- BI Norwegian Business School – Thesis -

Study Programme: ***MSc in Political Economy***

Title: **Does Africa Grow Differently?**

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ABSTRACT

This study follows closely in the footsteps of Steven A. Block (2001) by allowing for African differences in both direct and indirect growth effects. However, while Block's study analyzed the period 1975-1995, this study is concerned with the succeeding years, aiming to explain Sub-Saharan Africa's impressive growth performance since the mid-1990s.

The analysis facilitates comparisons between the two studies, but also introduces additional variables to account for effects from commodity exports and foreign direct investments. Robust regression shows that Africa in general benefits less - if at all - from improvements in variables that would enhance growth elsewhere. Particularly, African countries pay a greater penalty than others when being closed to trade.

There are also indications that the recent years' impressive performance may be mostly driven by raw material exports and investments from abroad.

TABLE OF CONTENTS

CHARTS

FORMULAS

TABLES

APPENDICES

1. INTRODUCTION

The article *"Does Africa Grow Differently?"* by Steven A. Block was published in the *Journal of Development Economics* in 2001 and challenged the common assumption that economic growth mechanisms operate the same in Sub-Saharan Africa ("Africa") as elsewhere (Block 2001). It also marks the point of departure for the analysis presented in this thesis.

1.1. Introduction: Historical backdrop

In the 1960s Africa's growth potential was seen as bigger than East Asia's, and the World Bank announced there were seven countries in the region that *"clearly ha[d] the potential to reach or surpass"* a 7 percent annual growth rate (Easterly and Levine 1997, 1203). Nevertheless the poverty of post-colonial Africa remained an inconvenient truth throughout the whole 20th century. Through development and aid programs, tremendous amounts were injected into infrastructure, education, health projects, and more to realize Africa's potential to become a self-sustainable economic region. However, the efforts failed to materialize. Why did not Africa grow?

Many explanations were offered. Some pointed at the most obvious obstacles for stable economic growth such as corruption, wars and poor institutional quality; others tried to explain the reasons for these problems. Many emphasized colonial powers' disregard for cultural and lingual differences in the definition of African nation states (Easterly and Levine 1997). Others pointed at trade restrictions (Rodrik 1998) or claimed that Africa was victim of a "resource curse" causing corruption and rent seeking among public officials (Sachs and Warner 1997, 837).

Development loans were granted and reforms introduced, but no known cure seemed to alleviate the problem. For decades Africa would not grow. Hence, it was no less than puzzling when it picked up speed in the late 1990s.
How come Africa failed to grow for all those years aided by development programs, and suddenly boomed now for no obvious reason? Could growth mechanisms work differently for Africa?

1.2. Introduction: The study

In his study, Block analyzed eighty-nine economies from around the world and their growth performance from 1975 to 1995. By doing so, he wanted to investigate whether there were unique differences from the global norm in how economic growth was determined in Africa.

This thesis aims to investigate the same question within the same framework, but for the years 1995-2009, in order to shed light on Africa's newfound prosperity. The objective is to test whether these developments are explained by the determinants identified by Block, and if the African sample still differs from the general pattern.

1.3. Introduction: Structure of the study

In the first following chapters, the backdrop for the study is laid out before the current research question is presented, and the theoretical and methodological design accounted for.

When the framework is established the papers will proceed with the main analysis before conclusions are derived and any lessons that are to be learned accounted for.

2. BACKGROUND

2.1. Steven A. Block - "Does Africa Grow Differently?" (2001)

Block's *"Does Africa Grow Differently?"* (2001) extended the analysis of African economic growth in two directions:

- "**first** by challenging the assumption that growth effects of particular explanatory variables are the same in Africa as elsewhere" (Block 2001, 443)

- "**[S]econd**, by measuring indirect contributions to growth of initial conditions as they influence explanatory variables in a basic growth regression." (Block 2001, 443)

Through cross-regional regression analysis, Block discovered that Africa both directly and indirectly failed to reap growth benefits from several positive influences, and paid greater penalties from the negative relationships (Block 2001, 453). According to Block, Africa's growth mechanisms did indeed work differently:

- Being closed to trade hurt African countries more that non-African (Block 2001, 453).

- Africa failed to benefit from reductions in fiscal deficit - a serious concern given the central role of such reductions in typical reform programs. (Block 2001, 453)

- The African slope terms and intercept were jointly significantly different from other countries (Block 2001, 454).

- Raw material abundance was more negatively associated with institutional quality for Africa (Block 2001, 457).

- Africa failed to benefit from factors, like schooling, that reduced population growth elsewhere, adding indirectly to Africa's growth penalty (Block 2001, 461).

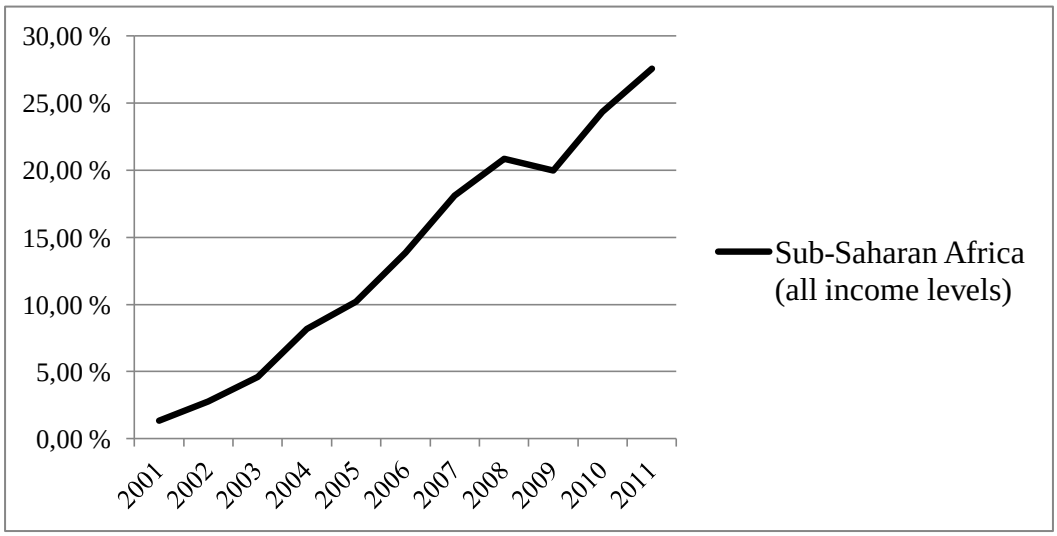
His most important lesson was that "one-size-fits-all" programs that had proven successful elsewhere were less likely to succeed in Africa (Block 2001). This interpretation was supported by the well-documented failure of the International Monetary Fund ("IMF") and World Bank to facilitate growth in the region through their structural adjustment programs (Easterly 2003). According to some, their initiatives made matters even worse (George 1990).

2.2. A New Millennium, a New Reality?

Since Block's study, the context for analyzing African growth has changed dramatically.

Through the 2000s the GDP of his African selection improved by 55.9 %, measured in constant 2000 USD (World Bank n.d.) – making it the world's third fastest growing region that decade, only beaten by Southern Asia and Russia (World Bank n.d.).

Chart 1 – SSA's change in GDP per capita since year 2000



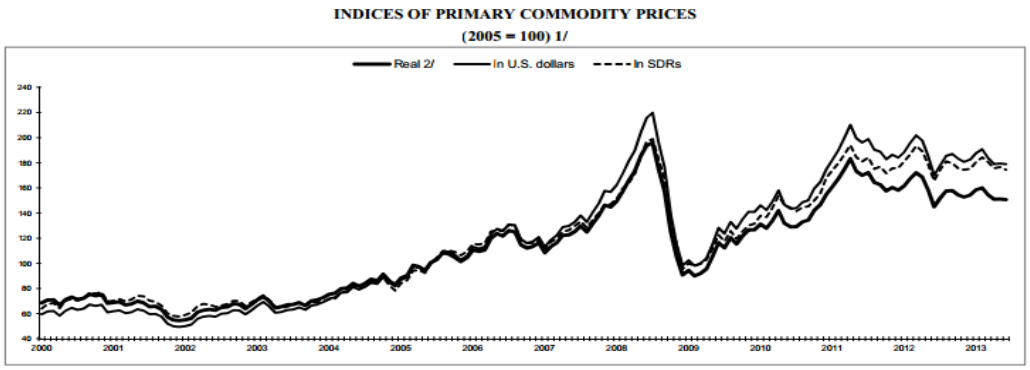
(Please refer to *Appendix C* for a larger copy)

Source: (World Bank n.d.)

One interesting question for the review of Africa's impressive growth performance in recent years, is how well the framework applied in Block's analysis from 2001 would explain the growth if the study had been conducted today. Would he have come to the same conclusions?

Block's selected variables may very well have improved for Africa. However, it is no secret that natural resources are the main pillars of most African economies (World Bank 2011) and "pseudo-scientific" observation discovers what seems like a correlation between the commodity prices and Africa's GDP growth since 2000 (ref. Chart 1 and 2). Considering the continent's reliance on raw material exports, it certainly makes sense to question the growth's robustness towards price fluctuations.

Chart 2 – Indices of Primary Commodity Prices



1/ Combines indices of non-fuel primary commodity prices and petroleum prices.
2/ Deflated by U.S. CPI.

(International Monetary Fund (IMF) 2013)

That the average growth rate between 2000 and 2010 was 4.69 % p.a. for his African selection - 0.5 percentage points higher than the 4.19 % p.a. for the non-African sample (World Bank n.d.) - does anyway suggest it is time to revise Block's study. This thesis aims to do exactly that.

3. RESEARCH QUESTION AND APPROACH

- The **question** to be answered by my study is:

"Did Sub-Saharan Africa's economy grow differently from other low- and middle-income countries in the period 1995-2009?"

- The main **objectives** of the study are:

Primarily, to analyze Africa's growth mechanisms and identify to what extent economic growth worked differently in Africa than elsewhere.

Secondly, to identify suitable policies that will secure continued developments in Africa for the future.

4. THEORY

4.1. Economic growth theory

Before we continue, this section will give a brief introduction to the theories that constitute the framework for my research.

There are substantial disparities between different schools of thought, and there is simply no universally acknowledged theory about what determines economic growth. The discipline is in a sense still waiting for its "Darwin" – someone to break the code of how it is all connected. This fact has implications for how previous work should be interpreted. There are certainly lessons to be learned from what others have done before, but one should also keep in mind that their conclusions may have been biased by the framework they chose to apply.

The partially unknown relationships between different explanatory variables and economic growth do at least prove the need for further research in this area.

When speaking of economic growth theory, a myriad of branches could be mentioned. There are nevertheless three that have been more influential than the rest. They will be given a brief introduction below.

4.1.1. Classical growth theory

Economic growth theory as we know it first saw the light of day with the "founding fathers" of modern economics -- Smith, Hume, Malthus, Mill and Ricardo. The classical theorists were mainly concerned with free market capitalism, productive efficiency, and the accumulation of capital that determined that capacity. Somewhat simplified, the classical theorists' belief was that all an economy needed to do to grow was saving money to buy machines, i.e. capital, or employ more labor. However they also acknowledged the idea of diminishing returns from capital and labor (Foley and Marquetti 1997), as well as the benefits from trade. Particularly Ricardo's theory of "comparative advantage" is still of great influence and has been the basic framework for many modern economic theories such as the Heckscher-Ohlin model that shows how factor proportions determine comparative advantage (Balassa 1965) .

According to Ricardo, nations should focus their resources on exporting the goods they produce most efficiently *relative* to others; the good for which they have a *comparative advantage*; and rather use profits from this trade to import what others produce most efficiently (Balassa 1965). There are many real-life examples of comparative advantage in today's global environment. Take Norway as an example, the country certainly has the physical and human capital to produce textiles, possibly at a higher hourly rate than they do in China. However, Norway will receive higher returns from investing most of its capital in petroleum production, and rather cover its demand for textiles by importing it from China. As long as their relative efficiencies are different, both countries will be better off by trading with each other than producing everything themselves (Balassa 1965).

That being said, the alleged effects of comparative advantage may be less pronounced in modern-day theory than they used to be. According to what is known as *New Trade Theory*, a country can protect "infant industries" and experience increasing returns to scale with time. From this perspective, the reason similar economies trade is thus rather due to the fact that economies of scale make it more profitable for a country to specialize in the production of only a handful brands (maybe only one), while consumers' preferences will demand a wider range of alternatives (Krugman 1979).

4.1.2. Neoclassical growth theory

The next great paradigm shift came in the 1950s with Robert Solow and Trevor Swan parallel developments of a model, since referred to as the *Solow-Swan-model,* which attempted to model long-term growth and the diminishing returns from capital and labor through a series of equations ((Solow 1956); (Swan 1956)). A particularly important contribution was the discovery of technological progress was more important for long-term growth than capital and labor increases (Encyclopædia Britannica n.d.); at the kink of the investment slope, a country can only experience increased growth through total factor productivity.

