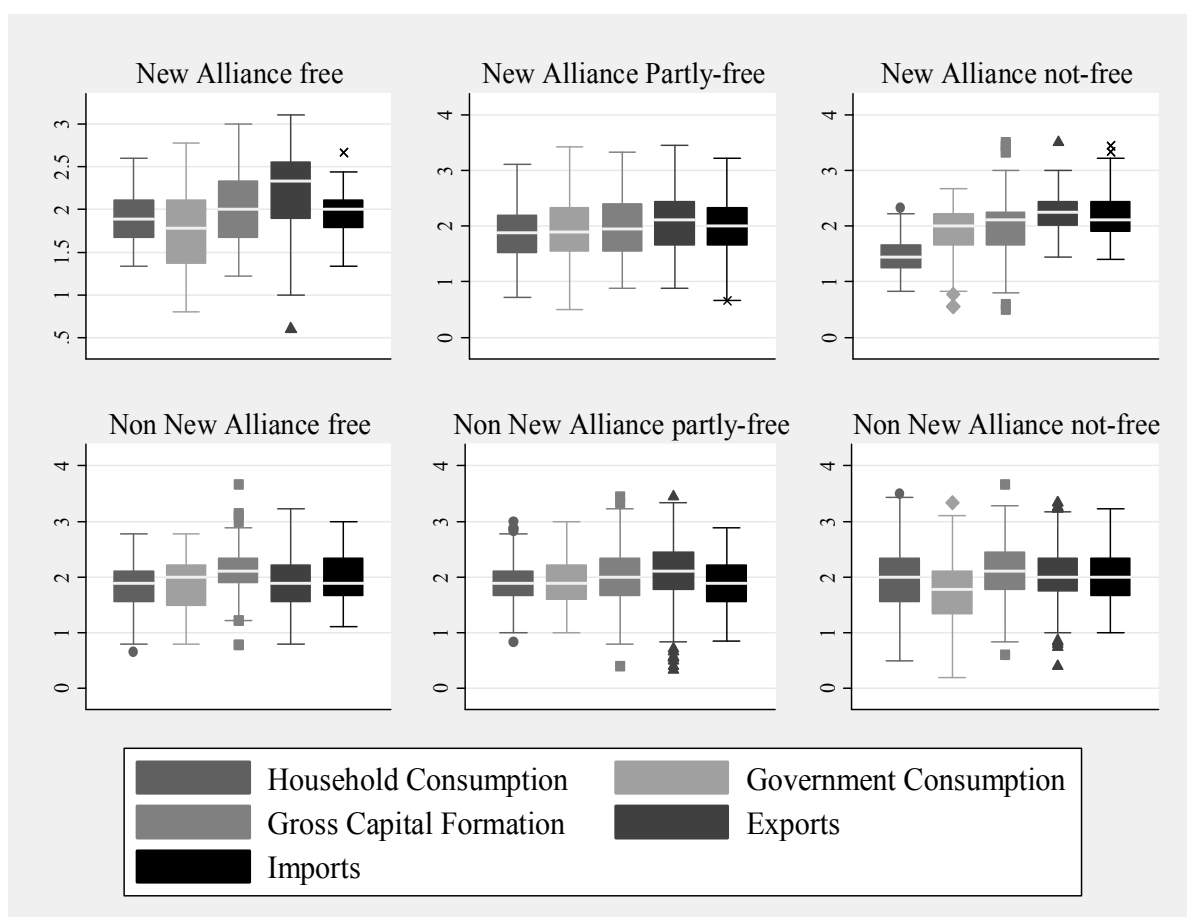**Figure 3 – Leading-following relations by sub-regional decomposition, 38 SSA countries 1972-2012**

Source: Author's calculation

After this brief report on the changes according to geographical categories, the next section reports the dynamic of the data with a consideration of political freedom.

4.4. Leading-following relations under New Alliance and non-New Alliance countries and Political freedom

Political freedom is the categorical variables explored in this section. The category of the data was collected from the Freedom house, Freedom in the world 2014 which reports the ranking of countries according to the progress or decline of their political freedom and civil liberty. The freedom house's ranking categorise 13.16 percent of the countries subject of this study as 'free', 47.37 'Partly-free' and 39.47 'not-free'. The figure below show by decomposition and the weight of this political freedom across the countries part of the G8 New Alliance and those who are not.

