LISBON SCHOOL OF ECONOMICS & MANAGEMENT
UNIVERSIDADE DE LISBOA

MASTER

MONETARY AND FINANCIAL ECONOMICS

MASTER´S FINAL WORK

DISSERTATION

HOW DOES THE DEVELOPMENT OF PRIVATE EQUITY CAPITAL MARKETS AFFECT ECONOMIC GROWTH IN DEVELOPING COUNTRIES?

MAX RENE REIMERS

OCTOBER 2020

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GLOSSARY

FDI – Foreign Direct Investment

GDP – Gross Domestic Product.

ODA – Official Development Assistant

ABSTRACT

This dissertation provides insights on the introduction of private equity capital markets and its effect on economic growth in African countries. We address this issue by focusing on stock exchange markets as the predominant type of new equity markets. The dissertation deep dives into the effects of the implementation of stock markets by focusing on the GDP per capita and on GDP per capita growth. It uses the Diff-in-Diff regression method. The analysis uses a panel data set on 48 Sub-Saharan countries over the time range of 1970-2018. 23 countries are part of the "treated" group, which introduced international stock exchanges, and 25 "untreated" countries serve as control group. Further, I will investigate the impact of new stock exchange markets on each year to follow their introduction until year 10.

The results are rather interesting. Compared to the time period prior to the introduction of stock exchange markets, GDP per capita rises by the amount of 532 US$ (around 40% of the Sub-Saharan average) after the introduction in treated countries. The coefficient is significant on a 5% level. In the 10 years post introduction, the effect is hump-shaped, with effects becoming statistically significant from the first year after implementation and peaking in year 5 and no statistically significant effect from year 6 onwards.

KEYWORDS: AFRICAN STOCK EXCHANGE; ECONOMIC GROWTH; MARKET OPENNESS
JEL CODES: C32; G15; N17.

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ACKNOWLEDGEMENTS

I would like to thank my fellow student João Vieira, who took away my fear of working actively with statistical packages the year prior starting my thesis.

Also all the participants of the MFE who have been helpful throughout my Master's degree.

Many thanks to my family for encouraging me of taking the step of going abroad to fulfil my Masters.

Finally, I would also like to thank Professor António Afonso for being my supervisor for a research question which is less of an ordinary type but means a lot to me, personally.

1. INTRODUCTION

The correlation between economic growth and equity capital markets has been brought to evidence in different empirical studies in the past. Fuchs-Schündeln and Funke (2001), focusing on existing, but liberalized stock markets concluded that there is a temporary positive effect of such liberalization on real GDP growth. They based their study on a sample of 26 countries from all over the world. The empirical evidence was confirmed for the countries from the Middle East and North Africa (henceforth MENA region, Naceur, et. al., 2008) where the focus of the investigation was centered on the pre-and post-development of those economies, which introduced equity capital markets. So far, the effect of introducing stock exchange markets as a determinant of economic growth has not been researched for the case of Sub-Saharan Africa. This paper addresses this issue, focusing on stock markets as the predominant type of new equity markets.

The motivation behind the research question "How does the development of private equity capital markets affect economic growth in developing countries?" lies within the fact that most of the Sub-Saharan countries implemented their stock exchange markets very recently. The countries mostly belong to third world developing countries where it is of interest to analyze whether the introduction of such financial markets has significant positive effects on economic growth. The introduction of international stock exchanges affect GDP throughout different channels. They, improve accounting standards and disclosure transparency, enforce property rights, strengthen legal and judicial systems for investor protection, attract foreign and local equity capital and increase the domestic institutional investor base.

A useful empirical identification strategy to assess these effects is by use of a Diff-in-Diff approach. The source of variation in this setting arises from the comparison of economic growth prior to and past the introduction of stock exchange markets, and in comparison of a group of treated countries (that implemented stock markets) versus control countries (that did not implement stock markets). When estimating the coefficient for "treated" countries we control for variables such as the value added over time for different sectors, foreign direct investment net inflows, and domestic credit to private sector and net official development assistance. This is to ensure that the common trend assumption is fulfilled. These control variables directly correlate with both, GDP per capita and the introduction

of international stock exchange markets and thus are necessary to estimate unbiased coefficients.