Another innovation of the model was the theoretical *explanation* for the diminishing returns previously only observed by the classicists. According to the Solow-Swan model, a country will grow faster if it is located way below its "steady-state" path (Klenow and Rodriguez-Clare 1997), best understood as an

economy's *"value determined by the rate of technological progress"* (R. J. Barro 1996, 10).

The standard production function of neoclassical modelling assumes no international capital flows and can be written on the following form:

Formula 1

$$Y = Ae^{\mu t}K^{\alpha}L^{1-\alpha}$$

(Pack 1994, 55)

Here, Y is gross domestic product, K the stock of capital (both human and physical), L is unskilled labour, A reflects the technological starting position of society, and e^{μ} the exogenous rate at which that technology evolves. α is the percentage increase in GDP from a 1 percent increase in capital.

4.1.2.1. Criticism

Despite its dominance in economic analysis through the last half of the 20th century, the model was never universally adopted, mainly because it predicts growth to be independent of government policies (Renelt 1991). Some also argue the model would imply that countries with similar technologies would converge to the same *steady-state,* a tendency that has been hard to prove empirically for larger groups (Renelt 1991).

Lucas (1990) discussed another implication of the model that demonstrates its limited ability to model reality. According to the Solow-Swan model growth rates will be higher in countries that deviate negatively from their steady-state path, what we usually call "developing countries". As return on investment consequently will be higher there (according to the model), we should find that most new investments flow to these regions (Lucas 1990). This had historically not been the case when Lucas published his paper (Renelt 1991), even though there has arguably been a shift in investor's orientation in recent years.

4.1.3. Endogenous growth theory

A new school of thought motivated by the problems related to neoclassical theory's explanatory power was introduced around 1990, with Romer, Lucas and Puthenkalam among its most notable contributors.

According to Renelt, the two major approaches within endogenous growth theory are to *"remove the fixed factor constraint of the Solow model by allowing constant returns to reproducible factors* ***[OR]*** *to endogenize technological change by explicitly modeling the introduction of new technologies"* (Renelt 1991, 5).

Endogenous growth theory gave a mathematical explanation to technological advancement, but did also include a new concept; ***human capital*** (included in capital, ***K***, in the neoclassical model, ref. Formula 1 above).
In its simplest form we may say the production function of endogenous growth theory is written as follows:

Formula 2

$$Y = AK$$

(Pack 1994, 56)

Here ***A*** is technology and ***K*** the sum of *physical* and *human* capital.

According to Romer (1989), knowledge in a generation is positively related to the subsequent rate of investment which is assumed to be proportional to the subsequent rate of income growth. Like in neoclassical theory, the relation between capital and output will be constant in the "***AK***" form (Pack 1994, 56), but Romer argues that there may be "spillover effects" – ***externalities*** - that allow for growth without technological change. In other words, Romer claims that an investment - be it a physical one made by a firm or a human capital investment by an individual - can lead to increases in productivity that exceeds the investor's private gain (Pack 1994).

As *human* capital has increasing returns, an economy will grow even if investments are kept constant. Since people and firms learn from each other (also across borders), the initial level of human capital will be higher for each new generation. One may say the economy grows from "within" (hence the term

endogenous growth); a mother will help her daughter with her math problems if she can, and a private firm may benefit from government research.

4.1.3.1. Criticism

Nevertheless, Renelt finds two major problems with this theory:

First of all, he argues, both Romer and Lucas fail to identify what kind of externalities that are "empirically large enough" to account for the growth left unexplained (Renelt 1991, 7).

Secondly, human capital probably cannot be accumulated without bound, and the effect will eventually wear off (Renelt 1991, 7).

4.2. Previous research on African growth

A lot of research has been carried out dealing with economic growth in Africa specifically, and a substantial share of the most influential papers was written in the 1990s. Here follows give a quick introduction to some of the studies that motivated Block to carry out his study.

In 1996 Robert J. Barro made a significant contribution to contemporary growth theory with his paper *"Determinants of Economic Growth: A Cross-Country Empirical Study"*. This was not a study dealing with Africa specifically, but introduced a growth equation that has since been widely adopted (please here refer to section 5.1.1 for details on the model).

With his study, Barro aimed to identify the input variables most decisive to economic growth. His main finding was the influence of governance, specifically that increases in inhabitants' political rights initially will improve growth, but that the tendency shifts at some level so that further interference will retard growth as soon as "a moderate level of democracy" has been attained (R. J. Barro 1996, 70). He also found other policy initiatives (such as tax distortions, redistribution programs, regulations on labor and markets), increased life expectancy, secondary and higher schooling, lower fertility rates and improvements in terms of trade to be important determinants of growth (R. J. Barro 1996).

In a cross-country study from the same year called *"Africa's Growth Tragedy: Policies and Ethnic Divisions"* (1997), William Easterly and Ross Levine set forth to explain why some African countries chose growth-enhancing policies while others adopted growth-retarding ones. Their analysis quantified the relationships between economic growth and a broad base of explanatory variables over a 30-year period, and found that the countries with the slowest growth also had a high level of *ethnic diversity* which in turn was closely related to lower schooling, underdeveloped financial systems, distorted foreign exchange markets, and insufficient infrastructure (Easterly and Levine 1997) - all of them variables considered crucial to a country's development. The researchers did however emphasize that the findings were not particular to Africa (Easterly and Levine 1997).

In *"Trade Policy and Economic Performance in Sub-Saharan Africa"* (1998), Rodrik argued that *"growth depends first and foremost on the fundamentals"* (Rodrik 1998, 37), and his main conclusion was that trade policies worked the same in Africa as anywhere else. According to Rodrik, the region's restrictive trade policies had been a main obstacle for growth in the past (Rodrik 1998). Hence, the liberalization in recent years expectedly would improve performance substantially in the years to come (Rodrik 1998). He also concluded that Africa's poor infrastructure, geography and dependence on natural resources would not imply it was irresponsive to commercial policy, and thus there was no reason to be pessimistic on Africa's behalf as long it opened up to the world (Rodrik 1998).

Another contribution from 1997 was Sachs and Warner's *"Natural Resources and Economic Development – The Curse of Natural Resources"* (1997) which investigated the infamous "resource curse". They noted that *"(...) none of the countries with extremely abundant natural resources in 1970 grew rapidly for the next 20 years"* (Sachs and Warner 1997, 829) and posed the question *"If natural resources really do help development, why do not we see a positive correlation today between natural wealth and other kinds of economic wealth?"* (Sachs and Warner 1997, 828).

Through their research Sachs and Warner found that other industries in resource abundant countries had suffered from reduced competitiveness through the 1970s,

as they had to compete within *"higher than normal price levels"* (1997, 834). They concluded there could be other unknown reasons, but that these countries anyhow lacked strong export-led growth, and hypothesized that the accessibility of natural resources would make politicians in these countries more prone to be corrupt and seek rents rather than focusing their efforts on promoting growth-enhancing initiatives (Sachs and Warner 1997, 835).

5. EMPIRICAL FRAMEWORK AND ESTIMATION STRATEGY

5.1. Empirical framework

5.1.1. Introduction: Robert J. Barro's growth equation

Block's analysis was based on the well-known growth equation used by Robert J. Barro in "*Determinants of Economic Growth […]"* (1996) which again is derived from the neoclassical model, but also incorporates government policies, human capital accumulation, fertility decisions, and the diffusion of technology (1996).

Barro's growth equation is written in the form

Formula 3

$$D_y = f(y, y,^*)$$

(R. J. Barro 1996, 9)

Here D_y is the growth rate of per capita output, y is the current level of per capita output, and y^* is the long-run level of per capita output ("steady-state").
The growth rate, D_y, is diminishing in y for given y^* and rising in y^* for given y (R. J. Barro 1996, 9).

In Barro's own words, "*[t]he target value* y^* *depends on an array of choice and environmental variables. The private sector's choices include saving rates, labor supply, and fertility rates, each of which depends on preferences and costs. The government's choices involve spending in various categories, tax rates, the extent of distortions of markets and business decisions, maintenance of the rule of law and property rights, and the degree of political freedom. Also relevant for an open economy is the terms of trade, typically given to a small country by external conditions"* (R. J. Barro 1996, 9).

Put simpler, new policies can increase a nation's potential, y^*, and will consequently change its growth rate, but as the economy approaches this new target value, growth will slow down (*"converge"*) and eventually restore this rate to a value determined by the rate of technological progress (R. J. Barro 1996). Nevertheless, these transition periods of increased growth can last a long time as

implementation of policies and adjustment of private behavior is not done over night, nor is it to catch up with the new steady-state. Barro emphasizes that this implies poor countries will not grow faster if they have low steady-state positions, ***y****. *"In fact,"* he explains, *"a low level of* ***y**** *explains why a country would typically have a low observed value of* ***y*** *in some arbitrarily chosen initial period."* (R. J. Barro 1996, 10)

5.1.2. Block's Barro-style equation – the framework of the study

With reference to Easterly and Levine (1997), Sachs and Warner (1997), Rodrik (1997) and more, Block objected to the assumption in previous studies of Africa being the same as other regions with regards to the factors contributing to growth (Block 2001). Africa's slower growth entirely as a consequence of its explanatory variables' immaturity relative to other regions was not satisfactory to Block -- for two reasons:

1) Previous studies' *"forced equality between African and non-African slope coefficients"* (Block 2001, 444), by which Block meant it was not given that growth mechanisms worked the same everywhere, and

2) previous studies' *"lack of consideration of the channels of transmission through which the reduced form variables affect growth"* (Block 2001, 444), by which he meant that they did not sufficiently control for indirect growth effects.

By first specifying a Barro-style growth equation and then several additional equations *"intended to explain the determinants of selected variables in the initial growth equation"* (Block 2001, 444) he claimed his model would permit *"identification of indirect growth effects of more fundamental variables"* (Block 2001, 444). To test his hypothesis, Block took what he called the "*novel approach of freeing not only the African intercept term, but each of the African slope terms as well*" (Block 2001, 444). In other words, he wanted to allow for growth effects to differ for Africa, and did this by estimating the equation in two forms, both *partially* and *fully* unrestricted (Block 2001).

The fully unrestricted regression had the form:

Formula 4

$$Y = \beta_0 + (\boldsymbol{\gamma_0} * \boldsymbol{d}) + X_\beta + (\boldsymbol{d} * \boldsymbol{X})\boldsymbol{\gamma} + \varepsilon$$

(Block 2001, 447)

In this equation ***d*** identifies African differences (equal to 1 for the African observations only), while ***X*** represents the slope terms (Block 2001). Effectively, the equation is divided into two parts; the first part being the intercept and slope of the full sample (denoted by $\boldsymbol{\beta}$), while the latter expresses how these differs for Africa (denoted by $\boldsymbol{\gamma}$). This "construction" is basically running both a general and an Africa-specific regression in one, but with the single equation Block facilitated hypothesis testing of their differences (Block 2001).

In the *partially unrestricted* regression, the African slope ***(d * X)*** would be "neutralized" by imposing the constrain $\boldsymbol{\gamma} = \mathbf{0}$. In effect, only the Africa intercept would be freed (Block 2001, 447). As differences in the African slope consequently would be "pooled" in the African intercept, a finding that this intercept term was statistically significant would indicate the model's failure to account for African differences (Block 2001). To control that this interpretation was correct Block then ran the *fully unrestricted* regression. If the intercept disappeared he considered it proven that freeing the African slope allowed for better modeling of the data (Block 2001).

5.2. Estimation strategy

The current study will blueprint Block's estimation strategy in order to facilitate comparison.

To prevent that outliers drive the findings, OLS is avoided in favor of median regression (a special case of quantile regression; (Block 2001)). Median regression differs from OLS by fitting the median of the dependent variable to a linear function of covariates (Block 2001). Rather than minimizing the squared deviation from the mean, median regression minimizes the absolute deviation around the median of the distribution of the dependent variable (Block 2001), solving:

Formula 5

$$\min_{\beta} \sum_{i} |y_i - x_t \beta|$$

(Block 2001, 448)

This function is known as the *least absolute deviations* ("LAD") estimator (Block 2001, 449).

LAD is less sensitive to outliers than OLS, but highly vulnerable to other threats to robustness. Block highlighted the concerns related to model uncertainty, and wrote *"[i]f particular parameter estimates are only statistically significant in the presence of other particular independent variables, the robustness of the finding is in question"* (Block 2001, 449). He solved this by noting and reporting any change in *"either the sign or the significance of explanatory variables as they are combined in a step-wise manner"* (Block 2001, 450). He also applied the *RESET* test for omitted variables, and concluded that the greatest practical concern for the study anyway would be slope coefficients driven by outliers, and that the robustness of *LAD* in this respect far exceeds the potential threats related to other potential robustness issues (Block 2001, 450).