Figure 4 – leading-following relations among G8 and non-G8 New alliances

Source: Author's calculation

The G8 New Alliance (G8NA) countries are counting about 11 countries against 27 non New Alliance (non-G8NA). Comparing the two groups according to their attributes, figure 1 shows the following results:

- **Free countries**: countries part of the New Alliance, export and investment are leading while, in the non- G8NA free countries, investments and imports are leading the economy.
- **Partly free countries**: G8NA and non- G8NA are showing similarities with the exports and investments leading.
- **Not-Free**: in the G8NA countries exports and imports are leading while a reverse sequence of imports, exports are dominating in the non- G8NA.

The next section will look at the variation across countries of the leading-following relations with a consideration of the business environment.

4.5. Leading following relations and the investment climate
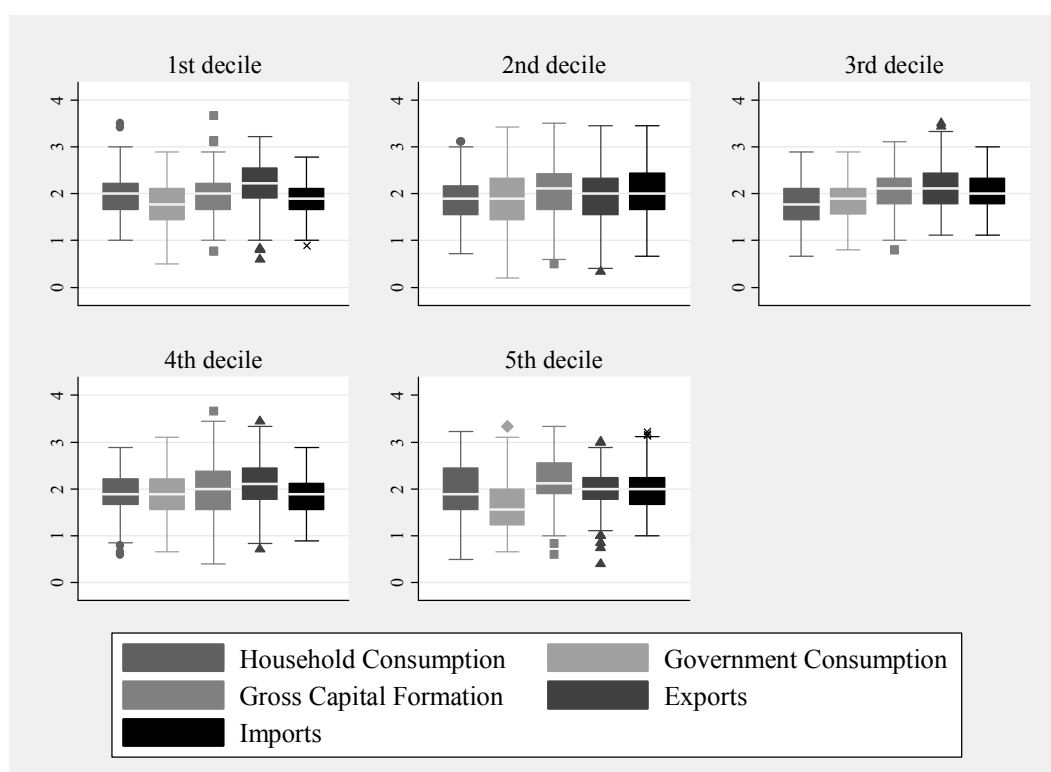
In this section, the business environment is placed at the core centre of the analysis and applied as a categorical variable to the orbit analysis output data. The Business environment ranking was retrieved from the World Bank Doing Business Index 2014, under the category of sub-Saharan Africa. The overall ranking, which weighted the all criteria are used in the present analysis. Five ranges of interval by decile were constructed to categorise all the countries   from the top best to the less performing.

The deciles were distributed as follows: the first top ten represents 13.51 percent, the second decile 27.03, the third decile 18.92, the fourth decile 27.03 and the fifth decile 13.51. In other words, the majority of the countries is falling under the range [10-20] and [30-40] while the rest are equally distributed across the extreme ranges. The results of this classification are summarised in figure 5 below.

- **First decile**: on average, exports, investments, household consumption, imports and finally, government expenditures are leading in the sense of orbit analysis.
- **Second decile**: leading variables are imports, investments, followed by exports, household consumption and finally, government expenditures.
- **Third decile**: exports and investments are among the leading variables followed by imports, government expenditures and finally household consumptions.

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- **Fourth decile**: similar to the third decile, exports and investments are, on average leading the economy, followed by government expenditures, household consumptions, and finally, imports.
- **The last decile** depicts investments and imports are leading in the sense of orbit analysis, followed by exports, household consumption and government expenditures.

Figure 5 – leading following relations considering the business environment for 38 countries in SSA

After the presentation of the results the next section is presenting some discussion points about the implications of these findings for policy making.

