quantum global
research lab

Does FDI matter for Sustainable Growth in Sub Saharan Africa ? Evidence from a Heterogeneous Panel

Fernando C. Barbi and Celso Jose da Costa Jr

QGRL WORKING PAPER
No. 2016/03

August 2016

Does FDI matter for Sustainable Growth in Sub Saharan Africa ? Evidence from a Heterogeneous Panel*

Fernando C. Barbi†
and
Celso José da Costa Jr.‡

August 2016

Abstract

The debate around policies to attract Foreign Direct Investments (FDI) assumes that it induces economic growth. Authors still debate this assumption but recent studies suggest that FDI is relevant to growth when some prerequisites are met: the existence of good infrastructure, a significant stock of human capital and deep financial markets can increase the effects of FDI. Sub Saharan Africa (SSA) keeps growing even in the absence of these conditions. Our contribution is to show the existence of a long-run positive relation between FDI and growth in the SSA region using recently developed econometric techniques that control for sample heterogeneity and capture long term relations. Using different estimation techniques we verify that FDI affects growth positively in the long run but that trade openness and government expenditures are more significant factors to explain the growth process in the region. These results suggest that policies to attract foreign investors at the expense of public income should be carefully considered as they may backfire in the long run.

JEL Classification: F21, F43, C33, O55

Key words: FDI, Sustainable Growth, Sub Saharan Africa, Cointegrated Panel, ARDL

*The authors are grateful to Jeremy Wakeford for helpful suggestions and discussions. The views expressed are those of the authors and do not necessarily reflect those of the Quantum Global Group.

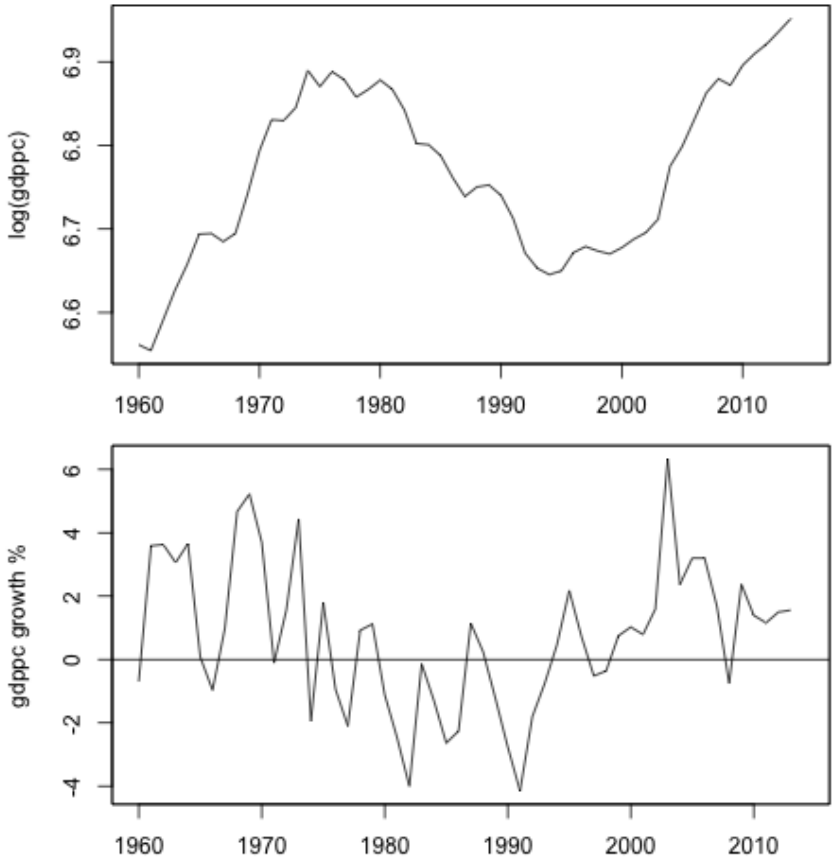
†Quantum Global Research Lab AG. fernando.barbi@quantumglobal.ch

‡São Paulo School of Economics (EESP/FGV)

1 Introduction

Since the mid-1990's Sub Saharan Africa experienced a period of elevated real GDP per capita growth that coincided with an increase in inflow of Foreign Direct Investments (FDI). Figure 1 shows that in 1995 growth was 2.1% per year, peaking at 6.3 % p.y. in 2003. It also shows that growth has been resilient: after slumping to -0.7% in 2008, it rebounded to 2.3% in 2009 and lately, in 2012 and 2013, has been around 1.5% p.y.

Figure 1: Real GDP per capita and growth rate



This increase in GDP coincides with the "Great Moderation", a period of growth with small variability of real activity and inflation on a global scale, that Canova (2009) explains as a coincidence of "good luck" (fall in the standard deviation of the shocks) and "good policy" (stable policy rules) factors. Sub Saharan Africa grew faster than the rest of the world during this period. Studying growth in Africa Beny and Cook (2009) come to the conclusion that growth is jointly caused by an increase in commodity prices and policy reforms. Andersen and Jensen (2014) indicate that institutions have improved in Africa so the authors believe that growth is sustainable. This is unfortunately not a consensus as other authors (Arbache and Page, 2010) believe that institutions are not yet strong enough to

ensure continuous, long term growth. Authors agree that a structural break took place circa 1995. A usual explanation for the posted growth rates for many of the Sub Saharan African nations is rooted in the commodity boom that preceded the financial crisis and the structural changes that happened in terms of financing investments on the continent. Some authors (Weisbrod and Whalley, 2011) observe that the increase in Sub Saharan African growth rates also coincided with a significant increase in Chinese inward Foreign Direct Investment (FDI).

Figure 2: FDI, Natural Resource, Openness and Credit in SSA

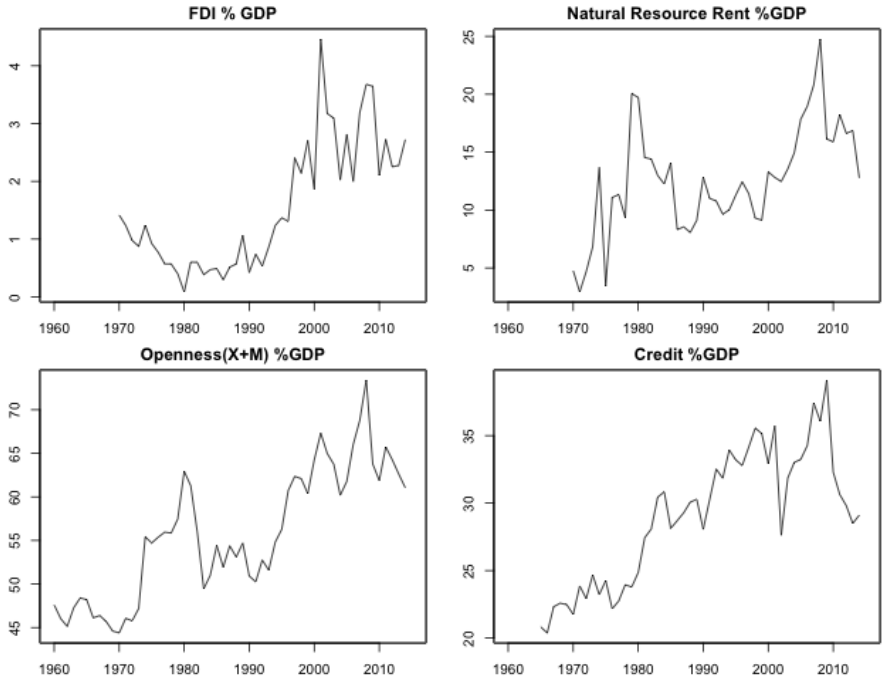


Figure 2 shows that other important changes happened on the international front with increased FDI/GDP and trade openness[1] to global markets while on the domestic front the financial markets (Credit/GDP) have gained relevance, offering increasingly more credit to the private sector. It is also true that the share of natural resources rents (representing the aggregate output from natural resources sectors including oil, diamonds and other minerals) has grown in terms of GDP. With this picture we propose three possible candidates to explain the increased participation of FDI, as discussed in section 2. Public policies also might have affected growth. The improved macroeconomic context can be perceived by the stable inflation (the GDP deflator) in figure 3 and the stable size of government expenditures as a share of GDP. The declining inflation and increasing share of credit/GDP created a good environment for investments, both domestic and foreign.