Our results are robust and presume that the introduction of international stock exchange markets have a significant impact on the level of GDP per capita. For treated countries, the GDP per capita increases around 532 US$ post market implementation. In economic terms, this is considerable given that it constitutes a more than 40% increase compared to the average GDP per capita of all Sub-Saharan countries over the period of 1970-2018. We repeat the regression to measure the impact of an introduction on GDP per capita growth. In this approach, we find the introduction of international capital markets on GDP per capita growth to be significant on a 5% level when including control variables. Post implementation, treated countries display a growth rate that is 0.9 percentage points. The positive relationship is coherent with the results of Fuchs-Schündeln and Funke (2001) who did a similar regression on market liberalization but controlling for policy reforms. Based on our results, we deepen our analysis by assessing how variable this effect is overtime. We apply the empirical strategy of Fuchs-Schündeln and Funke (2001). This way we can capture if the effect of introducing stock markets on economic growth is limited overtime or sustainable in the end. Our regression suggests that in the very year of market introduction, the effect on the GDP per capita level is statistically non-significant with a coefficient around 407 US$. Afterwards, it follows a hump-shape, by starting to be statistically and economically significant from year 1 after the introduction onwards and peaking in year 5. This result is coherent with the work of Fuchs-Schündeln and Funke (2001) who found that the effect of liberalization on GDP per capita growth reaches its peak in year 4. However, the effect seems to be limited to the first 5 years after introduction. From year 6 onwards, the effect is no longer statistically significant and the coefficient decreases which implies that the long term effect of the introduction of international stock exchange markets on GDP per capita limits itself to the results achieved within the first five years.

The remainder of the thesis is divided into 5 sections. Section 2 summarizes the relevant literature. Section 3 gives a brief overview of stock exchange markets and economic status of Sub-Saharan countries in general. Section 4 describes the empirical methodology and is followed by the results in section 5. Finally, section 6 concludes.

2. REVIEW OF LITERATURE

Within the economic development literature, many studies have assessed the potential effects of international stock markets on economic growth. The purpose of this section is to summarize the potential channels through which the implementation of equity capital markets is suggested to affect GDP per capita and GDP per capita growth: enhancing complementary markets and market infrastructure, attracting domestic and foreign capital by providing a higher degree of market openness, a higher transparency of disclosure of external accountings and a general improvement of accounting standards, the strengthening of legal and judicial systems for investor protection followed by the enforcement of property rights, and so on.

Several studies focused more on the theoretical background of the Solow growth theory model (Romer, 1996). Greenwood and Smith (1997) assessed whether equity capital acts as a driver for capital accumulation). Their research focuses on an agent's savings behavior in the presence of equity capital markets and its positive impact on the saving rate of an economy. One conclusion is that equity markets increase the growth rate of an economy relative to the optional bank financing if and only if agents are risk averse.

Levine and Zervos (1998) predicted that stock market liquidity and banking development have a positive impact on economic growth, capital accumulation and productivity. They performed an empirical analysis taking into account several economic growth indicators as dependent variables: output growth, capital stock growth, productivity growth and savings. Their investigation promotes a strong link between liquidity and capital accumulation, whereas the stock market size itself and its openness are not specifically linked to growth.

Nowbutsing and Odit, (2009) do a time series analysis for Mauritius. They underline that also for this single country (which liberalized stock markets in 1988) an increase in stock market liquidity increases GDP per capita growth. In contrast to Levine and Zervos (1998), the size of equity capital markets correlates significantly with GDP per capita growth. Nowbutsing and Odit (2009) conduct a time series analysis of years followed by the introduction of capital markets constructing an error correction model. In this work, a 10% increase in the size of capital markets is associated to an increase of 1.3% of real GDP per capita. Cuza (2012) assessed the impact of stock market development on GDP

growth using a single country analysis (Rumania) as well. He applied a VAR model that includes the GDP growth rate, market capitalization, stock traded value and real investment (Cuza 2012). Similar to Nowbutsing and Odit (2009), Cuza's results imply that the level of market capitalization does not have a significant impact on GDP growth. On the other hand, he finds a direct relationship between an increase of market capitalization and real investment and therefore an indirect impact on GDP growth.