5. Discussions

To begin, it is necessary to recall the main purpose of this paper which is the investigation of the long-run dynamics of the leading-following relations of the driving forces of the African economy that go along with the changes within the intersectoral linkages among the various industries such as agriculture, mining, manufacturing, transport, construction, telecommunication, wholesale and retail industries and so on.
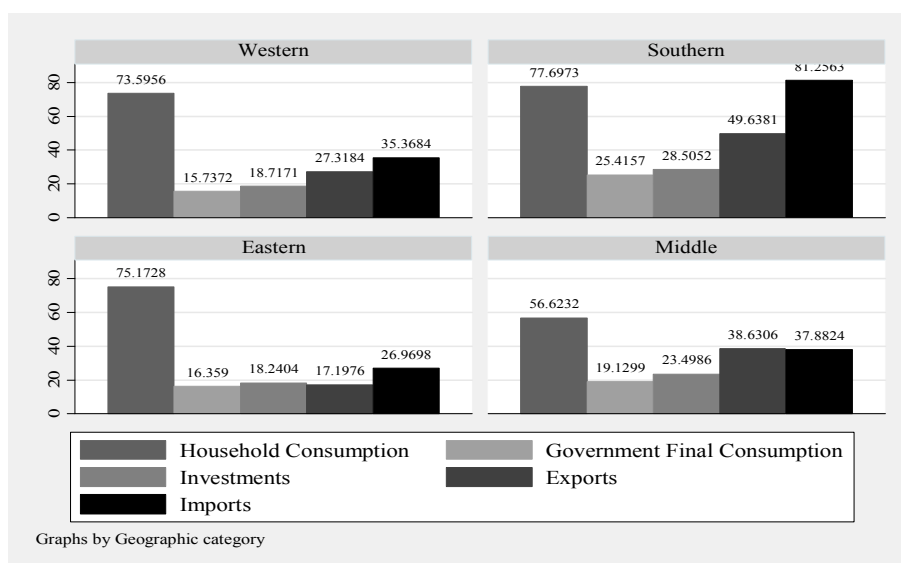
The results presented in the previous section provide information on the change within the GDP aggregate across time for 38 African countries in sub-Saharan Africa, and give further details with respect to the long-run dynamic interaction of the leading and following relation among the variables: household consumptions, government expenditures, gross capital formation, and finally the exports and imports of goods and services. Another set of results presents in depth insights of the interactions of the previously mentioned variables taking into account: geographical circumstances, such as the fact of being coastal or landlocked country, also, the fact of being part of the G8NAor non-G8NA and finally, the civil and political freedom as well as the quality of business environment.

The rest of this section will examine one by one the components of the GDP aggregates and will compare its standard representation with the results of orbit analysis. In addition, it will explore some historical facts to draw their implications for policy making in sub-Saharan Africa.

5.1. The structure of the African economy

The results of this analysis show that on average, exports of goods and services have played an important role in the African economy across time. From this perspective, it is therefore important to make some comparison on how the raw data are represented within the GDP aggregate depicted in figure 6.

Figure 6 – Main aggregates in Percentage of GDP for 38 SSA countries, 1970-2013

Source: Author's calculation

5.2. Consumption

Across the 38 countries subject of this study, consumption, represents on average, the largest proportion of the GDP, accounting for 71.36 percent. However, with the regional decomposition, these figures are showing a fairly important change. In Western, Eastern and Southern Africa, consumption represent an average of 75 percent of GDP, whereas, it only records a share of 56.62 percent in Middle Africa. Also, for the region of Southern Africa, Imports are outwitting consumption, accounting for 81.27 percent of the GDP. Nonetheless, the breakdown using the geographical conditions (coastal and landlocked), indicated that consumption plays a leading role in Coastal Eastern and for both categories in Middle Africa. The results of the panel orbit analysis show that household consumption, according to the hierarchy of the leading-following relations, homogeneously, ranks at the fourth position, before government expenditures.

Bringing the discussion to the SSA context, several factors such as the population growth, urbanisation rate, and poverty reduction are key determinants in policy discussions. One of the major challenges for African countries, for the coming decades, is the management of its fastest growing population, in majority young, and the rapid urbanization within a context of slow structural transformation accompanied by a gradual decline in poverty.