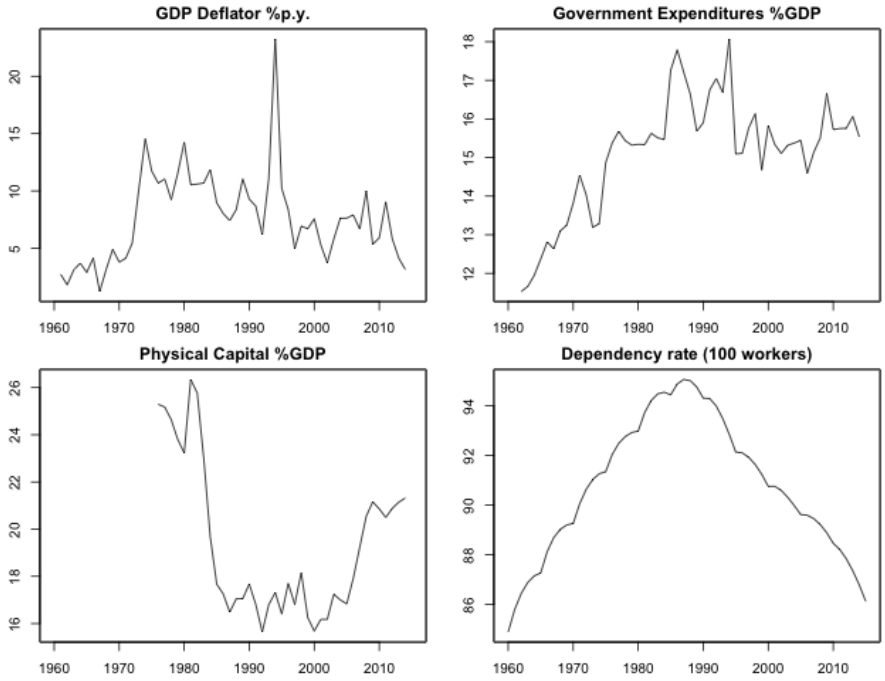
Figure 3 also shows other structural changes in SSA, such as the reduction in

[1]Openness is measured as the sum of import (M) and export (X) shares of GDP.

the "dependency"[2] rate that generated more workers per thousand inhabitants as indicated by figure 3. The increase in the number of workers can be traced back to good public health policies that translate into increased lifetime, but also to increased political stability in the region that preserved the lives of young adults. The last graph indicates that the share of physical capital has been growing after a slump in the 1980's and 1990's caused by conflicts and low investments. We should point out that the SSA region was swept since the 1960's by an increasing urbanization trend that could help explain the increased productivity, as discussed ahead.

Finally, for the sake of completeness it is important to mention that the region has received increasing amounts of Official Development Assistance (ODA) as net transfers received from the UN International Fund for Agricultural Development (IFAD) in the form of grants and net loans (minus repayments of principal on earlier loans) destined to develop the agricultural sector[3].

Figure 3: CPI, Government/GDP, Dependency and Physical Capital Stocks



We should note that from figure 2 the natural resource tendency to go above 15% of GDP after 2003 is probably related to the "commodity super-cycle" that lasted until 2008, with China simultaneously boosting prices and demand. This is reflected in the stock of physical assets in figure 3 that shows a significant spike circa 2005. Indeed, as primary sector activities require significant fixed capital, such as oil platforms and drilling equipment, this indicator could be misleading if

[2]The dependency rate is the percentage of dependents, people younger than 15 or older than 64 years, over the working-age population, those aged 15 to 64.

[3]The International Atomic Energy Agency (IAEA) has also provided ODA for some countries but this is a recent trend that we will not consider.

the observer assumes it will have a significant impact in the rest of the economy (this expansion is probably not related to an increase in manufacturing capabilities, but we could not confirm this with data).

Since FDI increased concomitantly to the real GDP per capita in the SSA region, our first contribution is to investigate if FDI caused growth, taking into consideration that many other permanent and temporary shocks happened concomitantly and could also explain the growth pattern observed in the data. There is abundant literature on the different mechanisms linking FDI to economic growth (see Blomstrom and Kokko (1997) for a survey). Our focus is to check if the connection exists in the SSA region.

The novelty of our approach is to use recent heterogenous cointegrated panel econometric tools to assess the long term relation between FDI and real GDP per capita. These tools provide robust results that allow us to relax some unrealistic assumptions on homogeneity and work with non-stationary data. The choice to focus on real GDP per capita is standard in the development literature as it takes into account the movement of GDP already discounting for inflationary and population growth effects. We opt for this variable in levels instead of in first difference, as usually done in the empiric literature, to capture the long term effects of FDI on GDP.

This paper is structured as follows. In section 2 we revisit the literature about the link between FDI and growth. In section 3 we present the challenges to invest in SSA. In section 4 we discuss the estimation methods used in the empirical treatment of the question. In section 5 the data used in the empirical analysis is presented next to the model results. In section 6 we conclude.

2 FDI and Growth

We first define FDI as an international venture in which an investor residing in the home economy acquires a long term "influence" (voting shares of 10% or more) in the management of an affiliate firm in the host economy. Aggregate FDI flows are the sum of equity capital, reinvested earnings, and other direct investment capital; hence, aggregate FDI flows and stocks include all financial transfers aimed at financing of new investments, plus retained earnings of affiliates, internal loans, and financing of cross-border mergers and acquisitions. (Contessi and Weinberger, 2009)

The debate over the benefits of FDI for developing economies postulates some conditionalities: given a certain level of existing capital, both physical and human, there is evidence to support that FDI brings technology spillovers, improves human capital formation, and contributes to international trade integration. These factors contribute to sustainable (ie.long term) economic growth by alleviating poverty and improving income distribution. Some authors highlight potential risks such

as the deterioration of the balance of payments as profits are repatriated, the potential lack of linkages within local markets and the risks to the environment, especially in extractive activities. (OECD, 2002)

Many authors emphasize the technology transfer channel in which FDI impacts positive growth through knowledge spillovers to domestic firms that raise total factor productivity in the host economy. Wang and Blomström (1992) and Rodriguez-Clare (1996) model technology transfers by multinational companies and propose that technology transfers induced by FDI are positively related to the level of host country firms learning investment. To increase technology transfer rather than defining performance requirements for the foreign companies, host country governments should focus on supporting the domestic firms in their learning efforts because the transfer process depends to a large extent on their capacity to absorb knowledge. This result suggests that FDI incentive programmes with local content requirements are suboptimal if they don't provide incentives for domestic firms to train their workers.

Borensztein et al. (1998) show that FDI contributes to growth as it is an important vehicle for the transfer of technology, and this contribution is enhanced by interacting with the level of human capital in the host country so that FDI is more productive than domestic investment only when the host country has a minimum threshold stock of human capital. The authors also find some evidence of a "crowding-in effect", that FDI is complementary to domestic investment. "The beneficial effects on growth of FDI come through higher efficiency rather than simply from higher capital accumulation."

More recently Carkovic and Levine (2005) question the robustness of these results using Generalized Method of Moments (GMM) panel data estimation techniques. The authors find that FDI is insignificant in the panel estimation when controlling for financial development or for international openness as proxied by either the trade share or the black market premium on the foreign exchange market.

Natural resources can negatively affect growth when institutions are not strong enough to discipline powerful groups. Lane and Tornell (1999) presented the "voracity effect" when interest groups fight to capture a greater share of the rents from natural resources inducing a bad allocation of resources as public subsidies and taxation grow faster than the windfall income. The *voracity effect* is a more-than-proportional increase in discretionary redistribution in response to an increase in the raw rate of return in the efficient sector.

Torvik (2002) argues that a greater amount of natural resources can hurt the economy as "more natural resources are likely to stimulate rent seeking that results in fewer manufacturing firms and lower average productivity, rather than harming the productivity in traded sector agriculture as an application of standard Dutch disease theories would suggest, or increasing productivity in domestic manufacturing." Based on the Chilean experience De Gregorio (2003) disagrees that natural resource exploration negatively impacts growth. The author argues that most rel-

evant from an economy's welfare perspective is not its rate of growth of output but the level of output and empirical evidence shows that the richer a country is in natural resources, the greater its income.

Alfaro (2003) shows that foreign investments in the primary sector are negatively correlated to growth while FDI directed to manufacturing have a positive effect. No clear relation was found for investments in the service sector. If Sub Saharan Africa's economies depend on natural resources (oil, gas, diamonds) we would expect a negative correlation between FDI and growth. The final impact is not so clear if the income from these activities is invested in infrastructure and human capital, two well-known determinants of long term growth (Lucas, 1988).

Alfaro et al. (2004) show that local financial markets are important to attract FDI and their relevance goes beyond the role played by the credit. According to the authors "to the extent that significant FDI arrives through mergers and acquisitions, it is not just easy availability of loans but also well-functioning stock markets that matter. Well-functioning stock markets, by increasing the spectrum of sources of finance for entrepreneurs, play an important role in creating linkages between domestic and foreign investors."