The main study that serves as inspiration for this dissertation will be Fuchs-Schündeln and Funke (2001). Their sample comprises 12 Asian, 7 Latin American, 5 African and 3 European countries. They focus on liberalizing existing markets instead of introducing stock exchange markets. In their paper the focus lies on an empirical analysis of the economic situation of three different time periods: (i) prior to liberalization, (ii) the year of liberalization, (iii) the period of post liberalization. Their results point out that real per capita GDP growth exhibits a higher average in the period of financial liberalization. This dissertation will use a similar empirical identification strategy to test the effects of newly introduced stock exchange markets purely on Sub-Saharan countries. Another difference will be that in this work, Sub-Saharan countries that did not introduce capital markets will be added as control variables to add value by comparing economic developments of non-treated vs. treated countries, which actually introduced stock exchange markets mainly in the late 1980's until recently.

In the first part of their work, using a sample of 27 countries, Fuchs-Schündeln and Funke (2001) analyze the effect of opening their equity stock markets to foreign participation. Firstly, they regress GDP growth on liberalization dummies, country specific constants and year dummies. Afterwards they additionally control for variables that, if omitted, might bias their results, amongst others trade openness, stock market size and private investment which make the estimation very robust. This is, moreover, to ensure the validity of the common trend assumption underlying Diff-in-Diff analyses. Although trade openness is not significant, the stock market size and private investment play a significant role.

In the second part of their work, they assess empirically the role of institutional factors. Taking GDP growth as dependent variable, they choose the change of contract enforceability, change in national risk, and trade openness as explanatory variables. The

time range under investigation is one-year prior and 5-year post to liberalization. Their regression justifies that an improved contract enforceability prior to the liberalization of international financial markets is positively correlated with GDP growth. Lower national risk would have similar effects, though less significant than a functioning institutional framework for contract enforceability.

Additionally, there must be in place a high quality level and timely disclosure of firms' external accounting. This is necessary to provide investors with a minimum of information to assess the value of the securities being traded on public offerings and on the secondary stock market. Bad functioning of the accounting system and weak and delayed disclosure creates moral hazard and permits insiders to take advantage of price movements. Having in place an efficient judiciary enforcement of sanctions against insider trading increases the positive effects of market liberalization on growth. Fuchs-Schuendeln and Funke (2001) embed an institutional indicator of prohibiting insider trading, but the coefficient is statistically insignificant.

In the work of Yiew et al. (2018), a panel data sample of 95 developing countries is assessed throughout the years 2005-2013. He uses foreign direct investment (FDI) as control variable. His empirical approach applies the fixed effect model regression to support his research question. His model embeds a quadratic relationship of official development aid (ODA) with economic growth. Indeed, he finds a U-shape relationship in ODA and economic growth. The result implies that in the short run, ODA has a negative effect whereas it has a positive correlation with economic growth in the long run. Nevertheless, economic growth is less likely to depend on ODA. His results are that for a 1% increase in private FDI, the economic growth increases by 0.036% for the respective model. We will recur to the use of ODA as one control variable in my analysis. The reason is that also other studies such as Mallik (2008) confirm that ODA and real GDP are negatively correlated. They find this result using panel cointegration techniques and using data from the Central African Republic, Niger, Malawi Togo, Sierra Leone and Mali. In the short term, net ODA is not significant on economic growth per capita for all countries except for Niger. In the long run, foreign aid has even a significant negative effect on real GDP. In general, one can say that there have been several studies on the relationship between net ODA and GDP per capita growth with different conclusions. For

the investigation of the effect of the implementation of equity capital markets on GDP per capita, it is crucial to control for FDI and ODA in our analysis.