6. DATA COLLECTION

6.1. Country samples and variables

The country samples are the same as for Block (please refer to *Appendix A* for a complete list).

The initial growth equation estimates economic growth as a function of initial income per capita, initial life expectancy at birth, institutional quality, openness, fiscal deficit, and population growth. Block contends that: *"This reduced-form specification is broadly representative of the recent growth literature."* (Block 2001, 450).

Throughout the data collection and construction of variables, all possible precautions have been taken to ensure the resemblance between the current study's and Block's dataset. However, due to data limitations and other obstacles, minor differences exist nevertheless.

Please refer to *Appendix B* for a complete list of variables, data labels and sources.

6.2. Testing data quality

In order to redo Block's study for a different time period, it should be established that the collected data mostly captures the same variation. Thus a dataset spanning from **1975-2009** has been constructed by the use of data from updated versions of the sources employed in Block's paper.

The suitability of the collected data is then tested by correlating the period **1975-1994** in the dataset with Block's:

Table 1 - Correlation matrix: Block's data vs. data analyzed in this paper

		"My" data (1975-1994)										
		ELF	INST	GRTOT	OPEN	GRPOP	GRGDP	TYR25	WORKER	LLEB(0)	LGDP(0)	DEF
Block's data (1975-1995)	ELF	**0,71**										
	INST	0,09	**0,95**									
	GRTOT	-0,21	-0,59	**-0,39**								
	OPEN	-0,50	-0,12	-0,59	**0,91**							
	GRPOP	0,26	-0,09	0,34	-0,35	**0,86**						
	GRGDP	-0,20	0,05	-0,54	0,43	-0,37	**0,92**					
	TYR25	-0,44	-0,06	-0,59	0,53	-0,33	0,26	**0,93**				
	WORKER	0,35	0,63	0,17	0,18	0,06	0,19	0,20	**0,75**			
	LLEB(0)	-0,61	0,20	-0,66	0,66	-0,29	0,60	0,58	0,52	**0,97**		
	LGDP(0)	-0,43	0,44	-0,49	0,57	-0,18	0,49	0,41	0,55	0,87	**0,97**	
	DEF	-0,24	0,26	-0,26	0,62	0,18	0,49	0,55	0,71	0,63	0,77	**0,89**

As the matrix above displays, the variables are generally positively correlated, with only one exception. Growth rate of net barter trade ("GRTOT") is negatively correlated between the datasets. However, in Block's study it was found that this variable did not have a statistically significant Africa-specific effect (Block 2001). When disregarding the "*GRTOT"* variable, the correlations between the datasets range from 71 to 97 %; with an average value of 89 %. I consider this solid proof that the data I have collected will allow for a coherent analysis of the variables' developments since Block's study.

6.3. Data: Africa versus other developing areas

As Block, this analysis begins with a simple comparison of the descriptive statistics for the African versus non-African sample. Obviously, there will be substantial variation within each sample, but the comparison still offers an introduction to how they differ in their characteristics:

Table 2 - Descriptive statistics								
	1975-1994 ("Block's" period)							
	Africa				**Non-Africa**			
Variable	*Mean*	*S.D.*	*c.v.*	*n*	*Mean*	*S.D.*	*c.v.*	*n*
GRGDP	0,0243	0,0456	1,88	137	0,0380	0,0349	0,92	204
LGDP(0)	6,4528	0,826	0,13	144	7,5141	1,6831	0,22	212
LLEB(0)	3,9195	0,1383	0,04	144	4,1567	0,1187	0,03	212
GRPOP	0,0272	0,0106	0,39	144	0,0206	0,0114	0,55	208
TYR25	2,555	1,4498	0,57	116	4,5125	2,1663	0,48	200
ELF	0,6823	0,2387	0,35	144	0,3757	0,2520	0,67	212
INST	0,4117	0,1814	0,44	73	0,4405	0,1971	0,45	143
DEF	-1,6572	6,2311	3,76	11	-1,2882	4,3522	3,38	26
GRTOT	-0,0044	0,0795	0,00	93	-0,0143	0,0645	4,51	111
OPEN	0,2227	0,3877	1,74	88	0,4698	0,4687	1,00	172
WORKER	0,387	0,0588	0,15	36	0,3953	0,0779	0,20	53

Continuation of Table 2 - Descriptive statistics								
	1995-2009 ("My" period)							
	Africa				**Non-Africa**			
Variable	*Mean*	*S.D.*	*c.v.*	*n*	*Mean*	*S.D.*	*c.v.*	*n*
GRGDP	0,0464	0,0424	0,91	108	0,0399	0,0223	0,56	157
LGDP(0)	6,9368	0,9454	0,14	108	8,4159	1,4706	0,17	159
LLEB(0)	3,9487	0,1469	0,04	108	4,2502	0,0784	0,02	159
GRPOP	0,0244	0,0106	0,43	108	0,0148	0,0101	0,68	156
TYR25	4,2522	1,8981	0,45	87	6,5081	2,2665	0,35	150
ELF	0,6823	0,239	0,35	108	0,3757	0,2522	0,67	159
INST	0,5014	0,1556	0,31	85	0,4609	0,1363	0,30	146
DEF	-1,1104	3,5559	3,20	52	-1,6645	3,3975	2,04	111
GRTOT	0,0055	0,0407	7,40	94	0,0088	0,0494	5,61	148
OPEN	0,9545	0,1747	0,18	66	0,986	0,0942	0,10	129
WORKER	0,4042	0,0571	0,14	108	0,4239	0,0771	0,18	159

Although the study's data for the period **1975-1994** was closely correlated to Block's, there are still individual outliers as such that potentially could make a direct comparison with his descriptive statistics a misleading exercise.

For instance, Block found that the *coefficient of variation* ("c.v.") – the normalized measure of dispersion of frequency distribution – for growth rate of GDP ("*GRGDP"*) was 16.8 versus 2.4, while it in this study is only found to be 1.88 versus 0.92 for the same period. Hence, to confidently state that African countries' GDP growth has converged radically since 1995 would probably be an over-interpretation of the output from the descriptive statistics. However, as the *c.v.* nevertheless shrank after 1995 regardless of which dataset one refers to, it is likely that growth rates *have* converged to some extent.

Anyhow, there is little doubt the average GDP growth in Africa has soared since the 90's. It has even slightly surpassed growth in the Non-African sample (Africa: 4,64 %; non-Africa: 3,99 %). This observation is at the core of this study, as it is exactly this "boom" in African growth it aims to investigate.

For the remaining variables, differences are not great. Still, it is worth noting they are no longer as unilaterally in Africa's disfavour as in Block's study. Interestingly, Africa now scores higher on average than "non-Africa" in institutional quality. It may also seem like budget deficits now are smaller for African countries than the non-African. That being said, a very small number of observations throughout the two periods suggest that not too much emphasis should be put on this interpretation. Anyway, African countries have significantly improved their score on the openness index, from an average of 0.22 to 0.95, reducing the gap to the Non-African sample from 0.25 in **1975-94** to only 0.03 in **1995-2009**. This could potentially be a key development to explain the growth during recent years, considering Block's finding that openness to trade was highly influential in determining Africa's economic growth (Block 2001).

This is about as far as the descriptive statistics are able to take us. They offer some possible explanations, but in order to test these hypotheses we need to move on to a more systematic approach.

7. REGRESSION ANALYSIS

Trusting all necessary precautions to prevent systematic errors have been taken, we move on to analyze the years **1995-2009**. The period has been divided into three five-year periods; **1995-1999**, **2000-2004** and **2005-2009**. The sample consists of 89 countries; with three observations each, giving a total maximum of 267 possible observations for each variable. The African sample has a maximum of 108 potential observations per variable, while the non-African adds up to 159.

7.1. Block's initial regression (1975-1994)

The main aim of this study is to investigate Africa more in detail than merely as a dummy variable, which has often been the case in contemporary growth literature (Block 2001). Thus, we run both a partially restricted and a fully unrestricted regression.

As discussed in section 5.1.2, Block defined his unrestricted growth equation as:

Formula 6

$$Y = \beta_0 + (\boldsymbol{\gamma_0} * \boldsymbol{d}) + X_\beta + (\boldsymbol{d} * \boldsymbol{X})\gamma + \varepsilon$$

(Block 2001, 447)

Here ***d*** specifies the African differences while ***X*** is the particular slope terms (Block 2001).

Block hypothesized GDP growth as a function of initial income per capita, initial life expectancy at birth, institutional quality, openness, fiscal deficit, and population growth (Block 2001, 450). From his analysis, Block defined both partially restricted and fully unrestricted growth specifications.

(Keep in mind that in both specifications the *SSA*-variable is a binary dummy with the value *1* for African countries and *0* for non-African. The relevant parts of each equation are here displayed in bolded font.)

For the ***partially restricted*** regression, when $\boldsymbol{\gamma = 0}$, his model would be equal to Formula 7 below:

Formula 7

$$GRGDP =$$
$$0.283 + [\,(-0.028 * \mathrm{LGDP}(0)) + (-0.057 * \mathrm{LLEB}(0)) + (0.138 * \text{"INST"}) + (0.021 * \mathrm{OPEN}) + (0.002 * \mathrm{DEF}) + (-0.733 * \mathrm{GRPOP})\,]$$
$$+(\mathbf{-0,038} * \mathbf{SSA}) + \varepsilon$$

(Please refer to *Appendix B* for list of data labels)

In the ***fully unrestricted*** regression, when also allowing for slope terms to differ ($\boldsymbol{\gamma = 1}$), the model looked as in Formula 8:

Formula 8

$$GRGDP =$$
$$0.112 + [\,(-0.038 * \mathrm{LGDP}(0)) + (0.086 * \mathrm{LLEB}(0)) + (0.139 * \text{"INST"}) + (0.011 * \mathrm{OPEN}) + (0.003 * \mathrm{DEF}) + (-0.781 * \mathrm{GRPOP})\,]$$
$$+(\mathbf{0.062} * \mathbf{SSA}) + [(\mathbf{0.015} * \mathbf{LGDP(0)} * \mathbf{SSA}) + (\mathbf{-0.118} * \mathbf{LLEB(0)} * \mathbf{SSA}) + (\mathbf{-0.021} * \mathbf{INST} * \mathbf{SSA}) + (\mathbf{0.030} * \mathbf{OPEN} * \mathbf{SSA}) + (\mathbf{-0.004} * \mathbf{DEF} * \mathbf{SSA}) + (\mathbf{-0.095} * \mathbf{GRPOP} * \mathbf{SSA})] + \varepsilon$$

(Please refer to *Appendix B* for list of data labels)

7.2. Results from the updated initial regression (1995-2009)

With the framework established, we move on to the actual analysis and rerun the initial regression -- though for the period of interest: **1995-2009**.

Below, the table presents the ***partially restricted*** (column 1), the ***fully unrestricted*** (column 2), and ***standardized form*** (column 3) specifications.

Table 3 - Initial growth regression -- LAD estimation results.

Dependent variable: GRGDP[a]

	Partially restricted (1)			**Fully unrestricted (2)[b]**			**Fully unrestricted (3)[c]**		
	Coef.	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**
CONSTANT	-0,040	0,089	-0,45	0,089	0,170	0,53	0,086	0,076	1,13
LGDP(0)	-0,007	0,003	-2,21	-0,007	0,004	-1,84	-0,008	0,004	-1,84
LLEB(0)	0,020	0,025	0,81	-0,001	0,046	-0,02	-0,000	0,007	-0,02
INST	-0,001	0,012	-0,05	0,015	0,012	1,24	0,002	0,002	1,24
OPEN	0,053	0,013	4,11	0,011	0,007	1,47	0,002	0,001	1,47
DEF	0,001	0,001	1,91	0,001	0,001	2,00	0,004	0,002	2,00
GRPOP	0,219	0,243	0,90	0,009	0,271	0,03	0,000	0,003	0,03
SSA	0,001	0,007	0,09	-0,122	0,191	-0,64	-0,122	0,191	-0,64
LGDP(0) x SSA				-0,001	0,007	-0,11	-0,003	0,024	-0,11
LLEB(0) x SSA				0,022	0,051	0,42	0,042	0,099	0,42
INST x SSA				-0,038	0,024	-1,54	-0,010	0,006	-1,54
OPEN x SSA				0,056	0,023	2,41	0,026	0,011	2,41
DEF x SSA				-0,001	0,002	-0,33	-0,001	0,003	-0,33
GRPOP x SSA				-0,022	0,510	-0,04	-0,000	0,007	-0,04
Pseudo R2	0,108			0,154			0,154		
n	113			113			113		
RESET[d]	0,941								

[a] Coefficients are estimated for the period 1995/1999–2005/2009.