The positive relation between financial sector development and economic growth is challenged by some authors. Cecchetti and Kharroubi (2012) show that the level of financial development is good for growth only up to the point that it starts taking skilled human capital out of the real economy: at this point a fast-growing financial sector is detrimental to aggregate productivity growth. The mechanism is not simply based on the competition for skilled labor. Cecchetti and Kharroubi (2015) argue that an abundance of skilled workers in finance generates a negative externality on the other sectors: banks run by skilled workers can lend more to entrepreneurs and with more abundant and cheaper funding, entrepreneurs have an incentive to invest in projects with higher pledgeability but lower productivity, reducing total factor productivity growth. Should human capital be allocated to entrepreneurs who could invest in high return but low pledgeability projects, that would make aggregate productivity higher. Although this seems premature for SSA markets, it is possible to argue that as skilled workers are attracted to government and natural resource sector jobs, these two sectors' growth could be the reason why SSA economies lack dynamism in the manufacturing sector.

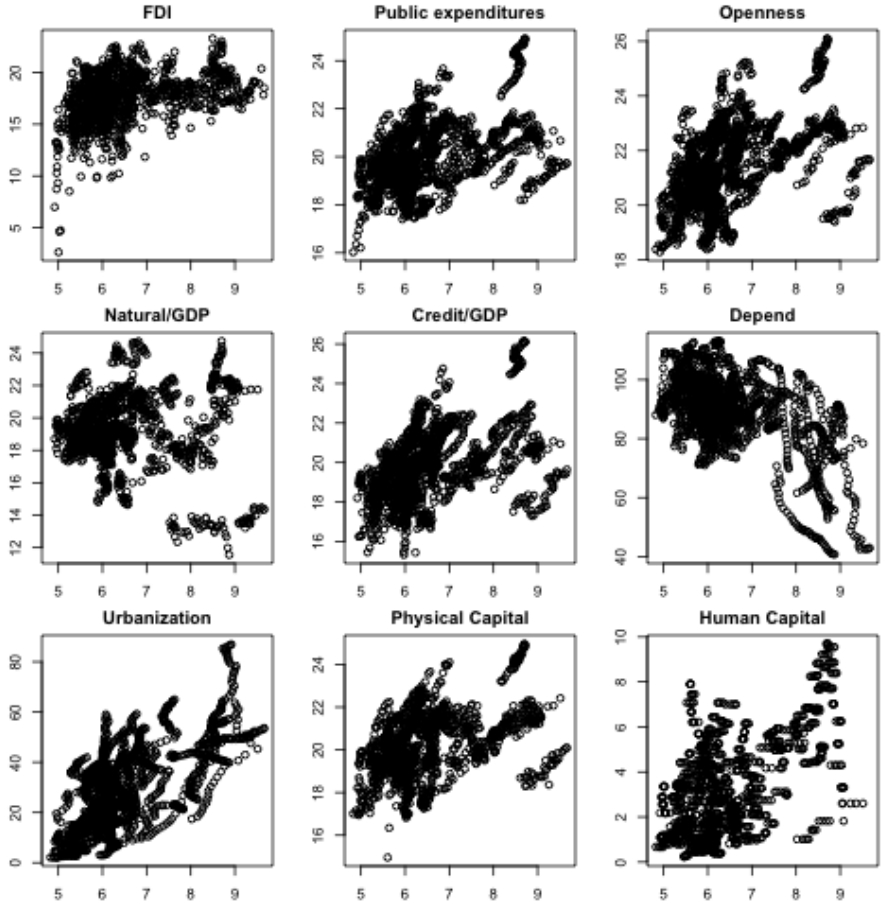
In Alfaro et al. (2006) the authors elaborate on the mechanisms that connect FDI to the local economy, because "since multinationals would like to prevent information leakage to potential local competitors, but would benefit from knowledge spillovers to their local suppliers, FDI spillovers ought to be between different industries." The authors suggest looking for vertical (inter-industry) externalities instead of horizontal (intra-industry) externalities. "This means the externalities from FDI will manifest themselves through forward or backward linkages, i.e., contacts between domestic suppliers of intermediate inputs and their multinational clients in downstream sectors (backward linkage) or between foreign suppliers of intermediate inputs and their domestic clients in upstream sectors (forward link-

age)."

3 Investing in Sub Saharan Africa

Africa has been the recipient of the smallest shares of FDI while, lately, the continent's economies have been growing in real per capita terms. This apparent inconsistency raises the question if Africa's growth is related to FDI inflows. Figure 4 suggest a concentration of investments in SSA countries with annual per capita GDP from USD 400 (in 2005 USD terms) to USD 8100 pointing towards the hypothesis that international investors look for host countries with developed local markets.

Figure 4: Real GDP per capita (horizontal) versus covariates



According to Morisset (2000) SSA raise some concerns next to investors. "The reforms in many African countries have been incomplete and thus have not fully convinced foreign investors to develop activities that are not dependent on natural resources and aimed at regional and global markets. True, it takes time for a country to modify its image, especially when the State has a long tradition of

policy intervention, and when the reforms have been mostly symbolic with the adoption of new texts that have not yet been translated into actions."

According to OECD (2002) the reasons for the lacklustre FDI in most other African countries also explain the generally low rate of private investment to GDP across the continent. While gross returns on investment can be very high, the risk-adjusted returns may not be enticing as there is a significant risk of capital losses. FDI in general, and greenfield investments in particular, have an important irreversible component. Investors' risk perception has a significant weight in the decision process and the deficit of democracy, and other kinds of political legitimacy, just compound to deter investments even further.

The SSA region possesses large reserves of oil, gold, diamonds and metals[4] that attract investors: "FDI in the primary sector is driven mostly by the extractive industry in developing economies. In 2014, the value of greenfield FDI projects in mining, quarrying and petroleum in developing economies increased 60 per cent, from US$25 billion to US$40 billion. The bulk of the growth took place in Africa, where the total value of greenfield projects increased almost six-fold (from US$4 billion to US$22 billion)." (Bolwijn et al., 2015)

Anyanwu (2011) examines the factors that determine FDI to African countries. The author shows that market size, proxied by the share of urban population, has significant positive relationship with FDI: African countries with large markets attract more FDI. The author interprets the negative elasticity of credit-to-GDP to growth as a sign that foreign capital would not be necessary. This conflicts with Alfaro et al. (2004), the authors believe that local financial markets play a significant role in allowing spillovers and linkages associated with FDI to materialize: in this sense these local players complement foreign capital instead of competing with them.

After controlling for policy, institutional and political variables Asiedu (2006) shows that in Sub Saharan Africa FDI inflows are determined by the existence of large local markets, natural resource endowments, good infrastructure, low inflation, an efficient legal system and a good investment framework. The author also shows that corruption and political instability scare investments. Cleeve (2008) observes that countries with a stable macroeconomic and political environment tend to attract FDI in areas other than natural resources, in spite of the size of their domestic markets, Mali and Mozambique are two examples.

Some authors advocate the need to account for the influence of China. Weisbrod and Whalley (2011) estimate that some SSA countries (Angola, Botswana, the Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Madagascar, Niger, Nigeria, South Africa, Sudan, Tanzania and Zambia) had a GDP growth increase by at least 0.5 percentage points due to inward Chinese FDI over the period from 2002 to 2009.

Studying the determinants of FDI in SSA Anyanwu (2011) controls for other

[4]mostly copper, cobalt, manganese, bauxite, chromium and platinum

African peculiarities such as the share of urban population because economic growth accelerates as workers gather in urban centers forming more efficient production clusters. The increased productivity leads to higher real wages that induce others to follow the same steps creating a permanent influx of workers to African cities[5].

Ncube and Brixiova (2013) point out that the flow of remittances from SSA expatriates is another relevant financing source for GDP expansion. We include this factor as a control in our regressions, it may indirectly affect FDI if remittances complement domestic savings. Another very peculiar African characteristic is the demographic nature of SSA countries with a steady surplus of young workers caused by a reduction in mortality rate across the continent after the 1990s. We control for this effect by including the dependency rate (Drummond et al. (2014) and Beny and Cook (2009)).

The Sub Sahara African region suffers from a lack of human capital as the result of prolonged armed conflicts[6] and epidemics[7] that affected the sampled countries during the study period. We tested two different measures of human capital, drawing from the literature we tested "Average Years of Secondary Schooling" and "Average Years of Total Schooling" (Barro and Lee, 2013) and we opted for the second one (the "hcap" regressor) because of its better fitting. Human capital is a complex subject and involves other dimensions besides education, such as health and experience, but we opted for one indicator that can be objectively and reliably measured in the SSA region. Unfortunately, for an important country in the sample, Nigeria,we found no data on education.