The rapid increase of population, both in rural and urban areas, coupled with the rapid urbanisation and feeble capacity of absorption in the other sectors of the economy might yield in the upsurge of urban poverty and inequality. As a matter of fact, the African population is growing at an annual rate of 2 percent and is expected to reach 2.4 billion people by 2050 (Population Reference Bureau, 2013). In addition, the annual rate of change of the urban population for 2005-2010 accounted for 4.07 percent against 1.86 percent in the rural area (UN-DESA, 2014). This implies that not only a large number of people are rapidly migrating from the rural area to the urban agglomerations, but also, the rural population itself is increasing at a rapid pace. The consequence of this rapid growth of population and urbanisation is the emergence of urban poverty and inequality accounting for an average Gini coefficient of 0.58 (AfDB, 2012), due to the low capacity of absorption of the other sectors of the economy located in the urban areas.

Despite the fact that consumption was ranked at a lower position in the leading-following hierarchy, the African consumer market constitutes a tremendous potential and business opportunities. Nevertheless, such positive sign does not automatically translate

into a direct benefit for the African population unless the policy design is devised to create a consumption-driven growth together with a skills and knowledge upgrade to improve industrial policy. The McKinsey Global Institute reports that Private consumption in Africa rose by $568 billion between 2000-2010 and the consumer facing industries, in other words, businesses that deal directly with the consumers, are expected to grow by $410 billion by 2020, of which 45 percent of this amount would represent apparels, consumer goods and food (McKinsey Global Institute, 2012). The size of this market and its projected growth, however, do not translate naturally into a consumption that will benefit the countries of SSA, some lessons from countries like China, which attempted to shift from an export-driven growth to a consumption-driven growth is therefore a possible policy model on which SSA economies can learn from (see. Lardy, 2006). In addition, an upgrade and development of skills are also essential ingredients that should accompany this transition, such approach, not only should include agriculture, and non-farm related skills but also those related to other sectors of the economy related to the consumer-facing industries. Matambalya (2012, p.368), in this regards, suggests eight approaches to develop industrial (but not limited) skills and knowledge for Africa, such as: improving cooperation between industry and training institutions; outsourcing professional skills within the world labour market; attract and encourage members of the Diaspora who have acquired significant industrial knowledge abroad to return home, establish a governance framework and knowledge management; strengthen and support the national institutions for the promotion of knowledge; cooperation with international institutions; establishing governance framework to promote good relations between industry and training institutions; strengthening research and development focused on education and capacity building.

5.3. Government expenditures

Government expenditures, across time for the 38 countries, represent a small share in percentage of GDP accounting on average 17.56 percent. Also, results of orbit analysis, homogeneously, show that government expenditures ranks at the lowest level in the hierarchy of leading following relations. Nevertheless, as it was presented in the result section, this element was playing an important leading role for 1989-1991 and 2000-2006 when major changes in development framework or economic clashes occurred. The first period historically, coincides with the implementation of the Structural Adjustment

Policies (SAP) where substantial reforms were imposed to African countries. The second, matches with the second wave of adjustment, known as the '*good governance era*'. In both cases, the government expenditures were playing a key leading role supporting the economy of SSA countries. The correlation test between the GDP and government expenditures for the two periods shows a strong and positive relationship of 0.9404 and 0.9044 respectively, and which are the second strongest parameters after consumption. This potentially implies that government expenditures are playing leading role in the implementation of substantial reforms. The major question that needs a further in depth analysis is to understand whether this leading role is only taking place during reforms that yield into adverse social effects. Nonetheless, the correlation test during which the government expenditures were leading was stronger than the time during which it was not[1]. Even so, a wide range of literature is criticizing these structural policies imposed to African countries and drawing the conclusion that the adjustment packages did not benefit to African industry (Lall, 1995), made the African political environment even riskier (Herbst, 1990) and created severe macroeconomic distortions (Easterly, 2005). Yet, although the findings of this paper indicate that the contribution of government as a leading actor in the economy was very little, its role in managing policies and bridging the linkages across different sectors is very crucial, particularly for agricultural development and food security.

5.4. Investments

Investments, on average, represent 20.49 percent of the GDP across the regions. In the leading-following relations, investments rank among the highest element of the economy, particularly, for Western, Southern and Middle Africa. Also, the regional breakdown shows that investments played the role as a kick-starter in the four regions. However, a major difference is noticed in the decomposition across the region when it comes to applying categorical variables considering geographical conditions. A set of duality between investments and exports exists in Western and Southern Africa, both for coastal and landlocked. For the G8NA and non-G8NA, both for 'free' and 'partly-free' economies, mixed form of duality exists for investments, with imports and exports. While

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[1] 0.9145 for (1992,1999) and 0.9401 for (2007,2013)

looking to the business environment, investments are positioned at the core of the leading-following relations where the same three-way relationship with imports and exports exist.