[b] The net slope term for Africa is the sum of the slope for the general interaction term and the slope of the Africa interaction term.

[c] Independent variables in standardized form. Coefficients indicate effect of a one standard deviation change on the dependent variable.

[d] Ramsey RESET test, P-value for H_0: No omitted variables (based on OLS estimation).

7.2.1. Interpretation of the partially restricted specification

In the **partially restricted** specification (column 1), the initial income level is found to have a slightly negative effect on the growth rate. The finding is statistically significant at the 5 % level, and corresponds with the theory's prediction of a slow-down in growth as the economy approaches the "steady state" (R. J. Barro 1996). Openness has also a strong effect, statistically significant at the 1 % level. Growth associated with budget deficits, although modest, is found to be statistically significant at the 10 % level.

The African intercept term ("SSA") is however of most relevance in this specification, and indeed it is *not* statistically significant. According to Block's logic this suggests the partially restricted model *succeeds* to account for African differences, which would mean there is no need to free the African slope term (Block 2001). However, an F-test rejects the null hypothesis of African slope terms and intercept being jointly equal to the non-African slope terms ($F(7,99) = 4.64$, $P = 0.0315$), also when the intercept term is excluded ($F(6,99) = 2.69$, $P = 0.0183$).

Ramsey's RESET test fails to reject the null hypothesis of no omitted variables, but the low Pseudo-R^2 statistic for both specifications tells us that a smaller share of the total variance is explained by the model. While 23 % of the variance was explained in Block's partially restricted specification, the current has an explanatory power of only 10.78 % in this respect.

The low explanatory power of the partially restricted specification motivates further investigation.

7.2.2. Interpretation of the fully restricted specification

Not too much can be said for certain from running the **fully unrestricted** regression (ref. column 2), but it still offers some insight. The effect from budget deficits seems to be of a general character. Although the African slope term for this variable is not statistically significant, most of the variation remains related to the general term when allowed to differ. A high score on the openness index is on the other hand found to have a quite substantial, positive effect; however only the African term is statistically significant (indeed, it is so at the 5 % level). While

being "open" according to the binary openness index of Sachs and Warner (1995) will improve economic growth by 1.1 percentage points per year in the general sample, the effect of openness will be an additional 5.6 percentage points for the African. Implicitly however, being closed to trade will thus also be more hurtful to growth in Africa than elsewhere. This is an interesting observation as it is consistent with Block's conclusion (Block 2001), and the apparent African "hyper-sensitivity" in his finding seems even more pronounced now. As noted by Block, other studies have recorded similar findings, for instance did Collier and Gunning (1999) conclude that Africa was characterized by smaller economies with relatively tight trade restrictions, and that trade restrictions were more damaging to smaller economies (Collier and Gunning 1999). Of more recent research, Olayeni (2011) found that openness stratified Sub-Saharan Africa into "small open" and "highly open" economies (Olayeni 2011, 1). He emphasized that the African countries are far from homogenous; and while openness may help some, it may still harm others. Failure to delineate this fact has potential to damage the region through counter-productive policy recommendations (Olayeni 2011).

Keep also in mind that the African sample's average "openness" score dramatically improved from Block's period (1975-1995) to the current (1995-2009), ref. Table 2.

Directing the attention back to the results, we note that the Pseudo-R^2 statistic is low; only 15.4 % for the fully unrestricted model (Block's was 26 %). There are several possible reasons why the model might have a lower explanatory power than Block's, one being that there may be inconsistencies between our data sources. However, it may also imply that the recent growth in African GDP is influenced by variables not included in Block's specification. We will return to this possibility in section 7.5.

We also note that the coefficient of the African dummy variable is -0.1215, although not statistically significant. With this in mind, note that none of the African interaction terms that failed to produce statistically significant results (except initial life expectancy at birth) had positive coefficients. It is in other words not beyond doubt, but still probable, that African differences undermine

growth in the region. Certainly, with only one exception Block found the same to be the case (Block 2001).

7.3. Trimming the model

Ideally, the conclusions from the initial regression would have been clearer, but there are some statistically significant results and they mostly support Block's findings. In order to test their robustness, the study continue by excluding the variables that failed to generate statistically significant results; *LLEB(0)*, *INST* and *GRPOP*.

Table 4a–Own results from trimmed model.
Dependent variable: GRGDP[a]

	Partially restricted (1)			**Fully unrestricted (2)**		
	Coef.	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**
CONSTANT	0,030	0,015	1,93	0,084	0,015	5,470
LGDP(0)	-0,006	0,002	-3,97	-0,006	0,002	-3,060
OPEN	0,068	0,009	8,01	0,009	0,006	1,470
DEF	0,001	0,000	3,03	0,001	0,000	3,130
SSA	-0,001	0,004	-0,25	-0,089	0,025	-3,500
LGDP(0) x SSA				0,002	0,003	0,540
OPEN x SSA				0,071	0,012	5,980
DEF x SSA				-0,002	0,001	-2,800
Pseudo R^2	0,078			0,131		
n	129			129		

[a] Coefficients are estimated for the period 1995/1999–2005/2009.

Apparently, the statistically significant results found in the first partially restricted specification are quite robust (ref. Table 4a, column 1). Furthermore, the African intercept term is still slightly negative, but not statistically significant.

A comparison of the model fit with an equivalent trim of Block's model (ref. Table 4b) shows the model has only a slightly lower Pseudo R^2 score for the fully unrestricted specification (ref. Table 4a and 4b, column 2).

Table 4b - Block's results from trimmed model.

Dependent variable: GRGDP[b]

	Partially restricted (1)			Fully unrestricted (2)		
	Coef.	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**
CONSTANT	0,091	0,039	2,37	0,101	0,041	2,46
LGDP(0)	-0,010	0,005	-2,04	-0,011	0,005	-2,14
OPEN	0,038	0,008	4,55	0,038	0,008	4,92
DEF	0,002	0,001	2,47	0,002	0,001	3,25
SSA	-0,018	0,008	-2,29	-0,047	0,061	-0,77
LGDP(0) x SSA				0,003	0,008	0,33
OPEN x SSA				0,001	0,016	0,05
DEF x SSA				-0,003	0,001	-2,56
Pseudo R^2	0,1354			0,149		
n	235			235		

[b] Coefficients are estimated for the period 1975/1979–1990/1995.

In the fully unrestricted specification (Table 4a, column 2), we also find that most of the results have not changed much from Table 3. However, we note that the African intercept term now is statistically significant which suggests the characteristic "being African" in itself will slow down a country's economic growth by 8.9 percentage points per year.

Interestingly, in this trimmed version of the model, the African interaction term for fiscal deficits ("DEF x SSA") is statistically significant which indicates that a reduction in fiscal deficits will slow down economic growth in Africa. This is quite the opposite of the effect observed for the general sample. Interestingly, Block found a similar relationship in his data; noting that *"[a] 1 percentage point reduction in deficits, which increases economic growth by 0.3 percentage points outside Africa, has no impact on growth in Africa"* (Block 2001, 453). The finding is particularly interesting as it supports the conclusions by Easterly (2005) that the IMF and World Bank's structural adjustment programs in Africa through the 80's and 90's by and large had few positive implications for the Africa's economic health. Schmidt-Hebbel (1995) found that fiscal adjustment did not contribute to higher growth by providing more resources for domestic investment, but rather had a strong, indirect effect by reducing macroeconomic instability

(Schmidt-Hebbel 1995, 39). The importance of policies that reduce macroeconomic fluctuations is also backed by Bassanini and Scarpetta (2001).

7.4. Indirect growth effects

Although not finding proof for African differences in the direct effects from institutional quality or population growth, Block still considered these variables to be essential to understand *how* African economies grew slower. At the general level, Block found statistically significant proof that improved institutional quality and reduced population growth would have strong and positive impacts on economic growth. By taking a closer look at the sample means for the variables, he also found that African countries on average had lower quality institutions and faster population growth (Block 2001).

As already noted, the model failed to generate similar results for **1995-2009** (ref. Table 2 and 3). In fact, the data suggest the quality of institutions in the African sample has surpassed that of the non-African sample. We will thus have to assume, at least for now, that Block was right about these growth effects, and contain ourselves to investigate how these two variables are determined.

7.4.1. Determinants of institutional quality

With reference to previous research by Rodrik (1998), Lane and Tornell (1996), and Collier and Hoeffler (1998), Block modelled institutional quality as a function of ethnolinguistic fractionalization ("ELF"), initial total years of schooling of the over 25 year old population ("TYR25"), and the share of raw materials in total exports ("RAW") (Block 2001).

Please note that Block did not specify the source or characteristics of his raw materials variable. I have thus run the following regressions with two related, though different, variables in its place. These are *"Fuel export as share of total merchandise exports"* ("FUEL") and *"Ores and metals export as share of total merchandise exports"* ("OAME").

The *partially restricted* specification (Table 5, column 1) provides only a statistically significant finding for ethnolinguistic fractionalization.

Like for Block, there are no statistically significant results from the raw material variables (Block 2001). Note also that the partially restricted specification for African differences, as in the initial regression, fails to provide a statistically significant result.

Table 5 - Determinants of institutional quality—LAD regression results.
Dependent variable: INST[a]

	Partially restricted (1)			**Fully unrestricted (2)**		
	Coef.	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**
CONSTANT	0.417	0.035	12.00	0.368	0.040	9.08
ELF	0.070	0.040	1.74	0.097	0.047	2.05
TYR	0.005	0.004	1.23	0.009	0.005	1.99
FUEL	-0.034	0.038	-0.89	0.023	0.040	0.58
OAME	-0.034	0.064	-0.53	-0.053	0.090	-0.58
SSA	-0.009	0.232	-0.38	0.134	0.074	1.83
ELF x SSA				-0.070	0.088	-0.80
TYR x SSA				-0.012	0.009	-1.34
FUEL x SSA				-0.167	0.080	-2.07
OAME x SSA				-0.057	0.116	-0.49
Pseudo R^2	0.0188			0.0355		
n	*186*			*186*		

[a]Coefficients are estimated for the period 1995/1979–2004/2009.

In the *fully restricted* specification (column 2), the results suggest there are universal, positive and statistically significant benefits from ethnolinguistic fractionalization and schooling. The first of these findings; that non-African countries benefit from ethnolinguistic fractionalization while it hurts the African is quite surprising since Block recorded the exact opposite (Block 2001). However, there is substantial literature suggesting that ethnolinguistic fractionalization is associated with poorer institutional quality and slower economic growth (Easterly and Levine 1997), and Africa *has* an unusually high level of ethnolinguistic fractionalization (ref. Table 2).

Anyhow, the model fit score is very low; and as Block emphasized in a footnote, the *ICRG indicator* of institutional quality is *"subjective and based on surveys of*

international businessmen dealing with various countries. As such, one cannot eliminate the possibility that the measure is biased" (Block 2001, 455).
Hence, we shall content ourselves to noting that the "INST" variable fails to give any clear indication of economic growth for now.

However, despite their failure to generate a statistically significant result with the *ICRG* indicator, effects from natural resources are highly relevant, particularly in the African context due to the region's natural resource abundance. Established literature suggests that natural resources may be both a "curse" and a "blessing" (Sachs and Warner 1997), for instance did van der Ploeg (2011) find that the resource rich countries that manage to benefit from their resources are characterized by good institutions, trade openness and high investments in exploration technology. He also notes that these countries are vulnerable to volatility in commodity prices, and even suggests this volatility may be one of the main reasons for "resource curses" (van der Ploeg 2011).

The parallel booms in commodity prices and African economic performance motivate further investigation of their relationship. That recent growth in African economies possibly has been caused mainly by increases in commodity prices – *not* structural improvements – is supported by Arbage and Page (2009). In their article *"How Fragile Is Africa's Recent Growth?"* (2009), they find that the post-1995 accelerations have not generally been accompanied by improvements that usually are correlated with long-term growth - such as in investments or institutional quality - but rather that the growth mainly took place in mineral-rich countries (Arbache and Page 2009).

In order to test for this hypothesis, the original model from section 7.2 has been modified by adding relevant explanatory variables. We will return to these modifications in section 7.5.

7.4.2. Determinants of population growth

In this next step, Block modeled population growth as a function of initial income, initial life expectancy at birth (first and second-order), initial total years of schooling in the over 25 population, and the ratio of total labor force to total population (first and second-order), drawing on the works of Becker (1991) among others. Within this framework one would expect increases in life expectancy, as well as better education and employment prospects to bring the birth rate down.