Closely related to the topic is the assessment of Coulibali and Gapka (2017) who perform an empirical analysis of 36 Sub-Saharan countries over the period of 1996-2013. They capture the effect of financial openness (which is measured by the ratio foreign direct investment inflows and outflows and portfolio equity flows) on GDP growth.
In addition, they also measure the effect of institutional quality of property rights with an index embedding the independence of judicial authority, the presence of corruption and the capability of enforcing contracts for firms and individuals. They divide their sample countries into two categories: rich in natural resources (16 countries) and poor in natural resources (20 countries). They use PMG regressions to capture the effects of the independent variables on economic growth. One result amongst others is that countries which benefit hugely from the existence of natural resources have on average a score of private property rights below Sub-Saharan countries which have not much natural resources. Nevertheless, a minimum insurance of property rights is necessary for international capital flows to Sub-Saharan countries to be fruitful. Domestic and foreign investors need to be protected by laws from expropriation. This is also confirmed by a working paper of the Bank of International Settlements (BIS), which stresses the importance of implementing efficient policies when establishing viable capital markets. Six key drivers of capital market development are defined: i) greater respect for market autonomy ii) strengthening legal and judicial systems iii) enhancing regulatory independence and effectiveness, iv) deepening the domestic institutional investor base
v) pursuing bi-directional opening to international participation while preparing for spillovers and vi) developing complementary markets and market infrastructures (Acharya, et. Al., 2019).

3. STATUS QUO: SUB-SAHARAN AFRICAN COUNTRIES AND THEIR STOCK EXCHANGE MARKETS

3.1 Countries and time-range of the analysis

The research analysis will focus on 48 Sub-Saharan African countries in between the years 1970 to 2018. All data is retrieved from the World Bank data repository of world development indicators (WDI).[1] For each country, the date of equity capital markets introduction and the number of listed companies were retrieved from the respective countries' stock exchange homepages.

Besides Kenia, Nigeria, Zimbabwe and South Africa, all stock exchanges were introduced between the late 80s until recently. Angola is just about to open its own stock exchange market for international investors (Macauhub, 2020). The control countries are the ones which did not introduce stock exchange markets until now. They are used as comparison group for the purpose of identification. The goal is to investigate the change in real GDP per capita and its growth from before the implementation of equity capital markets, to the year they were introduced, and post the implementation of equity capital markets.

[1] The raw data was retrieved from the WDI world bank indicator homepage https://databank.worldbank.org/

TABLE I
SUB-SAHARAN COUNTRIES UNDER INVESTIGATION[2]

Treated Countries	Introduction of CM	Listed Companies 2020	Stock Exchange
Botswana	1989	36	BSE
Cote d'Hivoire	1998	46	BRVM
Cameroon	2001	2	DSX
Cape Verde	2005	12	BVC
Gabon	2003	1	CEMAC
Ghana	1990	31	GSE
Lesotho	2016	0	MSM
Mozambique	1999	11	BVM
Mauritius	1988	88	SEM
Malawi	1995	14	MSE
Namibia	1992	7	NSX
Rwanda	2008	9	RSE
Sudan	1994	53	KSE
Somalia	2015	2	SSE
Swaziland	1990	5	ESE
Seychelles	2012	24	MERJ
Tanzania	1998	28	DSE
Uganda	1997	17	USE
Zambia	1994	26	LuSE
Kenia	1954	55	NSE
Nigeria	1960	215	NiSE
Zimbabwe	1948	63	ZSE
South Africa	1887	352	JSE

Source: Listed companies retrieved from the World Bank Indicator Databank.

[2] Control countries are: Angola, Burundi, Benin, Burkina Faso, Dem. Rep. of Kongo, Rep of Congo, Comoros, Eritrea, Ethiopia, Guinea, Guinea Bissau, Gambia, Equatorial Guinea, Liberia, Madagascar, Mali, Mauretania, Niger, Senegal, Sierra Leone, South Sudan, Sao Tome and Principe, Togo, and Chad.