Despite its small proportion in percentage share of GDP, its rank in the leading-following relations makes it one of the important determinants of economic development across time and countries. Moreover, albeit the reluctance about African investment environment, return on investments in the continent is today one of the highest in the world as stated by Cooke and Downie (2014), and thus, making the region one of the most attractive place for investment. In Policy, such dynamic force implies a potential for an investment-driven growth. However, there is a little information about the composition of these investments, whether they are formed by domestic or foreign sources. Traced across time, investments in the 38 countries were playing a kick-starter role over time and rank among the highest in the hierarchy of leading-following relations, but some contractions can be noticed during the period 1986 -1989, where investments were falling while in government expenditure increased. A test of correlation indicates a medium and negative relation (-0.3011) between government expenditures and investments for 1986-1992.

In macroeconomic theory, historically, domestic investment has been understood as a function of saving, yet over time, it policies stressed more on the importance of FDI to create positive linkages to the host countries. Indeed, early development theories underline the importance of saving as a mean for private companies to invest, create jobs and enhance their productivity. Nonetheless, when most of African countries gained their independence, the saving was missing and was replaced by foreign aid to spur economic growth (Moyo, 2009, p.30). Yet, this policy did not yield into the expected results as many countries saw their domestic saving declining as aid was increasing (Moyo, 2009, p.71). As policies were seeking to replace foreign aid, in the late 1980s, theories highlighting the importance of FDI were burgeoning, giving account to its effect on growth. From 2000-2010, the FDI inflows going to Africa accounted for $40 billion, and are expected to reach the $ 150 billion by 2015. A wide range of literature highlight that the FDI inflows depend on: market size, price level, trade barriers, production cost, cost of capital, the indicator of stability and so on. Also, there is an important debate with regards to the effects of FDI on development in the host countries. The nature and type of the investments might have positive, negative or mixed effects on the host countries' development (see. Moran *et al.*, 2005; Alfaro *et al.*, 2010). Recent studies of the World

Bank on FDI, combining theoretical and field research concluded that: *'the spillover effects of FDI in developing countries is not necessarily positive in the short term, but can be beneficial to local participants and suppliers in the medium to long term'* (Farole & Winkler, 2014). Yet, as mentioned earlier, the mixed effect can be misleading. Not only are the FDI effects different from time and space, but its type also plays a key determinant in the positive development in the host countries.

The destination of the FDI going into Africa, both for Greenfield and Mergers and Acquisition (M&A), is primarily in the secondary and tertiary sector, however, in the recent years, international institutions led by the World Bank is persistently fostering investment in agribusiness. FDI going into Africa are two types: Greenfield-type, which is establishing a new business in the host country and M&A-type in which a foreign company is taking over the control of a domestic one. These investments can be directed to the different sector of the economy, such as agriculture, manufacturing, telecommunications and new technology, services and so on. Studies conducted by Moran *et al.* (2005) explain that these mixed results are due to the differences at the level of the host countries in terms of human resources, the sophistication of the private sector (related to the existence of supply chain linkages) and the politics of the host governments towards investments and trade. The World Investment Report of 2014 indicates that for Africa, Greenfield investments are constantly growing, the announced value of these FDI amounted a total of $281 billion distributed across the region for 2009-2013, furthermore, the reports stated that 3 percent in primary sector, 48 and 49 percent, respectively in the secondary and tertiary sectors (UNCTAD, 2014).

Nonetheless, since the publication of the WDR2008, the Bank unremittingly embarked on a series of policies aiming at developing Value chains in the continent under the framework of Public-Private Partnership (PPP), and the transformation of African agriculture into a market-oriented model. The timeline of the publications of the Bank for instance, highlighted such eagerness to pursue the idea of scaling up African Agriculture. This series includes: Larsen et al., (2009) on *'Agribusiness and innovation systems in Africa'*; Webber and Labaste (2010) on *'Building competitiveness in Africa's agriculture: A guide to value chain concepts and applications'*; Devèze (2011) on 'Challenges for African agriculture'; Deininger and Byerlee (2011) on *'Rising global interest in farmland: can it yield sustainable and equitable benefits?'*; Aksoy (2012) on 'African agricultural reforms: The role of consensus and institutions'. Losch et al., (2012)