Table 6 - Determinants of population growth - LAD regression results.
Dependent variable: GRPOP[a]

	Partially restricted (1)				**Fully unrestricted (2)**			
	Coef.	**Std. Err.**	**t**	**P>|t|**	**Coef.**	**Std. Err.**	**t**	**P>|t|**
CONSTANT	0,727	0,248	2,93	0,004	2,276	1,717	1,33	0,186
LGDP(0)	-0,001	0,001	-1,36	0,175	-0,002	0,001	-1,26	0,210
LLEB(0)	-0,335	0,124	-2,70	0,008	-1,076	0,815	-1,32	0,188
WORKER	0,025	0,068	0,37	0,713	-0,002	0,076	-0,02	0,983
TYR	-0,002	0,000	-4,41	0,000	-0,002	0,000	-3,39	0,001
LLEB(0)2	0,041	0,016	2,59	0,010	0,130	0,097	1,34	0,181
WORKER2	-0,067	0,082	-0,82	0,412	-0,050	0,090	-0,56	0,578
SSA	0,003	0,002	1,79	0,075	-2,807	1,761	-1,59	0,112
LGDP(0) x SSA					0,001	0,002	0,59	0,556
LLEB(0) x SSA					1,378	0,838	1,65	0,101
WORKER x SSA					0,065	0,213	0,30	0,762
TYR x SSA					0,000	0,001	0,23	0,816
(LLEB(0) x SSA)2					-0,171	0,100	-1,71	0,089
(WORKER x SSA)2					-0,025	0,264	-0,09	0,925
Pseudo R2	0,320				0,346			
n	234				234			
RESET[b]	0,62							

[a] Coefficients are estimated for the period 1995/1999–2005/2009.

[b]Ramsey RESET test, *P*-value for H_0: no omitted variables
(based on OLS estimation).

The African intercept in the *partially restricted* specification (Table 6, column 1) is statistically significant at the 10 % level, suggesting that African populations grow at a higher rate (0.3 percentage points per year) than the general sample, thus there is an indication that the partially restricted model fails to account for African differences (Block 2001). Both the first and second-order terms for initial life expectancy at birth are statistically significant, leading to a U-shaped function which confirms that population growth is negatively associated with increases in life expectancy. No statistically significant results for work stock relative to population are found, but there is proof at the 0.01-level of significance that an additional year of average schooling generally will reduce a country's birth rate by 0.2 percentage points per year.

In the fully unrestricted sample, the first order term for African differences in initial years of life expectancy fails marginally to be significant at the 10 % level (p=0.101), but suggests a strong positive effect on population growth from improvements in life expectancy. The second order term is also strong and statistically significant at the 10 % level (p=0.089). These findings are consistent with Block's and lend support to his conclusion that improvements in life expectancy will reduce the birth rate more outside Africa than within; adding to the notion that Africa fails to benefit from another growth enhancing condition (Block 2001).

There are no statistically significant findings related to work stock's share of population. Note though that coefficients are of the "right sign" when compared with Block who found that an increase in the working share of the adult population would bring population growth down, but no substantial proof to claim the same is the case for Africa (Block 2001).

There is a general, negative relationship between years of schooling and population growth, but the model fails to account for African differences in this respect. Block, on the other hand, found that Africa also here failed to benefit from a factor that reduced population growth elsewhere (Block 2001).

Finally, note the African intercept which only just missed the 0.10 benchmark of significance (p=0.112) in the fully unrestricted specification. It displays a largely

negative and *unexplained* African difference (coefficient = -2.807) which is an indication that other explanatory variables should be included to improve the model of population growth. However, that would be beyond the scope of this study.

7.5. Modifications to the initial growth equation

With reference to the last paragraph of section 7.4.1, the study here proceeds by including the two raw material variables in the initial regression. This modification is done with base in a substantial heritage of growth literature discussing the effect of natural resources on macroeconomic performance and stability, including the intriguing concept of the "resource curse" (Sachs and Warner 1997) including its derivatives, such as the "fuel curse" (Fearon 2005).

Furthermore, it is essential to understand whether the growth observed in Africa since the mid-1990s results from structural improvements or simply is a response to the boost in demand for natural resources (Arbache and Page 2009). The increased demand is largely driven by the emergence of China as a global superpower, and potential Dutch disease effects related to this are obviously of great interest (Zafar 2007).

In the next step, a variable for foreign direct investments as share of GDP is included. This is mainly justified by the well-documented interaction between inflows of FDI and domestic growth (Fedderke and Romm 2006), but is also highly relevant in order to understand the impact of the Asian, and particularly Chinese interest in the region (Kaplinsky and Morris 2009). Traditionally, there has been harder for Africa than other regions to attract foreign investors (Asiedu 2002). During the last few years however, the region has been central in the foreign policies of the emerging superpower (Hanson 2008).

The modifications to the model are done in an attempt to improve its explanatory power in the post-millennial global economy. Although the new variables may prove excessive, missing important variables is surely more of a problem than introducing irrelevant ones (Sala-I-Martin 1997).

7.5.1. Fuels, ores and metals export

When fuel exports are included as an explanatory variable (ref. Table 7), we see that the results in the partially restricted specification do not change much, even though the effect of openness is no longer statistically significant. The effect of budget deficits are on the other hand statistically significant at the 10 % level in both specifications, and shows the same negative Africa-specific effect that was observed in the trimmed model (ref. Table 4a) and Block's study.

Fuel export is not a statistically significant determinant of economic growth in the general specification, but in the African sample. An F-test succeeds at the 0.10-level of significance to reject the null hypothesis of the African and non-African slopes to be equal for this variable.

Table 7 - Initial regression with fuel exports.
Dependent variable: GRGDP[a]

	Partially restricted			**Fully unrestricted**		
GRGDP	**Coef.**	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**
CONSTANT	-0,005	0,116	-0,04	0,039	0,233	0,17
LGDP(0)	-0,007	0,003	-2,01	-0,008	0,005	-1,52
LLEB(0)	0,022	0,030	0,74	0,013	0,063	0,21
INST	0,002	0,013	0,12	0,014	0,017	0,84
OPEN	0,009	0,009	1,00	0,009	0,009	1,10
DEF	0,001	0,001	1,87	0,001	0,001	1,64
GRPOP	0,147	0,306	0,48	0,025	0,351	0,07
FUEL	0,003	0,011	0,28	0,002	0,012	0,18
SSA	0,002	0,008	0,20	-0,296	0,276	-1,07
LGDP(0) x SSA				0,004	0,009	0,44
LLEB(0) x SSA				0,070	0,072	0,98
INST x SSA				-0,053	0,034	-1,58
OPEN x SSA				-0,005	0,073	-0,07
DEF x SSA				-0,006	0,003	-1,80
GRPOP x SSA				-0,086	1,017	-0,08
FUEL x SSA				0,078	0,038	2,05
Pseudo R2	0,096			0,134		
n	106			106		

[a] Coefficients are estimated for the period 1995/1999–2005/2009.

We have thus established there are indications that exports of fuels have a greater impact on GDP growth in Africa than elsewhere.

For the reasons explained above, we proceed by replacing this variable by ores and metals export. Table 8 shows a similar effect of initial income levels, openness and fiscal deficit as the previous specifications (although only a general effect from the latter). We also note a statistically significant growth effect from export of ores and metals, although only at the 10 % level and only for the African sample.

Table 8 - Initial regression with ores and metals export.
Dependent variable: GRGDP[a]

	Partially restricted			**Fully unrestricted**		
GRGDP	**Coef.**	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**
CONSTANT	-0,020	0,062	-0,33	0,070	0,157	0,44
LGDP(0)	-0,007	0,002	-3,17	-0,007	0,004	-1,93
LLEB(0)	0,014	0,017	0,85	0,004	0,042	0,09
INST	0,002	0,009	0,19	0,015	0,011	1,33
OPEN	0,060	0,009	6,47	0,011	0,006	1,81
DEF	0,001	0,000	2,86	0,001	0,001	2,04
GRPOP	0,111	0,169	0,65	0,046	0,258	0,18
OAME	-0,016	0,009	-1,71	-0,015	0,017	-0,88
SSA	0,001	0,005	0,17	-0,047	0,200	-0,24
LGDP(0) x SSA				-0,008	0,006	-1,37
LLEB(0) x SSA				0,006	0,051	0,13
INST x SSA				-0,046	0,023	-2,01
OPEN x SSA				0,103	0,015	6,87
DEF x SSA				-0,003	0,002	-1,45
GRPOP x SSA				-0,651	0,405	-1,61
OAME x SSA				0,032	0,023	1,36
Pseudo R2	0,124			0,195		
n	109			109		

[a] Coefficients are estimated for the period 1995/1999–2005/2009.

When both variables are included (ref. Table 9), a slightly different picture emerges. Openness, which until now has provided highly robust results, is no longer statistically significant, while a substantial and positive African effect from fuel exports emerges. Furthermore, export of ores and metals shows a negative general effect, but a strong positive Africa- effect. We also note that institutional quality records a negative effect for Africa which has proved quite robust in all specifications in this section (ref. Table 7, 8 and 9).

Table 9 - Initial regression with fuel *and* ores & metals exports.
Dependent variable: GRGDP[a]

	Partially restricted			**Fully unrestricted**		
GRGDP	**Coef.**	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**
CONSTANT	0,010	0,096	0,10	0,007	0,119	0,06
LGDP(0)	-0,007	0,003	-2,76	-0,008	0,003	-2,95
LLEB(0)	0,021	0,025	0,84	0,022	0,032	0,68
INST	0,004	0,011	0,38	0,009	0,008	1,11
OPEN	0,008	0,007	1,12	0,007	0,004	1,63
DEF	0,001	0,001	2,56	0,001	0,000	3,67
GRPOP	-0,044	0,243	-0,18	-0,117	0,175	-0,67
FUEL	0,004	0,008	0,55	0,006	0,006	0,97
OAME	-0,019	0,013	-1,51	-0,021	0,010	-2,05
SSA	0,002	0,006	0,36	-0,466	0,184	-2,54
LGDP(0) x SSA				0,005	0,006	0,82
LLEB(0) x SSA				0,107	0,047	2,27
INST x SSA				-0,088	0,017	-5,24
OPEN x SSA				0,000	0,055	0,00
DEF x SSA				-0,005	0,002	-3,5
GRPOP x SSA				1,104	0,718	1,54
FUEL x SSA				0,098	0,030	3,31
OAME x SSA				0,077	0,018	4,24
Pseudo R2	0,112			0,156		
n	106			106		
RESET[b]	0.4331					

[a] Coefficients are estimated for the period 1995/1999–2005/2009.

[b] Ramsey RESET test, P-value for H_0: No omitted variables (based on OLS estimation).

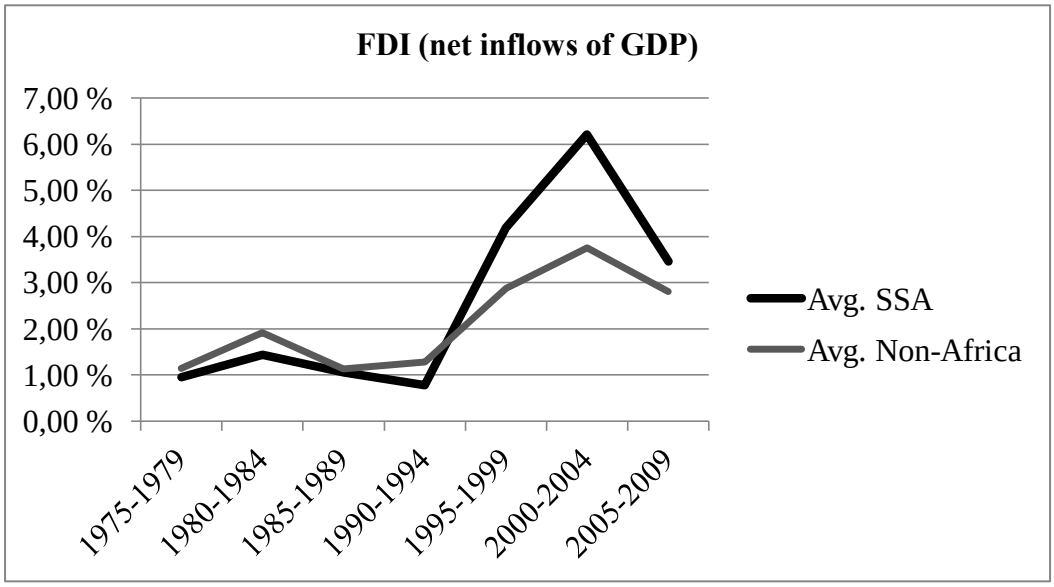
One can only speculate why improved institutions would have a negative effect on African growth, but it could possibly be related to the negative effect from overly large governments, previously discussed by Barro (1996) among others.

Indeed it seems like Africa *is* different. However, it is possible that the results are biased due to co-linearity between the export variables and the openness index. We will return to this possibility at a later stage.