Existing infrastructure can influence FDI decisions as it affects marginal cost. As an example, when producers can rely on public utilities they don't need to account for the costs of running electric generators routinely among their operating costs. The influence of existing infrastructure is controlled for by the inclusion of a physical capital ("pcap") regressor.

There is an extensive literature on the benefits of FDI to developing economies. FDI increases the stock of capital of a country and generates public revenue through taxation, but the main channels for FDI to improve economic growth are technological spillovers and transfer of know-how to the host country firms. In Rodriguez-Clare (1996) model the positive impact of a multinational in the host economy depends on its relative propensity to generate "backward linkages" compared to domestic firms. Backward linkage is measured as a the ratio of employment generated in upstream industries (suppliers) to the labor directly employed by the foreign firm. In the model if backward linkages are strong enough

[5]This is the conventional explanation for the urbanization process but Swilling and Annecke (2012) believe that external forces, such as globalization, are driving urbanization in Africa.

[6]Blattman and Annan (2010) exposes the consequences of child soldiering and concludes that military service does not substitute schooling as suggested by its negative impacts on skilled labor supply and income.

[7]On the Ebola crisis in 2014 Wilkinson and Leach (2015) discusses the domestic and international governance failures that are behind the deaths of more than five thousand people.

they can also improve the productivity of domestic firms via "forward linkages", the purchase of specialized inputs by leading domestic firms that allow them to produce more sophisticated final goods.

Following these lines Amendolagine et al. (2013) study the intensity and the determinants of linkages in SSA. Their analysis shows that foreign firms with a knowledge base which is too advanced with respect to the absorptive capacity of the domestic economy are less conducive to interactions with domestic economic agents. These results highlight the importance of attracting foreign firms that have a real potential of 'fertilizing' already existing domestic capacities rather than attracting highly sophisticated firms with the hope of observing an unrealistic leap-frogging of the domestic economy. There is a clear role for fiscal policies in the process of supporting local agents to receive the transfer of knowledge.

4 Model and Estimation Methods

We want to estimate the long term impact of FDI on GDP per capita. We focus on output per capita, y_{it}, a non-stationary I(1) variable, and its percentage variation, growth, defined as $(y_{it} - y_{it-1})/y_{it-1}$, that is stationary I(0). Through a number of different models and estimation techniques we want to estimate the elasticity of FDI and compare it to other factors, such as public expenditure and trade openness. We are concerned with omitted variable bias, sample heterogeneity (cross-section and temporal heteroscedasticity) and simultaneity bias. We also address the distinction between short and long term elasticities. The empirical literature on growth (Barro, 1996) usually resorts to panel data models using multiple countries to address questions related to determinants of growth. By adopting panel data the researcher can control for unobserved characteristics in individual countries and increase modeling capacity because the power of the statistical tests of estimator significance are higher than using individual country data in time series format.

The basic method adopted in panel econometrics is known as "Fixed Effects" (FE) as it assumes that unobserved individual characteristics are time-invariant. This method controls for the characteristics within each individual and is known as the "within" transformation. The Fixed Effects model can be represented by the equation

$$y_{it} = c_i + \beta \ddot{X}_{it} + \delta d_t + \varepsilon_{it} \tag{1}$$

where c_i is the fixed effect for individual i and $\ddot{X}_{it}$ is a set of regressors that were transformed by $\ddot{X}_{it} = X_{it} - \overline{X}_i$ and $\overline{X}_i = T^{-1} \sum_{i=1}^{T} X_{it}$. The d_t term is a dummy for each year to control for time related shocks.

The dynamic version of the Fixed Effect model includes a lagged dependent variable as in

$$y_{it} = c_i + \theta y_{it-1} + \beta \ddot{X}_{it} + \varepsilon_{it} \tag{2}$$

These two models impose homogeneity on the slopes (β and θ) implying that the elasticity of y_{it} to X_{it} is the same for all countries, what seems to be an unrealistic assumption. Estimation methods that impose homogeneity conditions are part of the reason why panel data models sometimes fail to provide evidence that FDI is relevant for growth. Fixed effect models, for example, force coefficient slopes to be homogeneous while allowing intercepts (c_i) to vary according to each individual characteristic.

Pooled estimators are even more restrictive as they also force homogeneity on the intercepts. The pooled OLS (POLS) estimator is obtained by imposing the same constant term c (also know as "drift" or "offset") for all countries as no control for individual characteristics are done

$$y_{it} = c + \beta X_{it} + \varepsilon_{it} \tag{3}$$

Note that the regressor is X_{it} and not $\ddot{X}_{it}$ that controlled for the mean-value of each regressor in X_{it}.

In panel data estimation samples are heterogenous as they are composed by mixing up advanced, emerging and developing economies in an effort to draw universal conclusions over the effects of each element of X_{it} (FDI) on y_{it} (GDP), after controlling for some factors that are well-known for influencing, positively and negatively, economic activity and GDP. Our approach is to focus on SSA countries (what should naturally reduce heterogeneity) and use panel data estimations to determine the elasticity of GDP per capita to FDI and public expenditures (investments). The selection of countries to compose the sample was determined by data availability but the choice to include only SSA countries allows us to include as explaining variables some factors that would normally not be considered by advanced economies, such as urbanization rates or foreign aid. We believe that growth processes are complex and involve interactions between specific elements that differ significantly between advanced and low income economies (an analogy would be to think in terms of "intensive" and "extensive" growth processes).

Empiric work usually rely on stationary data taking the percentage variation of GDP per capita (growth rate) as the dependent variable. Our estimations are performed with data in levels to control for the long term (*cointegrating*) relation between the dependent and the explaining variables. The sustainable aspect of growth can only be captured when analyzing the long term relations in the data. Our preferred method is panel Auto Regressive Distributed Lag (ARDL) presented in Pesaran and Shin (1999) and Chudik et al. (2013) because it allows for maximum heterogeneity among individuals, so that offsets and slopes can vary both in the short and long term relations.

A major risk when estimating low frequency data (annual) is the simultaneity bias that is introduced when the residuals are not orthogonal to the regressors, that is that a higher FDI may induce GDP growth while simultaneously being caused by a higher GDP. This would happen if investors observe the potential GDP growth and send resources to take advantage of a positive situation on that same observation

unit (one year). This may also happen for the control variables as put by Morisset (2000): "The estimated effects of the GDP growth and trade openness might be biased because of causality problems since changes in the business climate may determine and be determined by the GDP growth rate. Foreign companies may simultaneously follow or push the trade liberalization effort in a country." The same reasoning can be applied to the financial sector that expands credit given an increase in GDP that induced more deposits providing cheaper funds to be used in loans.

The use of annual data to capture long term movements raises concerns about potential simultaneity (endogeneity) bias. This bias comes from the possibility that a country grows because it receives FDI from abroad but also that the growth prospects of this country could bring foreign investors, therefore reinforcing the growth cycle. Simultaneity is usually tackled by using instrumental variables and the General Method of Moments (GMM) estimators are a popular choice among authors. We use GMM to compare results with other methods but our main contribution is to control for endogeneity by lagging the explanatory variables in a dynamic panel model in an Auto Regressive Distributed Lag framework. The consistence of this estimator has been proved by Pesaran and Shin (1999).

GMM estimators address the simultaneity issue using lags and first difference instruments but do not relax the unrealistic homogeneity constraints imposed on the data. We used two different GMM estimation methods: Difference GMM (D-GMM) from Arellano and Bond (1991) and System GMM (S-GMM) from Blundell and Bond (1998). These methods have other well-known limitations: GMM estimators perform poorly in small samples or when instruments are weak (Bond and Windmeijer, 2005) and the GMM orthogonality conditions between instruments and disturbance terms break down when the panel contains unit roots (Binder et al., 2005).