on '*Structural transformation and rural change revisited: Challenges for late developing countries in a globalizing world*'; and these followed by the two World Bank key documents in 2013: The World Bank Group Agriculture Action Plan and the three volumes report on Growing Africa: '*Unlocking the Potential of Agribusiness*'. The same year, another publication by Byamugisha (2013) on '*Securing Africa's land for* shared prosperity: A program to scale up reforms and investments'; and finally, Farole and Winkler (2014) on '*Making foreign direct investment work for sub-Saharan Africa: Local spillovers and competitiveness in global value chains*'. All of these technical documents were stressing the importance of the agribusiness, the creation of Value-Chains and PPP. Although, the McKinsey report projected that African food, apparel and consumer goods would worth $185 billion by 2030, the World Bank report of 2013 stated that Africa can create a $3 trillion food market which represents an important business opportunity more than the investments in other sectors. The agribusiness lobby was changing their approach to enter SSA through a new *modus operandi* which stresses on the PPP. Yet, such model poses some issues as the agri-corporation which already control 60-70 percent of the world food markets are teaming up with governments, other transnational companies and the international institutions to increase their control over the food system (Rajaonarison, 2014). Moreover, recent policy aiming at developing agriculture and ensuring food security, such as the *G8 New alliance* is putting an emphasis on the stabilization of international markets that will be organised by the Value-Chain (Rajaonarison, 2015). Nonetheless, this organisational framework also failed to generate the expected effect, especially about job creation relative to the size of their investments. In addition, other important problem such as the difference in market mechanism as well as the objective pursued by the investors and the host countries and the missing linkages at the household level, policy makers are facing a Trilemma while solving the problem of scaling up agriculture (Rajaonarison, 2015). And finally, the categorisation of the World Bank 'agriculture-based economy' is inhibiting the potential of the other sector of the economy to attract FDI and expand its absorption capacity relative to the rapid population growth and the urbanisation.

For policy implications, this means that it is necessary for African countries to devise a new approach to investments taking into considerations the context mentioned above, such as the population growth, urbanisation, growing consumer markets, and the need for an upgrade of the skills and knowledge. These sets of policies are crucial for host

countries to create enough room for the modern sectors to absorb the migrating rural population. Furthermore, the results of orbit analysis that use the investment climate as a categorical variable show that, investments are accompanied by trade regardless of the regional distribution. Therefore, future policies should be accompanied by an enabling investment and trade policies in a first stage and promoting a consumption driven growth in the long run.

5.5. Exports and Imports of goods and services:

In this section, the analysis of the exports and imports of goods and services are combined together, as the two variables directly interact each other to form trade. Hence, the discussions in this section, will touch briefly on the results of the orbit analysis, then, it will focus on the characteristics of trade across the continent and its sub-regions.

In the hierarchy of the leading-following relations, exports alongside with the investments are playing the role of kick-starters across countries. These two variables are also among the most influential ones across time. In percentage share of GDP, exports represent, on average, 28.47 percent, and for the period 2000-2013, it saw a steady rise of about 6 points compared to its value in 1972-1982. Yet, although this slight increase, the results of the orbit analysis show that the ranking position of the exports is, homogeneously declining. While looking at the sub-regional decomposition, the results of the orbit analysis does not show a major difference across the regions in their distributions, except for Western coastal and landlocked, Eastearn landlocked in which the ranking point across countries is slightly scattered, yet, not much different from the other regions. For the fact of being G8 or non G8 New alliance countries associated with the political freedom and liberty, exports is predominantly leading in the New alliance and 'free' countries (Ghana and Senegal). Major contrast can be noticed for the New Alliance not free countries (Ethiopia and Uganda), where exports and imports are mainly leading. Additionally, the categorisation of the business environment shows mixed results highlighting a leading following altered sequence between investment-exports-imports.

Imports of goods and services in percentage share of GDP represent on average 38.23 percent, while the results of orbit analysis rank it, on average, at the third position. At the regional decomposition, imports show feature similar to the general ranking for Western coastal and landlocked, Southern coastal and landlocked, and Eastern coastal and Middle Coastal Africa. This feature is slightly different for Eastern and Middle

landlocked Africa. While looking at the differences, whether this relations change with the category of being a G8NA or non-G8NA, associated with the political freedom, imports is leading in the free, non-G8 countries, partly-free G8NA and non G8NA and in the not-free G8NA and non-G8NA. Furthermore, while looking at the business environment conditions, imports are playing more important role in the countries ranked in the second and third decile. Although the findings present mixed results with regards to the geographical decompositions, coastal countries are more involved in imports of goods and services than the landlocked ones. Beside, political freedom coupled with the fact of being a G8 or non-G8 New alliance does not show major difference among countries, a new opening for further research is to know whether free, and partly-free countries are doing better than the 'not-free' country. Lastly, the analysis of how the hierarchy of leading-following relations is changing while looking at the business environment indicated that: countries having medium quality are more engaged in the activity of imports of goods and services.