7.5.2. Foreign Direct Investment (FDI)

As discussed in the introduction to this section, Chart 3 below clearly demonstrates how there has been a substantial increase in annual net inflows of FDI to Africa since the mid-1990s. This has often been referred to as one of the key indicators to understand Africa's recent growth (Hanson 2008).

Chart 3 – FDI (net inflows of GDP) SSA sample vs. Non-SSA sample since 1975



(World Bank n.d.)

To account for this potential effect, FDI is introduced as an explanatory variable in the initial growth equation, displayed in Table 10 below.

Table 10 - Initial regression with FDI.

Dependent variable: GRGDP[a]

	Partially restricted			Fully unrestricted		
GRGDP	**Coef.**	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**
CONSTANT	-0,039	0,107	-0,37	0,243	0,179	1,35
LGDP(0)	-0,007	0,004	-1,69	-0,006	0,004	-1,48
LLEB(0)	0,020	0,030	0,68	-0,040	0,048	-0,83
INST	-0,003	0,015	-0,19	0,013	0,013	0,95
OPEN	0,053	0,016	3,25	0,013	0,006	2,1
DEF	0,001	0,001	1,05	0,001	0,001	1,38
GRPOP	0,254	0,314	0,81	0,025	0,289	0,09
FDI	0,104	0,059	1,75	0,099	0,049	2,01
SSA	0,001	0,009	0,14	-0,269	0,202	-1,33
LGDP(0) x SSA				-0,001	0,008	-0,12
LLEB(0) x SSA				0,053	0,053	1,01
INST x SSA				-0,023	0,023	-1,03
OPEN x SSA				0,060	0,024	2,48
DEF x SSA				-0,001	0,002	-0,73
GRPOP x SSA				-0,043	0,571	-0,08
FDI x SSA				0,142	0,109	1,3
Pseudo R2	0,124			0,183		
n	113			113		

[a] Coefficients are estimated for the period 1995/1999–2005/2009.

Not too much attention should be directed towards the other results in this specification, due to the previously discussed problem of the model's modest robustness when faced with new variables, but we record a strong and general effect on growth from FDI. Apparently, a one percentage point increase in FDI will improve GDP growth by 9.9 percentage points per year. However, we find no unique effect for Africa that succeeds in producing a statistically significant result.

To test the robustness of the finding, we proceed by reintroducing the raw materials.

7.5.3. FDI, fuels, and ores/metals

When all three of the "new" variables are included in the specification, ref. Table 11 below, a handful of noteworthy relationships occur.

- Once again the negative effect of initial income on the general sample proves itself as highly robust. It is particularly strong for Africa.

- Openness proves important at the general level, but much more so for the African countries. This also implies that African countries which are "closed" pay an extraordinarily high price for not reforming their policies.

- There is recorded a positive effect from reducing budget deficits at the general level, but the model fails to find a similar, statistically significant effect for Africa. That being said, the coefficient's sign corresponds with the results from the initial regression, and also Block's.

- Population growth is negatively correlated with economic growth in the general sample, but Africa pays a much tougher penalty. Some precaution is advised in the interpretation though, as the effect and statistical significance of the variable has varied substantially between the different specifications.

- Interestingly, a negative relationship is found between higher quality institutions and economic growth in Africa. The finding also seems quite robust (ref. Table 3, 7, 8 and 9).

- Fuel export records a modest positive effect at the general level, but fails to be statistically significant for Africa specifically.

- Ore and metal export is negative at the general level, but fails to be statistically significant for Africa alone.

- Finally, FDI seems to have solid and robust effects in both samples, but the African effect is found to be particularly strong; approximately five times stronger than at the generic level.

Table 11 - Initial regression with FDI, fuels, and ores/metals.

Dependent variable: GRGDP[a]

	Partially restricted (1)			Fully unrestricted (2)[b]			Fully unrestricted (3)[c]		
GRGDP	**Coef.**	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**	**Coef.**	**Std. Err.**	**t**
CONSTANT	0,048	0,079	0,61	0,020	0,080	0,25	-0,069	0,069	-1,00
LGDP(0)	-0,008	0,002	-3,35	-0,009	0,002	-4,55	-0,010	0,002	-4,55
LLEB(0)	0,012	0,020	0,61	0,020	0,022	0,9	0,003	0,003	0,90
INST	0,002	0,009	0,26	0,007	0,006	1,18	0,001	0,000	1,18
OPEN	0,010	0,006	1,64	0,009	0,003	2,73	0,001	0,001	2,73
DEF	0,001	0,000	2,47	0,001	0,000	4,01	0,004	0,001	4,01
GRPOP	-0,038	0,204	-0,19	-0,044	0,115	-0,38	-0,000	0,001	-0,38
FDI	0,070	0,040	1,72	0,061	0,023	2,67	0,002	0,001	2,67
FUEL	0,006	0,007	0,89	0,007	0,004	1,76	0,001	0,001	1,76
OAME	-0,018	0,010	-1,81	-0,017	0,006	-2,66	-0,002	0,001	-2,66
SSA	0,001	0,005	0,15	0,248	0,166	1,5	0,248	0,166	1,50
LGDP(0) x SSA				-0,019	0,007	-2,66	-0,065	0,024	-2,67
LLEB(0) x SSA				-0,066	0,041	-1,62	-0,129	0,079	-1,62
INST x SSA				-0,026	0,011	-2,46	-0,007	0,003	-2,46
OPEN x SSA				0,211	0,059	3,6	0,098	0,027	3,61
DEF x SSA				-0,001	0,001	-0,8	-0,002	0,003	-0,80
GRPOP x SSA				-1,898	0,741	-2,56	-0,026	0,010	-2,56
FDI x SSA				0,277	0,070	3,94	0,010	0,003	3,94
FUEL x SSA				-0,019	0,025	-0,77	-0,003	0,004	-0,77
OAME x SSA				-0,011	0,018	-0,63	-0,002	0,002	-0,63
Pseudo R2	0,128			0,175			0,175		
n	106			106			106		
RESET[d]	0,93								

[a] Coefficients are estimated for the period 1995/1999–2005/2009.

[b] The net slope term for Africa is the sum of the slope for the general interaction term and the slope of the Africa interaction term.

[c] Independent variables in standardized form. Coefficients indicate effect of a one standard deviation change on the dependent variable.

[d] Ramsey RESET test, P-value for H_0: No omitted variables (based on OLS estimation).

8. REVIEW, DISCUSSION & CONCLUDING REMARKS

Approaching the end of the study, the most pronounced tendencies in the results will here be reviewed before we move on to discuss them in light of relevant literature and eventually get to the concluding remarks.

While the results already have been thoroughly presented and discussed on a technical level for each new specification, this section will attempt to look at the "big picture" and discuss what observations that should be highlighted in the conclusion. Due to the at times substantial differences from one specification to another, this section will not focus so much on variable coefficients as whether the results are robust and African differences occur.

8.1. Review

In the following we focus on one variable at the time; note however that some have been left out where no particularly interesting results were found.

8.1.1. Initial income per capita ("LGDP(0)")

There seems to be pretty robust empirical support for a modest, negative relationship between GDP growth and initial income per capita. Higher per capita levels of GDP will slow down growth, due to the economy's maturity, ref. the neo-classical "steady state" (R. J. Barro 1996, 11). There is no empirical support in the data - nor in Block's - that Africa's economic mechanisms work differently in this respect.

8.1.2. Initial life expectancy at birth ("LLEB(0)")

We find little statistically significant evidence for the effect from initial life expectancy at birth. However, there is substantial proof that Africa fails to benefit from this variable with respect to population growth. While initial life expectancy at birth is negatively associated with population growth and thus will have indirect positive effects on economic growth for the general sample, no such relationship is observed for Africa. The data even suggests the effect might be quite the opposite.

8.1.3. Institutional quality ("INST") & Population growth ("GRPOP")

Although Block found these to be the two most influential variables at the general level, my data for the most part fail to produce statistically significant results. Block's model also rejected direct African-specific effects, but found that the differences existed in how the two variables were determined.
I do indeed find some of the same indirect relationships, suggesting Africa still fails to benefit from social developments which indirectly enhance economic growth elsewhere. Note however, that such an interpretation assumes that the direct effects identified by Block still apply (Block 2001).

8.1.4. Overall budget deficit ("DEF")

There seems to be quite robust evidence that while most nations get a growth premium from reducing their budgetary deficits, that incentive does not apply to African countries. It seems that at best, the economic effect of reducing deficits in Africa will be zero, if not negative. Block also recorded the same relationship (Block 2001). There is no obvious reason why Africa should fail to benefit from healthier fiscal policies, but as the current situation in the Eurozone demonstrates, austerity alone will not create growth.

8.1.5. African intercept term ("SSA")

Unlike Block, all full-scale specifications in this study fail to record a statistically significant Africa-intercept. On the contrary, the partially restricted specification consistently returns very high p-values for this variable, regardless of the combination of interaction terms. According to Block's initial setup, this finding suggests that there is no real need to free the African slope terms. When we do however, there *are* indeed substantial differences for Africa.

Furthermore, in all of the specifications except the one in Table 11, our African intercept is negative when fully unrestricted. This suggests there exist an unexplained "x-factor" that slows down African growth, which researchers have failed to identify so far (Collier and Gunning 1999).

8.1.6. Fuel exports ("FUEL")

When included in the model, fuel exports seem to have a strong positive effect on African growth. However the effect turns negative and is no longer statistically significant when foreign direct investment (FDI) is introduced.

That the statistical significance of the explanatory variables in a model tends to be interdependent is indeed a well-known problem among growth theorists. Sala-I-Martin (1997) highlighted how growth theories fail to be explicit enough about what variables that belong in the "true" regression:
"[E]ven if it is known that the 'true' model looks like (1), one does not know exactly what particular variables x_j *should be used. If one starts running regressions combining the various variables, variable* x_1 *will soon be found to be significant when the regression includes variables* x_2 *and* x_3*, but it becomes nonsignificant when* x_4 *is included. Since the 'true' variables that should be included are not known, one is left with the question: what are the variables that are really correlated with growth?"* (Sala-I-Martin 1997, 178).

The inclusion of the fuel variable in the model also has implications for the statistical significance of the openness variable, suggesting they may account for some of the same variance. Indeed, it is not unlikely the variables "FUEL", "OAME", "FDI" and "OPEN" are interconnected as openness arguably will affect the level of FDI, while the levels of openness and FDI are likely to have a direct effect on the volume of raw materials a country is able to export. In fact, the African correlation (ref. Table 12) of "FUEL" with "OPEN" is 41.9 % while only 3.6 % in the general sample. Furthermore, the correlation between "OPEN" and "FDI" is 68.9 % (9.4 % in the general sample), and between "FUEL" and "FDI" it is 24 % (-7.2 % in general).

Table 12 - Correlation Matrix: FUEL, OAME, FDI and OPEN				
General sample:	Fuels	Ores & metals	Openness	FDI
Fuels	1,000			
Ores & metals	-0,097	1,000		
Openness	0,036	0,076	1,000	
FDI	-0,072	0,150	0,094	1,000
African sample:	Fuels	Ores & metals	Openness	FDI
Fuels	1,000			
Ores & metals	0,183	1,000		
Openness	0,419	0,476	1,000	
FDI	0,240	0,501	0,689	1,000
n = 185				

Table 13 - Correlation Matrix: GRGDP, FUEL, OAME and FDI				
	General sample			
	GDP growth rate	Fuels	Ores & metals	FDI
GDP growth rate	1,000			
Fuels	0,013	1,000		
Ores & metals	-0,002	-0,137	1,000	
FDI	0,097	-0,065	0,160	1,000
	African sample			
	GDP growth rate	Fuels	Ores & metals	FDI
GDP growth rate	1,000			
Fuels	0,257	1,000		
Ores & metals	0,356	0,024	1,000	
FDI	0,611	0,228	0,444	1,000
n = 235				

Notably, the African GDP growth's correlation with these variables is at a much higher level than for the Non-African.

8.1.7. Ore and metal exports ("OAME")

Similar and even stronger relationships are recorded for "OAME". Like for fuels, ores and metals exports seem to have a strong and positive Africa-specific effect, but the results are not very robust. The improvement in the explanatory power of "FDI" when "FUEL" and "OAME" is included in the equation is notable; particularly when the variable's African-specific correlation with the two is taken into consideration.

The effect of "OAME" at the general level is negative when statistically significant, suggesting that an increase in ores and metals as share of a country's total exports will hurt its growth - *unless* it is African. This may seem counter-intuitive, but could possibly be due to initial differences in level of technological development. While countries in the non-African sample expectedly are more focused on the processing of goods -- implying an increase in ores and metals' share of their total exports thus would mirror a decrease in exports of processed goods -- a similar increase in Africa would probably represent a move away from less profitable industries, such as agriculture and fishing.