We use panel Auto-Regressive Distributed Lag (ARDL) models, (Pesaran and Shin, 1999) , represented by a long term relation ARDL(p,q,..,q)

$$y_{it} = \sum_{l=1}^{p} \lambda_{il} y_{i,t-l} + \sum_{l=0}^{q} \delta_{il} X_{i,t-l} + \varepsilon_{it} \tag{4}$$

The long term coefficients β_i of $X_{it} = (x_{1it}, x_{2it}, ..., x_{Kit})$ are calculated by

$$\beta_i = \frac{\sum_{l=0}^{q} \delta_{il}}{1 - \sum_{l=1}^{p} \lambda_{il}} \tag{5}$$

Regressors can be either stationary or not, I(0) or I(1), so that the estimates will be consistent. The equation can be reparameterized as an error correction model (ECM) where the cointegrating relation is $(y_{i,t-l} - \beta_i X_{it})$ as in

$$\Delta y_{it} = \phi_i (y_{i,t-l} - \beta_i X_{it}) + \sum_{l=1}^{p-1} \lambda^*_{il} \Delta y_{i,t-l} + \sum_{l=0}^{q-1} \delta^*_{il} X_{i,t-l} + \varepsilon_{it} \tag{6}$$

where $\phi_i = (\sum_{l=1}^{p-1} \lambda_{il} - 1)$, $\lambda_{il}^* = -\sum_{m=l+1}^{p} \lambda_{im}$ and $\delta_{il}^* = -\sum_{m=l+1}^{q} \delta_{im}$.

Panel ARDL estimators impose few restrictions on estimators, as each country is estimated separately and coefficients are later averaged with equal weights to all individuals in the sample.

5 Data and results

The core of the dataset is composed of annual data collected from World Bank WDI (World Development Indicators) database for the period from 1970 to 2015 for all the 48 countries in SSA but 13 were left out of the estimation sample for lack of sufficient data (N=35). The SSA countries left out of the sample are: Angola, Cabo Verde, Eritreia, Ethiopia, Equatorial Guinea, Liberia, Sao Tome and Principe, Sudan, Somalia, South Sudan, Zambia and Zimbabwe. Data is more frequently available from 1970 to 2014 (T=45) but this varies from country to country. Some missing observations had to be imputed by linear interpolation when they occurred inside data (not in the beginning or at the end of the series). The imputation routine never interpolate more than two missing observations (years) in a row and does not change the extremes of the sample. There is no reason to believe in a systematic pattern for missing observations[8].

5.1 Data: Sources and Transformations

Net inward foreign direct investments (ifdi) are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long term capital, and short-term capital as shown in the balance of payments. Data are in constant 2005 U.S. dollars.

As pointed out by Marin and Schnitzer (2011) FDI may not capture the full investment picture if funds come from domestic sources. This risk is partially addressed by controlling for the relative size of the credit market in terms of GDP: a small domestic market may not provide the funds for foreigners to invest in the country making FDI relevant. Another control would be the savings-to-GDP ratio that translates into available funds for investment, if the main constraint is the lack of domestic savings FDI becomes a relevant mechanism to finance projects.

Domestic credit to private sector by banks (credit) refers to financial resources provided to the private sector by other depository corporations (deposit taking corporations except central banks), such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim

[8]Jerven (2015) discusses the implication for quantitative research of gaps in SSA data.

for repayment. For some countries these claims include credit to public enterprises. Data are in constant 2005 U.S. dollars.

GDP per capita (gdppc) is the gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2005 U.S. dollars.

Gross fixed capital formation (pcap) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.

Total natural resources rents (natural) are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. Data are in constant 2005 U.S. dollars.

Age dependency ratio (depend) is the ratio of dependents–people younger than 15 or older than 64–to the working-age population–those ages 15-64. Data are shown as the proportion of dependents per 100 working-age population.

Urban population (urban) refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects. Expressed in percentage of total population.

GDP deflator (deflat) is inflation as measured by the annual growth rate of the GDP implicit deflator and shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.

Human capital is measured as "Average Years of Total Schooling" (hcap), from Barro and Lee (2013). More details on the regressors are available in the Data Appendix.

Net official flows (oda) from International Fund for Agricultural Development are the net disbursements of total official flows from the UN agencies. Total official flows are the sum of Official Development Assistance (ODA) or official aid and Other Official Flows and represent the total disbursements by the official sector at large to the recipient country. Net disbursements are gross disbursements of grants and loans minus repayments of principal on earlier loans. Data originally supplied in current U.S. dollars was converted to constant 2005 USD to match the reference date of other series.

Personal remittances (remit) consist of all current transfers in cash or in kind made or received by resident households to or from nonresident households. Per-

sonal transfers thus include all current transfers between resident and nonresident individuals.

Our dataset has two key limitations. We don't have data on public investments. Public expenditures aggregate current expenditures (such as payroll) and public investments but ideally we should estimate the elasticity of GDP to public investments (and exclude current expenditures). The lack of data on FDI that is not related to natural resources exploration forces us to use the total FDI, including inflows destined to extractive sectors (oil and minerals). We don't have data on FDI by sector and country. With data on FDI by sector (agriculture, manufacturing and services) we could measure the specific impact of the "good" FDI, the one that builds linkages with the rest of the domestic economy[9].

5.2 Results

Based on the discussion on previous sections we expect to obtain a positive covariate for FDI, as more investments increase both the aggregate capital and technology levels; we expect a positive sign for trade openness, yet we are aware that if the exports result from the primary sector there may be no clear effect on the rest of the economy if not enough linkages exist between these sectors. We expect a positive relation with credit, as domestic producers demand credit to expand. The reliance on rents from the primary sector tend to reduce GDP as the higher uncertainty over future income caused by the volatility of commodity prices tend to reduce investments in all sectors not related to the exploration of resources. We expect a positive correlation with both physical and human capital, since both are key production factors. We expect a positive relation with urbanization as the clustering of workers around cities increase their productivity. Finally, we expect a negative relation with the dependency rate: less dependents represent relatively more workers available to increase output.

Table 1 presents the countries in the sample. The start and end fields correspond to the period with existing data that was effectively used for estimation. The sample has 35 of the 48 countries in the region, that is a significant sample but the omission of some countries could induce a sample selection towards the more advanced economies of the region. The single exception may be Angola that is one of the biggest economies in the region but was left out of the sample for lack of data. We present and discuss the models estimated in **R** with package *plm* (Croissant and Millo, 2008) and *ardl* (Barbi, 2015).

Table 2 presents statistics for the sample used in inference (after imputation). It is interesting to observe that FDI and remittances have close location moments (mean and median) but rather different scale moments (standard deviation, sd):

[9]Offshore oil platforms on the African coast provide a good metaphor for low linkage: not only are they not located inland but also they are self-sufficient and require minimum interaction with the rest of the economy.

remittances present higher volatility than FDI. We also draw attention to the reduced number of ODA observations. Growth is much more volatile than GDP per capita, and all the variables expressed in terms of GDP are also more volatile than their non-stationary counterparts (eg. open_gdp is more volatile than lopen) due to log smoothing. All the transformation are documented in the Data Appendix. Note that regressors receive the prefix "l" to indicate the log value. We use the convention X_gdp to represent X as a percentage of GDP.

Table 3 presents the results for different specifications estimated with fixed effects (FE). All models were estimated with year dummies but results are not shown to save space. The first model (column) indicates that both FDI and government expenditures are statistically significant to explain the GDP per capita (lgdppc) but expenditures have a higher impact (elasticity) than FDI. This model may suffer from omitted variable bias. Column 2 proposes another model adding trade openness (lopen) and an indicator for the size of the financial system, credit-to-GDP (lcredit): the coefficient for FDI is not significant and public expenditures are, once again, the most relevant factor. In column 3 the model includes the share of natural resources in total income (lnatural) and the stock of physical capital (lpcap). The physical capital coefficient is significant and positive as expected. Model 4 (column 4) improves by adding an indicator for the stock of human capital (hcap), the urbanization rate (urban) and remittances (lremit). This model suggests that FDI is significant, while now openness to trade is more relevant than public expenditures. All the coefficients present the expected signs but both credit and physical capital lost statistical relevance, while human capital, urbanization and remittances are all relevant. The negative sign for remittances may be puzzling, if they serve a source of funds for investments we would expect a positive coefficient. Tentatively we suggest that remittances may be tied to the gap in income between countries (the country of origin and the current location of the worker): low income countries tend to attract more remittances as expatriates send more resources to support their families. This interpretation denies the existence of a link between remittances and savings, and suggests that remittances are more related to consumption. In column 5 we complete the specification with indicators for dependency and ODA (Official Development Aid). The increment in model fitting is marginal (measured by adjusted R^2) while the cost in degrees of freedom is significant since ODA has significant less observations. The coefficient for ODA is negative as expected since the poorest countries are the main targets of UN financial support initiatives. The main takeaway from this analysis is the decision to adopt model 4 as the reference for further investigation.