The characteristics of the relationship between leading-following relations is characterised by a dynamic alteration of investment, imports and exports. By looking at the pattern of the interaction of these variables between 2003-2012[2], three main features are organised as follows: first, countries, predominantly engaging in trade, in which imports and exports are playing a dynamic role of leading/following (EM/ME). The second pattern that could be extracted from the analysis is the IE/EI type, in which, investments and exports are playing a dynamic role of leading/following, and finally, the IM/MI pattern, in which, investments and imports are dynamically leading and following. Countries that exhibit these different types are regrouped in the following table:

Table 4 – pattern the leading following relations in of trade and investment, SSA, 2003-2012

Western	Southern	Eastern	Middle
EM/ME : Imports exports			
Angola		Ethiopia	DRC
Gambia		Kenya	Cameroon
Mauritania		Madagascar	
Sierra Leone		Uganda	
		Zambia	
		Zimbabwe	
IE/EI type: Investment exports			

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[2] Based on the decomposition of the data through four different periods composed on 10 years.

Benin	Namibia	Malawi	Congo
Burkina Faso		Burundi	
Cote d'Ivoire		Rwanda	
Guinea			
Nigeria			
Guinea-Bissau			
Niger			
IM/MI type: Investment Importing			
Ghana	Botswana	Mozambique	Chad
Mali	Lesotho	Tanzania	Equatorial Guinea
Togo	Swaziland		CAR
Senegal			Gabon
Liberia			

Source: Author

The categorisation of these countries, according to the patterns of the investment/trade relations give rise to the following policy implications:

For the countries mainly engaging in trade **EM/ME type**: to ensure that trade will be geared towards the establishment of the missing linkages not only with agriculture but also with the other leading sectors of the economy. Early literature stated that agricultural exports provide a supply of foreign currency that enable to purchase capital goods and services needed in the modern sector (Johnston & Mellor, 1961). And trade instruments can be used to level-up the labour -absorptive capacity of the modern industries. This latter, however, would not take off if an enabling environment and human capital are missing, therefore, policy instruments such as aid or government intervention to create a learning society are likely to accompany this pattern.

For **IE/EI type countries**: Exports and Investments combined together have positive and negative sides. The two variables have an enormous potential to improve the productive capacity of a given country, which eventually can create jobs, but this will only have a positive externalities if the investments are not mainly coming from a foreing sources and the exports not concentrated on natural resources. Indeed, a massive inflow of FDI coupled with the earnings in foreign currency from exports might engender negative externalities such as the 'Dutch disease' or a major increase in foreign currency, which will have as an effect the decline of competitiveness over time. In addition, if the investments are capital intensive, it might not create enough jobs to level-up the labour absorptive capacity of the modern sectors. The sophistication of the exports also matters for the sustainability of its resultant force to lead the economy. The trends reported by the United Nations (2014) in the Greenfield investments are showing that the secondary and

third sectors are the sector in which the FDI inflows are directed to, hence, potential exports and development for the host countries can be derived from these two sectors in the long run while commodity driven export could be adopted as a kick-starter in the short run.

For **IM/MI type countries**: Investments coupled with imports can stimulate the level of productivity of the African economies and open up another opportunity to enhance export capacity for trade-led strategies. Yet, the role of imports in the investments varies within the short and the long run and according to its composition. The trajectory of the orbit analysis indicates that over time, the role played by imports, government expenditures and consumption are shifting to an upward movement while exports and investments are following a declining trend. As stated earlier, trade openness or the importance of trade relative to the economic activities, is increasing across time, such degree of openness is getting stronger in Western, Eastern and Middle Africa while it changes a little in the Southern region. Imports of goods and services will continue to support the development of the countries in SSA taking into consideration the inflows of investments going to the secondary and tertiary sectors. It would play a key role alongside exports and investments both in the short and long run. In the short run, imports of goods and services would be associated with the investments in the leading following relations, whereas, in the long run, it would follow the leading elements of the GDP.

Imports, investments and exports for the coming years would play a crucial role in agricultural policy and food security. Since the majority of the countries in SSA are today net food importers, creating trade and investment policies enhancing the productive and the absorptive capacity across all sectors would lead to sustainable economic activities and livelihood for the rapidly changing Africa.

6. Conclusion

This paper investigated the long-run driving forces of the SSA economy using the technique of Panel Orbit Analysis to construct a dynamic hierarchy of leading-following relations across 38 countries in SSA. While pursuing such endeavour, the method reveals that over the long run, exports and investments are, on average, leading in the sense of orbit Analysis across time and countries.