Arbache and Page also found mineral-wealth to be central in explaining the strong African performance after 1995: *"The resource-rich economies had significantly higher frequencies of growth accelerations and lower frequencies of growth decelerations than their neighbours without natural resources"* (Arbache and Page 2009, 20).

8.1.8. Foreign direct Investments ("FDI")

When included in the initial regression, a substantial positive effect occurs at the general level (apx. +0.10 change in the coefficient). An Africa-specific effect does however only emerge when in combination with "FUEL" and "OAME", but is then the single most influential variable for the African sample (coefficient = 0.277) and highly significant (p=0.000).

8.2. Discussion

Ironically, the only indisputable conclusion that can be made from this study is that estimating economic growth is an incredibly difficult exercise. In fact, scholars have still only an imperfect understanding of how economic growth is determined. However, a lot of good research has been done on the subject.

Due to the magnitude of the study, and its acknowledgement of the already discussed interrelation between the explanatory variables' statistical significance, some of the wisdom from Sala-I-Martin's *"I just ran two million regressions"* (1997) will here be used as points of reference for the concluding chapter of this paper.

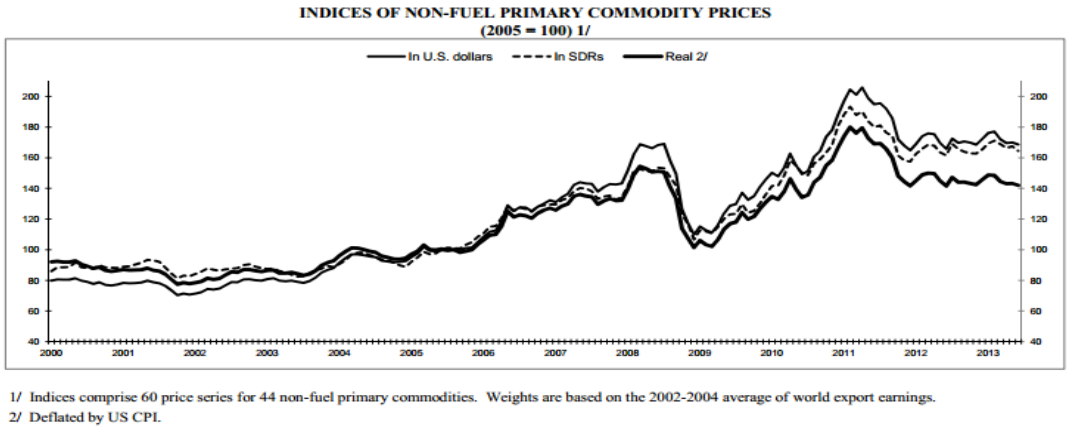
By literally running two million regressions, Sala-I-Martin identified twenty-two variables that proved highly robust to how growth equations were specified, and *even* then the regional variables turned out to have the most robust effects -- particularly that being *African* retards economic growth (Sala-I-Martin 1997, 181). Certainly, regional variables are only proxies for other, unidentified mechanisms, but in this study too there are tendencies suggesting such an unexplained and negative relationship, although it is only statistically significant in certain specifications.

Sala-I-Martin also found positive effects from trade openness and investments, as well as a negative effect from increases in primary products as share of total exports (Sala-I-Martin 1997). The African differences in this study's (and Block's) results for openness -- as well as the extension of the analysis to test for effects from FDI and raw material exports -- has the potential to explain some of the variance recorded in the Africa-dummy. Certainly there seems to be a positive relationship between raw material exports and African growth; contesting established theory on the field (Sachs and Warner 1997). However, one should keep in mind that the period investigated in this study is only 14 years long and consequently does not account for long-term effects. Hence, it is not necessarily self-contradictory that Africa "booms" in the short run - driven by increased demand for natural resources - but still fails to achieve long-term growth - due to commodity price volatility, as well as political rent-seeking and corruption (Sachs and Warner 1997). Indeed, Sachs and Warner found that sudden price shocks

often leave the exporting countries uncompetitive in other industries due to increased labor cost (Sachs and Warner 1997, 835).

In a study quite similar to this one, Arbache and Page (2009) compared the years **1975-1994** with **1995-2005** and found that the improvement in Africa's economic performance since 1995 was mostly due to a general growth increase in mineral-rich economies, and that there was little proof for the observed growth being associated with substantial policy and governmental improvements (Arbache and Page 2009).

Chart 4 – Indices of *Non-Fuel* Primary Commodity Prices



(International Monetary Fund (IMF) 2013)

They also found structural improvements similar to those recorded in this study, such as trade openness and FDI (Arbache and Page 2009). However, the improvements in FDI were largely found in the mineral-rich countries (Arbache and Page 2009). On this basis, Arbache and Page concluded that Africa's growth improvement in recent years was largely a result of increases in global demand for natural resources, although some of it perhaps could be attributed to fewer mistakes in economic policy than in previous decades (Arbache and Page 2009). Indeed, when reviewing the results in *this* study, the correlation between "FDI" and "OAME" was more than 50 % (ref. Table 12).

Although useful in some respects, there are limitations to Sala-I-Martin's methodical framework. For instance, he specifically names variables such as

government spending, total labor force and ethnolinguistic fractionalization as "*not […] important*" (though adds that his analysis only allows for linear effects (Sala-I-Martin 1997, 182)). As demonstrated by the regressions in the current study, these effects may not be directly observable, but can nevertheless be highly influential (ref. Table 5 and 6).

To conclude on how economic growth in Africa is determined is in a way like attempting to explain why there is war in the world -- no matter how great the attempt, you will never be able to account for the full complexity of the question.

However, there have been some lessons worth noting from this analysis:

- **Openness to trade** is generally important to economic growth, and even more so in Africa (ref. Table 3 and 11). The general finding is backed by an exhaustive literature on the subject (Sachs and Warner 1995), while Africa's observed "hyper-sensitivity" in this respect is in line with Block's conclusion (Block 2001).

- The data also suggest that **FDI** have a general and positive effect which is even stronger in Africa (ref. Table 10 and 11). The proof for an African effect is arguably not very robust, but the general importance of investments has previously been recorded in a variety of studies -- for instance by Sala-I-Martin (1997181). Whether the African growth premium from FDI will be positive in the long run will probably depend on whether these investments are channeled into infrastructure, industry and other instruments that will contribute to build the continent, or rather focus on tapping into the natural resources to meet the investors' short-term demand (Sachs and Warner 1997).

- **Natural resources** seem to have a strong, positive effect on African growth; contradicting the effect for the non-African sample (ref. Table 9). However, it remains to be seen whether the current demand from East Asia will be a "blessing" or a "curse" for Africa. Possibly, we still lack the perspective to draw the right conclusion.

- Like for Block, growth effects from **fiscal policy** are not too pronounced (ref. Table 3 and 9), but the African differences work in the region's disfavor.

Overall, the same pattern that was observed by Block is recognized. African differences are for the most part not very big, but almost always in the region's disfavor. The data does not offer a clear cut explanation for the improved economic performance in the region. However, GDP growth seems to have substantially stronger correlations with FDI and raw material exports in the African sample (ref. Table 13). In its own right, this observation might be no more than "pseudo-research", but seen along with the previously discussed regressions, as well as the Arbache and Pages study (2009), it lends some support to the notion of Africa being in the middle of a commodity price bubble - *not* sustainable growth driven by structural improvement and good governance.

8.3. Concluding Remarks

So, did the African economy grow differently from other low- and middle-income countries between 1995 and 2009?

Well, on the one hand the partially restricted specification failed to generate a statistically significant African intercept term, which was Block's initial proof of regional differences and fundamental justification for freeing the African slope terms in the first place. On the other hand though, when the African slope terms were allowed to vary, some of their coefficients differed substantially from the broad sample. This fact suggests there *are* mechanisms working differently in African economies.

Anyhow, throughout the whole study, the lack of statistically significant results posed as a limitation to the robustness of the results. The main reason is believed to have been the relatively small size of the sample and high prevalence of missing data. Certainly, this is not the first study that has had to cope with the fixed number of countries in the world, nor certain governments' selective approach to official statistics. However, there unarguably exist more countries in Africa that could have been included in the sample, and was I to be offered the opportunity to carry out the study again, at a bigger scale, I would certainly take

it. Expanding the sample would increase the number of observations, and possibly also improve both model fits and significance levels dramatically.

That being said, it is still very likely that studies will keep to fail in modeling African growth precisely as long as the hang prevails among researchers to lump these countries together like they were one ((Block 2001); (Olayeni 2011)).

With respect to specific results, little proof is found in the data for Africa's recent growth being accredited to structural improvements. The only noticeable trend would be the continued market liberalizations to open for foreign trade, which seems particularly important for growth in Africa. These results are however closely correlated with growth effects from export of raw materials and particularly foreign direct investments. Indeed, Africa has certainly improved in its ability to attract investments, but the data in this study says little about how these investments will benefit the continent in the long run.

Like great men before me, I will have to conclude this study with more questions than I had when I started, but one thing is for certain: It will require more research to determine whether Africa's growth adventure is really a bubble.

***

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APPENDICES

Appendix A: Country samples

African sample	Non-African sample
1. Botswana	1. Argentina
2. Burkina Faso	2. Bahrain
3. Burundi	3. Bangladesh
4. Cameroon	4. Barbados
5. Cape Verde	5. Bolivia
6. Chad	6. Brazil
7. Congo, Dem. Rep.	7. Chile
8. Cote d'Ivoire	8. China
9. Ethiopia	9. Colombia
10. Gabon	10. Costa Rica
11. Gambia, The	11. Dominican Republic
12. Ghana	12. Ecuador
13. Guinea-Bissau	13. Egypt, Arab Rep.
14. Kenya	14. El Salvador
15. Lesotho	15. Greece
16. Liberia	16. Guatemala
17. Madagascar	17. Guyana
18. Malawi	18. Haiti
19. Mauritania	19. Honduras
20. Mauritius	20. Hong Kong SAR, China
21. Mozambique	21. Hungary
22. Namibia	22. India
23. Niger	23. Indonesia
24. Nigeria	24. Iran, Islamic Rep.
25. Rwanda	25. Jamaica
26. Senegal	26. Jordan
27. Sierra Leone	27. Korea, Rep.
28. South Africa	28. Malaysia
29. Sudan	29. Mexico
30. Swaziland	30. Morocco

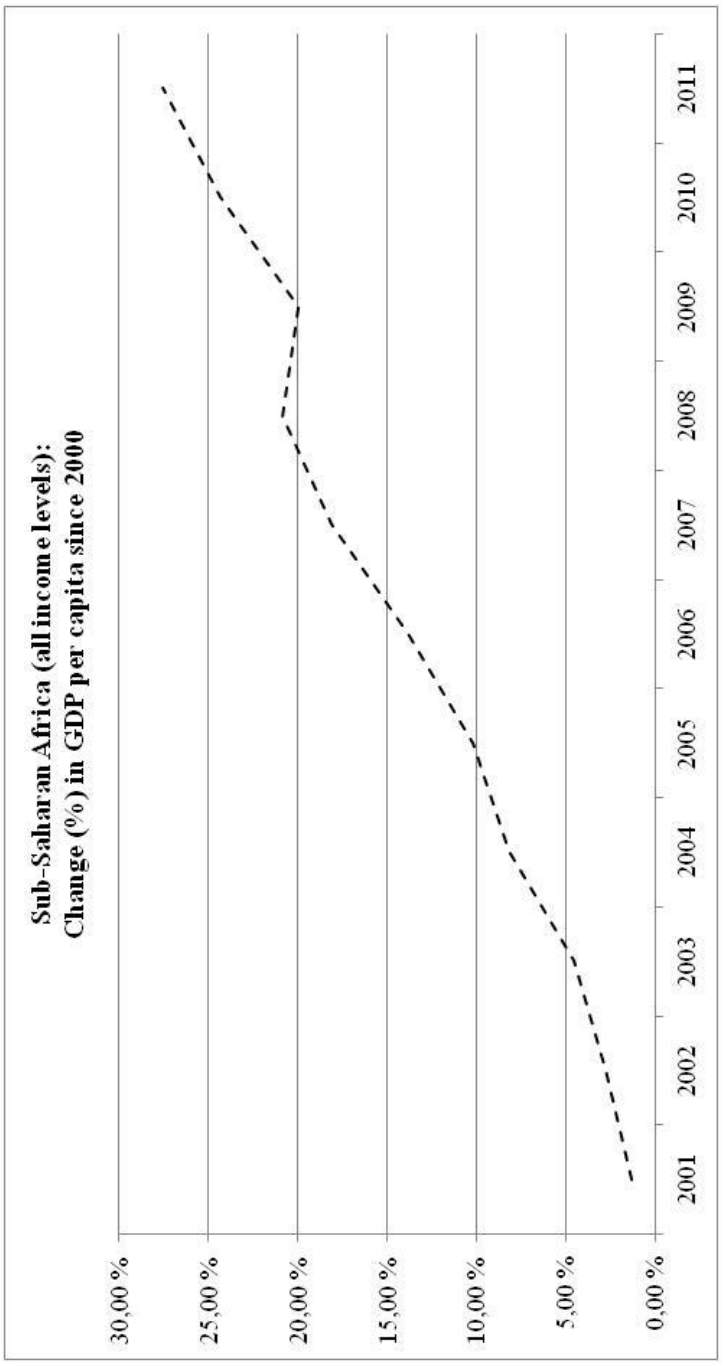
31. Tanzania 32. Togo 33. Uganda 34. Zambia 35. Zimbabwe	31. Myanmar 32. Nepal 33. Nicaragua 34. Oman 35. Pakistan 36. Panama 37. Papua New Guinea 38. Paraguay 39. Peru 40. Philippines 41. Portugal 42. Puerto Rico 43. Romania 44. Singapore 45. Sri Lanka 46. Suriname 47. Syrian Arab Republic 48. Thailand 49. Trinidad and Tobago 50. Tunisia 51. Turkey 52. Uruguay 53. Venezuela, RB 54. Yemen, Rep.