Before we explore other techniques we present the results from table 4 that focus on growth, the percentage variation of GDP per capita, as the dependent variable. The regressors are net inward FDI-to-GDP (ifdi_gdp), government expenditures-to-GDP (gov_gdp), trade openness-to-GDP (open_gdp), stock of credit-to-GDP (credit_gdp), share of natural resources in terms of GDP (nat_gdp), stock of physical capital-to-GDP (pcap_gdp) and remittances-to-GDP (remit_gdp). All variables are stationary I(0) but model fitting is very poor with low R^2 ranging from

1% to 5%. We use these results mostly as a robustness test: we observe that FDI is significant in four of the five models, while trade openness and physical capital are the most significant factors. The coefficients for the share of natural resources are negative, as we expected. Curiously public expenditures and credit-to-GDP coefficients are not significant. Remittances, present in just one specification, are also not relevant.

Table 5 presents the results for the best specification using different panel estimation techniques: Pooled OLS (POLS), Fixed Effects (FE), AR(1) Fixed Effects and two GMM estimators: difference (D-GMM) and system (S-GMM). The POLS estimation suggest a negative coefficient for FDI and physical capital but all the other estimators have the expected signs. As discussed, the homogeneity constraints imposed on the data are extreme and coefficients are likely to be inconsistent and biased. The Fixed Effects estimator reproduces the Model 4 results from table 3 as a basis for comparison. The AR(1) model with Fixed Effects adds only a lagged dependent variable but clearly improves in terms of fitting. The auto-regressive coefficient is high as frequently presented in the literature, and the coefficients for all major regressors (lifdi, lgov, lopen, lcredit and lpcap) are statistically significant and positive. Human capital is barely significant while remittances' coefficient is clearly negative.

The final two columns present GMM estimators. In the Difference GMM (D-GMM) estimation, the auto-regressive component is relevant and FDI is not statistically significant: the coefficient is within the range of the AR-FE model but the relatively high standard error may be causing the loss of significance. Trade openness and the financial sector indicators also lost relevance and human capital presents a negative sign as in the AR-FE model. The same happens with the coefficient for remittances and we suppose that the data model is more to blame than the estimation technique or the model structure: the sample is relatively small, with 23 (800/35) degrees of freedom for 11 estimators. GMM uses lagged first differences as instruments and quickly exhausts degrees of freedom. In the System GMM (S-GMM) estimation FDI is positively correlated to GDP per capita, but the relevance of trade openness and public expenditures vanished. We confirm our expectation for a negative coefficient for natural resources and positive for physical capital but we are surprised by the negative sign for the credit indicator. The sample size appears to have doubled because two equations are estimated, one in levels and one in first differences, but essentially the same limitation in terms of degrees of freedom applies here.

Finally table 6 presents the coefficients for the long term relations using auto regressive distributed lag (ARDL) models. The results are from first order ARDL models ($p = q = 1$) but increasing the order did not change the qualitative results so we opted to show results from the longest sample. Estimations were done with a restricted sample: time observations were restricted from 1991 to 2010 to control for differences in data availability among countries. The same procedure was performed for the fixed effects estimations but no significant change was observed

there, probably because FE makes no distinction between short and long term effects as ARDL does. The panel ARDL presents Mean Group estimators for the long term relations (short term coefficients are not shown): we allow both the short and long term coefficients to be different for each country and we average the estimators. We use the same weight for all observations, as recommended by Pesaran and Shin (1999). The results show that coefficients for FDI, trade openness and credit present significant and robust results. Public expenditures are also significant but this result is not so robust. It is difficult to choose the best model since the information criteria point towards the first model (column 1) but the last (column 4) has more meaningful results. The only challenging result in the last model is the negative coefficient for physical capital. As previously discussed (see figure 3) we suppose that the expansion of physical assets to be connected to the commodity super-cycle (2003-2008). If these assets are mainly destined for natural resource exploration they may not be relevant to explain the long term growth observed within this 20 year window. Ideally we should be able to take out the stock of fixed capital allocated to primary sector activities before re-estimating the model. The results from the last model suggest that long term growth in SSA relied on export-led policies and that public expenditures have, so far, had a positive impact on growth. Unplanned attempts to reduce public income could adversely affect long-run growth.

6 Conclusion

The joint analysis of Sub Saharan Africa's countries in an heterogeneous cointegrated panel framework shows that FDI is a relevant factor to explain GDP growth. Among the factors that make growth sustainable in the long run are trade openness, the size of the domestic credit market and the size of public expenditures. By focusing on FDI to Sub Saharan Africa our contribution is to show that, although it is positively and robustly related to real GDP per capita, the relative size of this relation is smaller than the elasticity of public expenditures. This result makes it difficult to justify subsidies to attract foreign investments that hurt public revenue (via, for example, tax cuts). Even though FDI affects GDP through potentially different channels, our results suggest that sophisticated panel data methods, notably GMM, that confound short and long term effects may be muddling the debate about the real effects of FDI on GDP and growth.

	country	name	lifdi	lgdppc	start	end
1	ZAF	South Africa	22.20	8.68	1970	2014
2	NGA	Nigeria	21.98	6.86	1981	2014
3	COG	Congo	20.99	7.53	1978	2014
4	MOZ	Mozambique	20.85	6.10	1989	2014
5	TZA	Tanzania	20.61	6.23	1990	2014
6	GHA	Ghana	20.60	6.42	1975	2014
7	UGA	Uganda	20.20	5.97	1982	2014
8	GAB	Gabon	19.82	8.82	1978	2014
9	MDG	Madagascar	19.77	5.63	1970	2014
10	ZAR	Dem.Rep.Congo	19.70	5.48	1970	2010
11	NAM	Namibia	19.60	8.32	1990	2014
12	BWA	Botswana	19.55	8.73	1976	2014
13	TCD	Chad	19.55	6.53	1984	2014
14	CIV	Cote d'Ivoire	19.53	6.86	1975	2014
15	MRT	Mauritania	19.50	6.68	1970	2012
16	NER	Niger	19.36	5.59	1980	2014
17	SEN	Senegal	19.32	6.67	1970	2014
18	CMR	Cameroon	19.22	6.85	1977	2014
19	MLI	Mali	19.21	6.10	1972	2014
20	MUS	Mauritius	19.19	8.72	1976	2014
21	MWI	Malawi	18.91	5.51	1973	2014
22	SLE	Sierra Leone	18.90	5.95	1981	2010
23	SYC	Seychelles	18.90	9.49	1990	2014
24	BEN	Benin	18.62	6.43	1983	2014
25	KEN	Kenya	18.43	6.38	1970	2014
26	TGO	Togo	18.38	5.98	1980	2014
27	BFA	Burkina Faso	18.11	6.13	1979	2014
28	RWA	Rwanda	17.92	5.90	1970	2005
29	SWZ	Swaziland	17.77	7.80	1981	2011
30	GIN	Guinea	17.70	5.71	1989	2011
31	GMB	The Gambia	17.53	6.08	1981	2013
32	CAF	Central African Republic	16.80	5.77	1978	2014
33	GNB	Guinea-Bissau	16.34	6.03	1990	2014
34	COM	Comoros	15.39	6.40	1982	2014
35	BDI	Burundi	13.31	4.99	1985	2013

Table 1: Annual inward FDI in SSA Countries

Variable	n.obs	mean	sd	median	trimmed	mad	min	max	range	skew	kurtosis	se
lgdppc	1740	6.52	1.04	6.19	6.39	0.72	4.82	9.66	4.84	1.04	0.26	0.02
lgdp	1740	21.89	1.42	21.77	21.82	1.32	18.70	26.52	7.82	0.62	0.69	0.03
lifdi	1237	17.50	2.36	17.66	17.61	2.19	2.63	23.30	20.66	-0.87	2.89	0.07
lgov	1665	19.95	1.39	19.78	19.86	1.31	16.03	24.93	8.90	0.76	1.09	0.03
lcredit	1617	19.81	1.80	19.67	19.70	1.66	15.32	26.15	10.82	0.77	1.23	0.04
lpcap	1428	20.28	1.55	20.17	20.24	1.56	14.96	24.97	10.01	0.32	0.32	0.04
lnatural	1462	19.20	2.17	19.12	19.29	1.70	11.55	24.73	13.18	-0.41	1.01	0.06
lopen	1705	21.37	1.48	21.25	21.31	1.60	18.29	26.10	7.81	0.44	0.06	0.04
lincome	1062	21.95	1.34	21.87	21.86	1.13	18.14	26.35	8.21	0.85	1.42	0.04
hcap	1540	3.20	2.11	2.75	3.00	2.29	0.20	9.69	9.49	0.77	-0.05	0.05
oda	809	14.28	1.17	14.45	14.37	1.13	9.32	17.04	7.73	-0.82	1.00	0.04
urban	1960	28.16	15.92	26.53	27.17	16.92	2.08	87.16	85.08	0.65	0.32	0.36
depend	1960	89.13	12.05	90.64	90.26	9.59	40.62	113.06	72.44	-1.24	2.66	0.27
lremit	1103	17.13	22.60	17.44	17.30	1.82	9.27	23.49	14.23	-0.72	0.96	0.07
growth	1705	1.15	5.72	1.22	1.16	3.83	-47.72	37.13	84.85	-0.14	9.07	0.14
credit_gdp	1639	15.64	13.32	12.91	13.38	9.27	0.15	108.02	107.87	2.43	8.40	0.33
export_gdp	1737	28.22	17.65	24.07	25.96	14.54	2.52	107.99	105.47	1.22	1.38	0.42
import_gdp	1737	36.24	17.55	31.98	34.23	13.59	2.98	117.02	114.04	1.28	2.10	0.42
open_gdp	1737	64.47	32.57	56.80	60.52	26.32	6.32	225.02	218.69	1.29	2.05	0.78
gov_gdp	1690	15.20	6.83	14.08	14.44	5.46	0.00	64.39	64.39	1.83	6.94	0.17
ifdi_gdp	1389	2.42	4.87	1.01	1.57	1.42	-28.62	54.06	82.69	3.92	29.84	0.13
nat_gdp	1474	11.36	12.81	7.22	8.60	6.48	0.00	77.05	77.05	2.23	5.16	0.33
pcap_gdp	1446	18.77	8.74	17.85	18.11	7.65	-2.42	60.56	62.99	0.98	1.99	0.23
remit_gdp	1103	2.31	3.31	0.95	1.59	1.31	0.00	22.46	22.46	2.49	7.53	0.10