3.2 General overview of GDP per capita in growth & levels and capital market size

TABLE II
VARIABLES TAKING INTO ACCOUNT FOR DIFF-IN-DIFF, PERIOD 1970-2018

Variable	Obs.	Mean	Std. Dev.
GDP per capita	2085	1257	2249
GDP per capita growth real	2053	1.36	6.9
Size of capital markets	199	86bn	221bn

Note: Values for GDP per capita and size of capital markets are in US$ currency. Values for GDP per capita growth are in percentage. The values are calculated based on a panel data of the whole sub-Saharan region over the period 1970-2018. The size of capital markets has 199 observation due to a lower data availability of the indicator, which aims to capture positive values only. The data was retrieved from the World Bank Indicator repository.

Table number II illustrates that the size of stock markets is quite low in Sub-Saharan Africa. In comparison, the company Apple with a market capitalization today of around 1.8 trillion US dollars is 22 times bigger than the mean market capitalization of the whole Sub-Saharan region over the investigated period (Bloomberg, 2020).

As most stock markets were introduced very recently in Sub-Saharan Africa, the amount of listed companies with a mean of 139 is pretty low. For comparison, the European Union had already 3321 companies listed in international stock exchanges by 1975. The number increased to 5700 by the year 2018. Given the low value of total market capitalization and the low number of listed companies of my treated countries compared to the US or Europe, I admit that I wonder about the extent to which introducing stock markets can actually have a significant impact on GDP per capita and GDP per capita growth. Should my analysis still point towards a positive effect of stock market introduction, then this would open up a high potential for a further development of equity capital markets to be associated with considerable gains in GDP per capita.

TABLE III[3]
REAL GDP PER CAPITA IN COMPARISON OF CONTINENTS

GDPPC	Mean	Std. Dev.
EU	18028.	11574
USA	29990	17523
Sub-Sahara	1257	2249
Treated countries	1811	2576
Control countries	881	1907

Source: World Bank Indicator Databank
The Sub-Sahara values and below are calculated based on a panel data set of the whole sub-Saharan region (48 countries) over the period 1970-2018. Values for EU and US are taking from the WDI directly.

In comparison with the European Union or the United States of America, mean GDP per capita in Sub-Saharan Africa is quite low and displays considerable variation. This indicates that income heterogeneity is substantial within Sub-Saharan countries. To highlight this, I consider two countries: Seychelles and Somalia. While the Seychelles had a GDP per capita of 14,745 US$ in 2015, Somalia had a GDP per capita of only 293 US$. This implies that the GDP per capita of the Seychelles is 14,745/293 = 50 times higher than the GDP per capita of Somalia. This example shows that the margins of GDP per capita between Sub-Saharan countries is very high. To further emphasize this we consider now two neighboring countries: Gabon which is part of the treated group and the Democratic Republic of Congo which is part of the control group. Although these are two neighboring countries, mean GDP per capita are very different from each other. The Democratic Republic of Congo has a mean of 327 US$ over this nearly 50 year period whereas for Gabon it amounts to 5,300 US$. This suggests that there might be a relationship between GDP per capita levels in real terms and the introduction of equity capital markets.

[3] Note: Values are in US$ currency.

TABLE IV[4]

SUMMARY OF GDP PER CAPITA GROWTH (REAL) AVERAGED PER CONTINENTS

GDPPCG	Mean	Std. Dev.
EU	1.88	1.65
USA	1.74	1.93
Sub-Sahara	1.36	6.93
Treat	2.15	5.90
Control	0.82	7.51

Source: World Bank Indicator Data Bank.
The **Sub-Sahara** values and below are calculated based on our panel data set of the whole Sub-Saharan region (48 countries) over the period 1970-2018. Values for EU and US are in percentage points and taken from the WDI directly.