Regarding the categorisation of SSA as an agriculture-based economy, this paper draws from the previous discussions that the strong signal sent by the World Bank and its

partners is inhibiting the **productive and absorptive capacity** of the modern sectors which are the main determinant of the future development and food security policy challenge for the rapidly growing young African population. The discussions also highlighted that the role of governments has been weakened and faces severe constraints during major reforms imposed by international institutions.

The analyses of the dynamics of the economy across sub-regions also indicated there is only a slight difference between the countries studied in this paper. The same slight differences can also be noticed while applying categorical variable such as the fact of being landlocked or coastal economies. Furthermore, the data also show a very little difference between countries part of the G8 New Alliance and the others, the same hold for the category of being free, partly-free or not-free country. Therefore, the paper draws the conclusion that countries selected in the G8 New Alliance were not chosen according to their good institutions, this open up to further research to understand the criteria from which the countries part of this initiative were selected.

While comparing the different regions of SSA, across time, there is a tendency of the variable to converge towards one point in which a set of interaction between investments-exports and consumption, government expenditures are in sequence, play the role of leading-following variables. Three patterns of trade and investments were also identified in this paper, namely: EM/ME type, IM/MI type and IE/EI type on which common policy could be devised for agriculture and its linkages to the other sector of the economy

This paper also, highlighted some key policy points as a determinant for a successful and sustainable structural transformation in the region of SSA. It also supports the premise that SSA government should seek to increase their potential in the other sectors of the economy while devising appropriate an acute policy towards investments and trade.

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Appendix

Table 5 – Summary statistics raw data, correlation raw data, summary statistics Orbit Analysis

Variable		Mean	Std. Dev.	Min	Max	Observations	
year	overall	1991.5	12.70222	1970	2013	N =	1672
	between		0	1991.5	1991.5	n =	38
	within		12.70222	1970	2013	T =	44
Household consumption	overall	5.65E+09	1.92E+10	1.26E+07	3.71E+11	N =	1672
	between		1.32E+10	3.35E+08	8.27E+10	n =	38
	within		1.41E+10	-6.73E+10	2.94E+11	T =	44
Government expenditures	overall	1.50E+09	5.27E+09	4500777	6.88E+10	N =	1672
	between		3.80E+09	8.10E+07	2.35E+10	n =	38
	within		3.69E+09	-1.90E+10	4.68E+10	T =	44
Investment	overall	1.73E+09	5.27E+09	4029309	7.58E+10	N =	1672
	between		3.86E+09	9.27E+07	2.42E+10	n =	38
	within		3.65E+09	-1.74E+10	5.33E+10	T =	44
Exports	overall	2.47E+09	8.33E+09	3907931	1.45E+11	N =	1672
	between		4.97E+09	7.07E+07	2.85E+10	n =	38
	within		6.74E+09	-2.40E+10	1.19E+11	T =	44
Imports	overall	2.35E+09	5.62E+09	4642546	8.84E+10	N =	1672
	between		3.26E+09	1.98E+08	1.83E+10	n =	38
	within		4.60E+09	-1.48E+10	7.24E+10	T =	44
GDP	overall	9.09E+09	3.05E+10	2.01E+07	5.15E+11	N =	1672
	between		2.29E+10	5.67E+08	1.43E+11	n =	38
	within		2.05E+10	-1.09E+11	3.81E+11	T =	44

Table 6 - Correlation table, Raw Data 38 SSA countries, 1972-2013

	GDP	consumption	Government	investment	Exports	Imports
Variable						
GDP	1					
Household consumption	0.974	1				
Government expenditures	0.7801	0.6402	1			
Investment	0.9516	0.884	0.8544	1		
Exports	0.8823	0.8487	0.6086	0.8092	1	
Imports	0.8612	0.8463	0.6177	0.8223	0.9489	1

Table 7. Summary Statistics of the 9 years moving average

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	1558	1992	11.836	1972	2012
Household Consumption	1558	1.88292	0.466514	0.5	3.5
Government Consumption	1558	1.84004	0.494706	0.2	3.42857
Gross Capital Formation	1558	2.04055	0.513175	0.4	3.66667
Exports	1558	2.07176	0.503407	0.333333	3.5
Imports	1558	1.97069	0.446903	0.666667	3.44444
Geographic category	1558	1.23684	1.1799	0	3
Landlocked and coastal	1558	0.394737	0.488951	0	1
New Alliance	1558	0.684211	0.464979	0	1
Political freedom	1558	1.26316	0.676282	0	2
Doing Business Ranking	1558	2.94737	1.29712	1	5
Country	1558	19.5	10.9694	1	38