mad is median absolute deviation (from the median)

Table 2: Sample Statistics

Table 3: Fixed Effects models for GDP per capita in SSA Countries

	*Dependent variable:*lgdppc				
	(1)	(2)	(3)	(4)	(5)
lifdi	0.014***	0.002	0.001	0.035**	0.007
	(0.003)	(0.003)	(0.003)	(0.015)	(0.014)
lgov	0.416***	0.225***	0.231***	0.109*	0.141**
	(0.013)	(0.015)	(0.016)	(0.058)	(0.059)
lopen		0.168***	0.109***	0.511***	0.408***
		(0.016)	(0.019)	(0.064)	(0.060)
lcredit		0.133***	0.124***	−0.025	0.001
		(0.010)	(0.010)	(0.037)	(0.036)
lnatural			−0.012	−0.223***	−0.228***
			(0.009)	(0.015)	(0.018)
lpcap			0.058***	−0.068	−0.024
			(0.011)	(0.049)	(0.048)
hcap				0.074***	0.057***
				(0.012)	(0.012)
urban				0.032***	0.027***
				(0.002)	(0.002)
lremit				−0.040***	−0.027**
				(0.010)	(0.011)
depend					0.004
					(0.003)
oda					−2.153***
					(0.205)
Observations	1,206	1,156	1,077	829	648
R^2	0.489	0.636	0.638	0.783	0.787
Adjusted R^2	0.457	0.590	0.587	0.732	0.733
Note:					*p<0.1; **p<0.05; ***p<0.01

Table 4: Fixed Effects models for GDP Growth in SSA Countries

	*Dependent variable:*growth				
ifdi_gdp	0.130^{***}	0.096^{***}	0.093^{***}	0.049	0.067^{*}
	(0.033)	(0.035)	(0.035)	(0.036)	(0.040)
gov_gdp	0.023	−0.008	−0.023	-0.044^{*}	−0.001
	(0.022)	(0.024)	(0.025)	(0.025)	(0.027)
open_gdp		0.018^{***}	0.020^{***}	0.012^{**}	0.005
		(0.005)	(0.005)	(0.006)	(0.006)
credit_gdp		0.001	−0.004	−0.014	−0.018
		(0.011)	(0.012)	(0.012)	(0.012)
nat_gdp			-0.024^{**}	-0.034^{***}	-0.024^{*}
			(0.012)	(0.012)	(0.014)
pcap_gdp				0.123^{***}	0.091^{***}
				(0.022)	(0.024)
remit_gdp					0.047
					(0.050)
Observations	1,367	1,323	1,300	1,242	1,026
R^2	0.014	0.024	0.026	0.052	0.032
Adjusted R^2	0.013	0.023	0.025	0.049	0.030
Note:					*p<0.1; **p<0.05; ***p<0.01

Table 5: Different Estimation Techniques for Model 4

	*Dependent variable:*lgdppc				
		panel linear		*panel GMM*	
	POLS	FE	AR-FE	D-GMM	S-GMM
lag(lgdppc, 1)			0.801^{***}	0.627^{***}	0.998^{***}
			(0.016)	(0.101)	(0.005)
lifdi	-0.021^{*}	0.035^{**}	0.005^{***}	0.007	0.007^{*}
	(0.012)	(0.015)	(0.001)	(0.006)	(0.004)
lgov	0.250^{***}	0.109^{*}	0.037^{***}	0.020	0.001
	(0.060)	(0.058)	(0.008)	(0.025)	(0.012)
lopen	0.342^{***}	0.511^{***}	0.018^{**}	0.030	-0.009
	(0.064)	(0.064)	(0.009)	(0.034)	(0.011)
lcredit	0.028	-0.025	0.016^{***}	0.029^{*}	-0.013^{***}
	(0.033)	(0.037)	(0.005)	(0.016)	(0.004)
lnatural	-0.212^{***}	-0.223^{***}	-0.0004	0.008	-0.008^{***}
	(0.014)	(0.015)	(0.004)	(0.009)	(0.003)
lpcap	-0.128^{***}	-0.068	0.015^{***}	0.036^{**}	0.021^{***}
	(0.048)	(0.049)	(0.006)	(0.018)	(0.006)
hcap	0.034^{***}	0.074^{***}	-0.006^{*}	-0.031^{**}	0.001
	(0.012)	(0.012)	(0.003)	(0.012)	(0.002)
urban	0.032^{***}	0.032^{***}	0.003^{***}	0.003	-0.0001
	(0.002)	(0.002)	(0.001)	(0.003)	(0.0003)
lremit		-0.040^{***}	-0.004^{***}	-0.009^{**}	0.003^{**}
		(0.010)	(0.002)	(0.004)	(0.001)
Observations	881	829	829	800	1629
R^2	0.729	0.783	0.931		
Adjusted R^2	0.721	0.732	0.839		
Note:					*p<0.1; **p<0.05; ***p<0.01

	*Dependent variable:*lgdppc			
lifdi	0.0247***	0.0091***	0.0080***	0.0196***
	(0.0026)	(0.0033)	(0.0028)	(0.0033)
lgov	0.1703***	0.0181	-0.0293	0.1254***
	(0.0103)	(0.0148)	(0.0187)	(0.0098)
lopen		0.2455***	0.0887***	0.1640***
		(0.0190)	(0.0212)	(0.0183)
lcredit		0.0542***	0.0151	0.0128***
		(0.0140)	(0.0098)	(0.0064)
lnatural			0.0101	-0.0462***
			(0.0120)	(0.0088)
lpcap			0.0968***	-0.0100***
			(0.0117)	(0.0038)
hcap				0.0035
				(0.0075)
urban				-0.0038**
				(0.0017)
Observations	680	680	678	538
AIC	−3.8095	−3.9948	−4.0611	−4.4280
BIC	−2.9260	−2.6632	−2.2795	−2.2970
Note:				*p<0.1; **p<0.05; ***p<0.01

References

Alfaro, L. (2003). Foreign direct investment and growth: does the sector matter? Technical report, Working Paper, Harvard Business School.

Alfaro, L., A. Chanda, S. Kalemli-Ozcan, and S. Sayek (2004, October). Fdi and economic growth: the role of local financial markets. *Journal of International Economics 64*(1), 89–112.

Alfaro, L., A. Chanda, S. Kalemli-Ozcan, and S. Sayek (2006, September). How does foreign direct investment promote economic growth? exploring the effects of financial markets on linkages. Working Paper 12522, National Bureau of Economic Research.

Amendolagine, V., A. Boly, N. D. Coniglio, F. Prota, and A. Seric (2013). Fdi and local linkages in developing countries: Evidence from sub-saharan africa. *World Development 50*, 41 – 56.

Andersen, T. B. and P. S. Jensen (2014). Is africa's recent growth sustainable? *International Economic Journal 28*(2), 207–223.

Anyanwu, J. C. (2011). Determinants of Foreign Direct Investment Inflows to Africa, 1980-2007. Working paper series n.136, African Development Bank, Tunis, Tunisia.