Appendix B: Data definitions and Sources

Code	Variable name	Source
GRGDP	Annual percentage growth rate of GDP at market prices based on constant 1987 local currency. Aggregates are based on constant 1987 US dollars.	(World Bank n.d.)
LGDP(0)	Log of real per capita GDP measured at the start of each 5-year period.	(Heston, Summers and Aten 2012)
LLEB(0)	Log of life expectancy at birth measured in the initial year of each 5-year period. Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	(World Bank n.d.)
GPOP	Growth rate of POP.	(Heston, Summers and Aten 2012)
TYR	Average schooling years in the total population over age 25, measured at the start of each 5-year period.	(Barro and Lee 2011)
ELF	Index of ethnolinguistic fractionalization, 1960. Measures probability that two randomly selected people from a given country will not belong to the same ethnolinguistic group.	(Easterly and Levine 1997)
INST	Computed from International Country Risk Guide Data (1982–1995). Unweighted average of subjective indices of: government repudiation of contracts, risk of expropriation, corruption, rule of law, and bureaucratic quality. Re-scaled to [0,1], averaged over entire period.	(The QoG Institute 2013); (The PRS Group 2013)
DEF	Overall budget deficit, including grants (% of GDP). Overall budget deficit is current and capital revenue and official grants received, less total expenditure and lending minus repayments.	(World Bank n.d.)

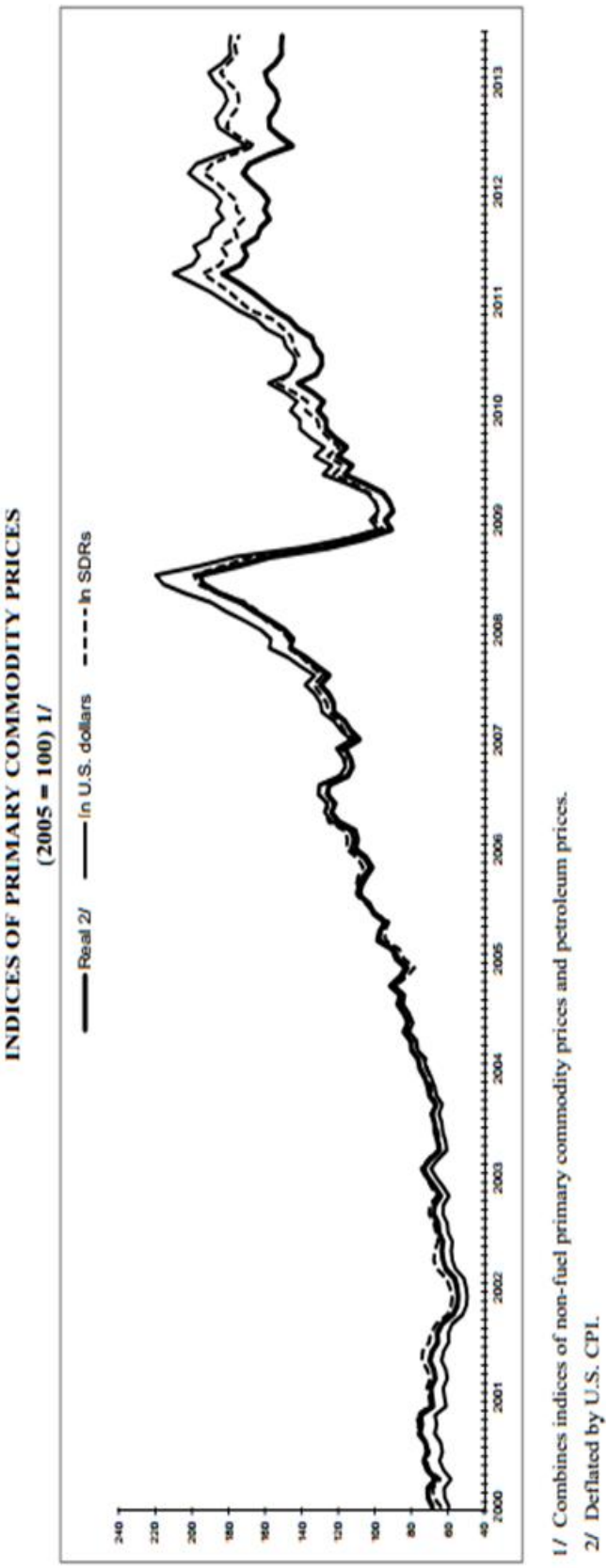
GRTOT	Growth rate of net barter terms of trade (1987=100). Net barter terms of trade are the ratio of the 1987 (base year) export price index to the corresponding import price index.	(World Bank n.d.)
OPEN	Portion of years in each 5-year period that is country is "open" as defined by Sachs and Warner (1995).	(Sachs and Warner 1995); (Wacziarg and Welch 2003)
WORKER	Ratio of total labor force to total population. Total labor force comprises people who meet the ILO definition of the economically active population: all people who supply labor for the production of goods and services during a specified period. It includes both the employed and unemployed. While national practices vary in the treatment of such groups as the armed forces and seasonal or part-time workers, in general the labor force includes the other unpaid caregivers and workers in the information sector.	(World Bank n.d.)
FDI	Foreign Direct Investments (net inflows of gdp in %)	(World Bank n.d.)
FUEL	Fuel exports (% of merchandise exports)	(World Bank n.d.)
OAME	Ores and metals exports (% of merchandise exports)	(World Bank n.d.)

Appendix C: Chart 1 – SSA's change in GDP per capita since year 2000



Source: (World Bank n.d.)

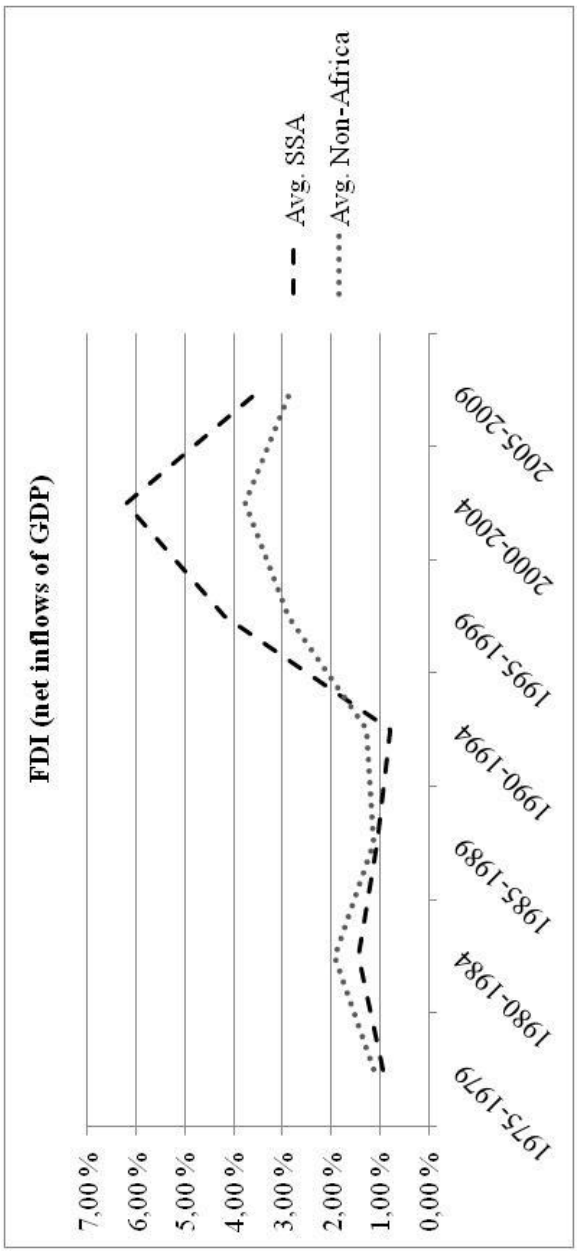
Appendix D: Chart 2 – Indices of Primary Commodity Prices



1/ Combines indices of non-fuel primary commodity prices and petroleum prices.
2/ Deflated by U.S. CPI.

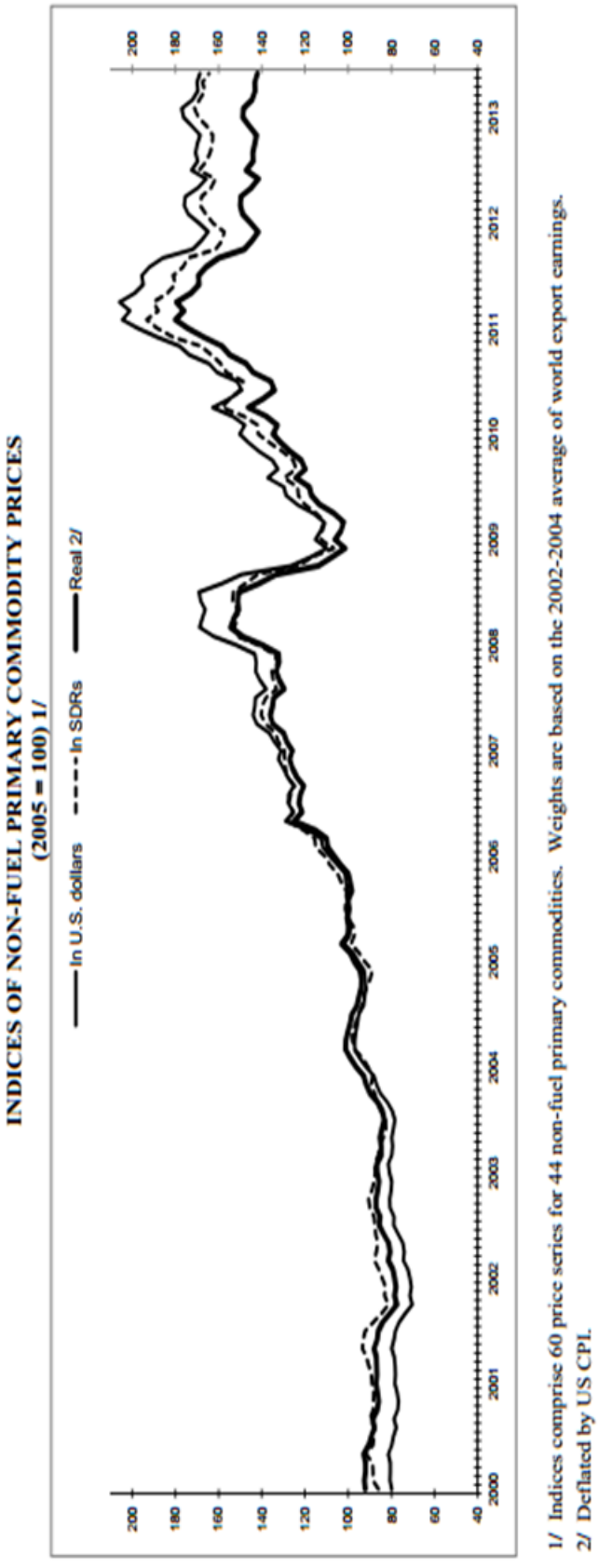
Source: (International Monetary Fund (IMF) 2013)

Appendix E: Chart 3 – FDI (net inflows of GDP) SSA sample vs. Non-SSA sample since 1975



Source: (World Bank n.d.)

Appendix F: Chart 4 – Indices of *Non-Fuel* Primary Commodity Prices



Source: (International Monetary Fund (IMF) 2013)