Also, in terms of growth of GDP per capita, there is a lot of variation. The most important variation was displayed in 1997 Equatorial Guinea, showing 140% due to the discovery of oil and gas in the early 1990's and the rise to one of Africa's leading oil producers in the aftermath (Frynas, 2004). The lowest GDP per capita growth materialized in Rwanda during the genocide against Tutsis in 1994. Income was reduced to nearly half its size from one year to the next (Hodler, 2019).[5]

The standard deviation of GDP per capita growth in Sub-Saharan Africa is higher compared to the United States or the European Union. This confirms a higher volatility of Sub-Saharan countries' GDP growth per capita. What I want to emphasize is that treated countries which introduced equity capital markets have a higher and less volatile growth rate of GDP per capita. To see this, consider the last two rows of Table IV: The average growth rate of GDP per capita for countries which introduced capital markets is 2.1%. The control group which has not introduced capital markets has an average growth of only 0.8%. In addition, the variation of the GDP per capita growth of control countries (5.90) exceeds the one of treated countries (7.5).

[4] Note: The values of GDP per capita of Europe and USA have been taken as country aggregated datapoints for this period.
[5] The cited literature (Hodler, 2019) points a decrease 58% in GDP per capita growth, which is about 10% higher decrease than our data from the WDI. We will consider the data from the WDI throughout the paper.

TABLE V
PRE-POST GDP PER CAPITA FOR SUB-SAHARAN COUNTRIES WHICH INTRODUCED CAPITAL MARKETS

GDPPC	pre 10 years	t=0	post 10 years
Mean	1476	1736	2144
Std. Dev	2437	2753	3241
Min	121	142	150
Max	12189	12007	16434

Source: World Bank Indicator Data Bank.
In this table I consider the GDP per capita in levels in the years prior, in the years of, and in the years post introduction. Whenever possible, I include the 10 years before and ten years after. For some countries pre- and post periods may be less than 10 years due to the timing of the introduction of capital markets[6]. The values in the three columns are then computed as simple averages over the available GDP per capita data in the respective timeframe.

Next, I discuss in how far GDP per capita and GDP per capita growth differed in treated countries prior to, in the year of, and post to the introduction of equity capital markets. Table V shows GDP per capita in levels (US$) of treated Sub-Saharan countries from the period ten years prior to the introduction, the year of introduction and 10 years post introduction of international capital markets. Although the time effects of growing GDP are not embedded in this summary yet, the table suggests that there could be an impact of the introduction of international stock exchange markets on GDP per capita in levels. The average GDP per capita in the year of introduction amounted to 1736 US$ which is around 17.5% higher than the mean of the previous 10 years to introduction. The value increases by around 23.5% during the 10 years after implementation to 2144 US$. This hints to the fact that there might be some relationship between GDP per capita and the implementation of international stock markets.

For example, in Lesotho capital markets were introduced in 2016, which leaves two observations of GDP per capita in the post period (2017 and 2018 - the end of my panel). In Somalia, capital markets were introduced in 2015 so that the post-period amounts to 3 years, 3 observations; Seychelles introduced 2012, therefore , post-period amounts to 6 years, 6 observations, For Kenia, Nigeria Zimbabwe and South Africa the year of introduction falls ten years before the start of the panel, therefore they are not included in the computation of this table.

TABLE VI
SUMMARY OF GDP PER CAPITA GROWTH (REAL) OF SUB-SAHARA DIVIDED IN 10 YEARS PRIOR INTRODUCTION OF EQUITY CM, T=0 AND 10 YEARS POST PERIOD

GDPPCG	pre (10 years)	t=0	post 10 years
Mean	1.74	4.02	2.06
Std. Dev	5.24	6.45	2.85

Source: World Bank Indicator Databank. For each Sub-Saharan country I compute year-to-year GDP per Capita growth rates in the years prior, in the year of, and in the years post introduction. For some countries pre- and post periods may be less than 10 years due to the timing of the introduction of capital markets[7]. The values in the three columns are then computed as simple averages over the available growth data in the respective timeframe.

Table VI above shows that similar results also hold for GDP per capita growth.