Arbache, J. S. and J. Page (2010). How fragile is africa's recent growth? *Journal of African Economies 19*(1), 1–24.

Arellano, M. and S. Bond (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies 58*(2), 277–297.

Asiedu, E. (2006, 01). Foreign Direct Investment in Africa: The Role of Natural Resources, Market Size, Government Policy, Institutions and Political Instability. *The World Economy 29*(1), 63–77.

Barbi, F. C. (2015). ARDL Models Estimation in R. Technical report, Quantum Global Research Lab AG.

Barro, R. J. (1996, August). Determinants of economic growth: A cross-country empirical study. Working Paper 5698, National Bureau of Economic Research.

Barro, R. J. and J. W. Lee (2013). A new data set of educational attainment in the world, 1950–2010. *Journal of Development Economics 104*(C), 184–198.

Beny, L. N. and L. D. Cook (2009, May). Metals or management? explaining africa's recent economic growth performance. *American Economic Review 99*(2), 268–74.

Binder, M., C. Hsiao, and M. Pesaran (2005). Estimation and inference in short panel vector autoregressions with unit roots and cointegration. *Econometric Theory 21*(4), 795–837.

Blattman, C. and J. Annan (2010, November). The Consequences of Child Soldiering. *The Review of Economics and Statistics 92*(4), 882–898.

Blomstrom, M. and A. Kokko (1997, March). How foreign investment affects host countries. Policy Research Working Paper Series 1745, The World Bank.

Blundell, R. and S. Bond (1998, August). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics 87*(1), 115–143.

Bolwijn, R., K. Byun, B. Casella, J. Clements, and H. E. Kady (2015). World investment report 2015: Reforming international investment governance. Technical report, UNCTAD.

Bond, S. and F. Windmeijer (2005). Reliable Inference For GMM Estimators? Finite Sample Properties Of Alternative Test Procedures In Linear Panel Data Models. *Econometric Reviews 24*(1), 1–37.

Borensztein, E., J. De Gregorio, and J.-W. Lee (1998, June). How Does Foreign Direct Investment Affect Economic Growth? *Journal of International Economics 45*(1), 115–135.

Canova, F. (2009, 06). What explains the great moderation in the u.s.? a structural analysis. *Journal of the European Economic Association 7*(4), 697–721.

Carkovic, M. and R. Levine (2005). Does foreign direct investment accelerate economic growth? In E. D. G. Theodore H. Moran and M. Blomstrom (Eds.), *Does Foreign Direct Investment Promote Development?*, pp. 195–220. Institute for International Economics, Washington, DC.

Cecchetti, S. and E. Kharroubi (2012, July). Reassessing the impact of finance on growth. BIS Working Papers 381, Bank for International Settlements.

Cecchetti, S. G. and E. Kharroubi (2015, February). Why does financial sector growth crowd out real economic growth? BIS Working Papers 490, Bank for International Settlements.

Chudik, A., K. Mohaddes, M. H. Pesaran, and M. Raissi (2013). Debt, inflation and growth - robust estimation of long-run effects in dynamic panel data models. CESifo Working Paper Series 4508, CESifo Group Munich.

Cleeve, E. (2008). How effective are fiscal incentives to attract fdi to sub-saharan africa? *The Journal of Developing Areas 42*(1), 135–153.

Contessi, S. and A. Weinberger (2009). Foreign direct investment, productivity, and country growth: an overview. *Review 0*(Mar), 61–78.

Croissant, Y. and G. Millo (2008). Panel data econometrics in R: The plm package. *Journal of Statistical Software 27*(2), 0.

De Gregorio, J. (2003, January). The role of foreign direct investment and natural resources in economic development. Working Papers Central Bank of Chile 196, Central Bank of Chile.

Drummond, P., V. Thakoor, and S. Yu (2014). Africa rising: Harnessing the demographic dividend. Technical Report IMF Working Paper 14/143, International Monetary Fund, Washington.

Jerven, M. (2015). *Africa: Why Economists Get It Wrong* (1 ed.). London: Zed Books.

Lane, P. R. and A. Tornell (1999, March). The Voracity Effect. *American Economic Review 89*(1), 22–46.

Lucas, R. J. (1988, July). On the mechanics of economic development. *Journal of Monetary Economics 22*(1), 3–42.

Marin, D. and M. Schnitzer (2011, August). When is FDI a capital flow? *European Economic Review 55*(6), 845–861.

Morisset, J. (2000). Foreign direct investment in africa: Policies also matter. Technical report, World Bank Working Paper.

Ncube, M. and Z. Brixiova (2013, December). Remittances and their macroeconomic impact: Evidence from africa. Working Paper Series 188, African Development Bank.

OECD (2002). Foreign direct investment for development. maximising benefits, minimising costs. Technical report, OECD.

Pesaran, M. H. and Y. Shin (1999). An autoregressive distributed-lag modelling approach to cointegration analysis. In S. Strøm (Ed.), *Econometrics and Economic Theory in the 20th Century*, pp. 371–413. Cambridge University Press. Cambridge Books Online.

Rodriguez-Clare, A. (1996, September). Multinationals, Linkages, and Economic Development. *American Economic Review 86*(4), 852–73.

Swilling, M. and E. Annecke (2012). *Just Transitions: Exploration of Sustainability in an Unfair World*. UCT Press, South Africa.

Torvik, R. (2002, April). Natural resources, rent seeking and welfare. *Journal of Development Economics 67*(2), 455–470.

Wang, J.-Y. and M. Blomström (1992). Foreign investment and technology transfer. *European Economic Review 36*(1), 137 – 155.

Weisbrod, A. and J. Whalley (2011, October). The contribution of chinese fdi to africa's pre crisis growth surge. Working Paper 17544, National Bureau of Economic Research.

Wilkinson, A. and M. Leach (2015). Briefing: Ebola–myths, realities, and structural violence. *African Affairs 114*(454), 136–148.

Data Appendix

1. gdp = NY.GDP.MKTP.KD (WDI)
   GDP (constant 2005 USD)
2. gdppc = NY.GDP.PCAP.KD (WDI)
   GDP per capita (constant 2005 USD)
3. growth = NY.GDP.PCAP.KD.ZG (WDI)
   GDP per capita growth (annual %)
4. gov_gdp = NE.CON.GOVT.ZS (WDI)
   General government final consumption expenditure (% of GDP)
5. gov = NE.CON.GOVT.KD (WDI)
   General government final consumption expenditure (constant 2005 USD)
6. ifdi_gdp = BX.KLT.DINV.WD.GD.ZS (WDI)
   Foreign direct investment, net inflows (% of GDP)
7. credit_gdp = FD.AST.PRVT.GD.ZS (WDI)
   Domestic credit to private sector by banks (% of GDP)
8. income = NY.ADJ.NNTY.KD (WDI)
   Adjusted net national income (constant 2005 USD)
9. export_gdp = NE.EXP.GNFS.ZS (WDI)
   Exports of goods and services (% of GDP)
10. import_gdp = NE.IMP.GNFS.ZS (WDI)
    Imports of goods and services (% of GDP)
11. pcap_gdp = NE.GDI.FTOT.ZS (WDI)
    Gross fixed capital formation (% of GDP)
12. cpi = FP.CPI.TOTL.ZG (WDI)
    Inflation, consumer prices (annual %)
13. deflat = NY.GDP.DEFL.KD.ZG (WDI)
    Inflation, GDP deflator (annual %)
14. depend = SP.POP.DPND (WDI)
    Age dependency ratio (% of working-age population)
15. nat_gdp = NY.GDP.TOTL.RT.ZS (WDI)
    Total natural resources rents (% of GDP)
16. oil_gdp = NY.GDP.PETR.RT.ZS (WDI)
    Oil rents (% of GDP)
17. urban = SP.URB.TOTL.IN.ZS (WDI)
    Urban population (% of total)

18. oda = DT.NFL.IFAD.CD (WDI)
    Net official flows from UN agencies, IFAD (current USD)
19. hcap = Average Years of Total Schooling (Barro and Lee (2013))
20. remit_gdp = BX.TRF.PWKR.DT.GD.ZS (WDI)
    Personal remittances, received (% of GDP)
21. lifdi = log(ifdi_gdp/100*gdp)
22. lgov = log(gov_gdp/100*gdp)
23. lcredit = log(credit_gdp/100*gdp)
24. lpcap = log(pcap_gdp/100*gdp)
25. lnatural = log(nat_gdp/100*gdp)
26. export = export_gdp/100*gdp
27. import = import_gdp/100*gdp
28. lopen = log(export+import)
29. lgdppc = log(gdppc)
30. lremit = log(remit_gdp/100*gdp)