For instance, mean GDP per capita growth 10 years prior to the introduction of capital markets averaged 1.74 %, whereas in the 10 years past the introduction it was about 0.3%-points higher. Also, introducing capital markets seems to lower the volatility of GDP per capita growth. The standard deviation 10 years prior amounts to 5.2%, whereas 10 years past the introduction it only amounts to 2.8%. That is, there seems to be less uncertainty about real GDP per capita growth after the introduction of stock exchange markets. This is coherent with the work of Bekaert and Harvey (2006) who analyzed the impact of financial liberalization on the volatility of GDP per capita growth (Bekaert, G., et. al., 2006). Obviously, the highest mean of GDP per capita growth occurs in the year of introduction itself, amounting to 4% which could be arising through general positive expectations of the economy. It is, however, also the period with the highest standard deviation amounting to 6.5%.

I check whether the introduction of equity capital markets is associated to higher and positive GDP per capita growth in all the treated countries. In the year of the introduction of international stock exchanges, only 3 out of 23 treated countries, i.e. Zambia, Sudan and Gabon actually had negative growth rates of -10%, -1.6% and -0.2% respectively. In the 10 years following the introduction even Sudan and Zambia showed a mean GDP per

For example, in Lesotho capital markets were introduced in 2016, which leaves two year-to-year growth observations until 2018 (the end of my panel). In Somalia, capital markets were introduced in 2015, post-period amounts to 3 years, 3 observations; Seychelles introduced 2012, therefore , post-period amounts to 6 years, 6 observations, For Kenia, Nigeria Zimbabwe and South Africa the year of introduction falls ten years before the start of the panel, therefore they are not included in the computation of this table.

capita growth of 0.9% and 3.2% respectively, whereas the mean growth of Gabon on the 10 years average after the introduction stayed slightly negative with -0.4%. For the remaining countries, the country with the highest mean GDP per capita growth in the year of implementation is Swaziland with 17.5%. The 10 years period past introduction shows a mean value of 3.2%. Although being a small landlocked country, Swaziland may have benefitted from its status as a politically stable location for neighboring South-African industries. All in all, these examples prove the value of testing empirically the impact of stock markets introduction on GDP development.

I am concerned about the time-series properties of my dependent variables "GDP per capita" and "GDP per capita growth". This is because I tend to think of the introduction of equity capital markets as a permanent (i.e. deterministic) shock to GDP per capita, such that GDP per capita should be non-stationary. Appendix Table XI indeed shows that GDP per capita is integrated of order 1, but I(0) in first differences: that is GDP per capita is non-stationary in levels, but growth of GDPPC is stationary. Given those results, I feel comfortable continuing with my empirical assessment.

4. EMPIRICAL STRATEGY

4.1 Identification

The empirical analysis will consist of a Diff-in-Diff regression. The source of variation arises between Sub-Saharan countries which actually implemented a stock exchange market (pre and post treatment) and countries which have not implemented international stock exchanges yet (control group).

The identification strategy will center on estimating β and γ in the following reduced form expressions:

$$(1) \quad y_{it} = c + \propto_i + \delta_t + \beta post_{it} * treat_{it} + \boldsymbol{\theta} X_{it}{}^{8} + \varepsilon_{it},$$

$$(2) \quad \Delta y_{it} = \zeta_t + \gamma\, post_{it} * treat_{it} + \boldsymbol{\psi} X_{it} + \upsilon_{it}.$$

[8] For the analysis we create two dummy variables "treat&post" which take the value one from the year a country introduced stock markets until 2018 if the country is treated.

Therefore, we want to investigate the magnitude and the statistical significance of the coefficient β and γ. I denote by i the country, and by t, time. Additionally, we have, y_{it} : GDP per capita; Δy_{it} : GDP per capita growth; c: constant; $\propto_i$ are country fixed effects: we try to capture time-invariant, country specific effects such as existence of natural resources, the quality of institutional framework and regulatory effectiveness, property rights, market autonomy and the existence of complementary markets and market infrastructure which, if omitted, would bias our coefficients of interest. And, we have as well as definitions, β, γ: treatment effects; X_{it}: control variables; δ_t and ζ_t are time fixed effects; ε_{it} and υ_{it} are country time level residuals.

4.2 Control Variables

I highlighted in Section (Lit) that prior works have found different variables to potentially impact GDP per capita and GDP per capita growth. Their omission might invalidate the common-trend assumption that underlies the Diff-in-Diff strategy and emphasizes the need to make control and treatment countries as comparable as possible (Fuchs-Schündeln and Funke, 2001). But also, their omission might bias my coefficients of interest, as I outline next.

For one, we will control for structural change indicators along our analysis. We see that the value added of services during the past 48 years in Sub-Saharan Africa dominated the other sectors, namely agricultural, manufacturing and industry with a mean share of 44.4% of the GDP. As in the Western World, services seem to become more and more important for Sub-Saharan Africa.

TABLE VII
CONTROL VARIABLES

Variable	Obs	Mean	Std. Dev.
Service value added (% GDP)	1819	44.4	11
Manufacturing value added (% GDP)	1728	10.4	5.90
Agriculture value added (% GDP)	1930	25.9	15.5
Foreign Direct Investment (% GDP)	2043	3.07	7.92
Domestic Credit to Private Sector (% GDP)	1948	17.8	19.2
Net ODA received (% of gross capital formation)	1772	64.5	129

Source: World Bank Indicator Data Bank.
The values are calculated based on our panel data of the whole Sub-Saharan region over the period 1970-2018.
The number of observations differs because availability of data begins at different points in time in the different countries (unbalanced panel).

In light of the Baumol disease, I control for the industry shares of the economies. Baumol highlighted that as economies undergo structural change and the service share becomes more and more important, these economies tend to stagnate in terms of economic growth (Baumol, 1966). This is because the service sector, being the one that displays slowest productivity growth, becomes more and more important in total value added of an economy. This highlights that different sectors contribute to economic growth very differently. Given that equity capital tends to be invested in innovative industries, and Sub-Saharan countries display a high growth rate in the manufacturing sector, I am concerned that omitting the industry, agriculture and service shares might bias my results.

The introduction of the equity capital market is accompanied by (actual or expected) improvements of institutional frameworks and political stability. It is also accompanied by higher contract enforceability and property rights (Merton, 1995). The accounting standards increase and become more transparent, which is necessary for pricing equity shares. Both aforementioned factors increase trust and reduce investment risk. This might lead to higher incentives for foreign and/or domestic investors to supply adequately priced short and long term financing for companies. In turn, this spurs investment and thus directly affects GDP per capita levels and growth, as it is typically highlighted in the standard neoclassical growth models (Greenwood et al., 1997). To control for this and to ensure that my estimate for the effect of equity capital markets implementation is not biased (upwards), I control for FDI (as share of GDP) and domestic credit (as share of GDP).

The introduction of stock/equity Capital Markets may also create expectations as to the independence and effectiveness of policy. Countries that are net supplies of development assistance might be willing to increase their financial aids due to a higher degree of confidence in the regimes to rightfully and efficiently allocate these funds where needed. This also directly impacts economic growth (Anyanwu, 2014), in particular if financial aid is targeted to innovative programs. To avoid a bias in my coefficient of interest, I control for ODA. The mean ODA in Sub-Saharan countries amounts to 65% of its gross capital formation. Note that there is one country which received ODAs of about 40 times its gross capital formation (Sierra Leone).

The advantage of panel data is that we can run fixed effect models in order to account for time-invariant, country-specific factors that, if omitted, might also bias my coefficient. For example, time-invariant cultural factors, certain institutions or norms, the existence of natural resources, the effectiveness of the institutional framework, the legal enforcement of property rights and the expansion of a functioning market framework are factors that facilitate the implementation of stock markets, but are also positively correlated with GDP per capita in levels in in terms of growth. So accounting for this is crucial to ensure unbiased results.

The other advantage of using a panel dataset is that we can include a full set of time dummies, in order to account for time fixed effects that affected all the Sub-Saharan countries in my data similarly. This is important because pre-post differences in GDP per capita that identify my Diff-in-Diff coefficient might be driven by constant upward time trends. Including time-dummies helps identify the coefficient consistently, and ensures that the common trend assumption is valid.

5. RESULTS

5.1 GDP Per Capita

Now to the specific results: Model 1 includes time effects and is based on 2085 observations. The coefficient of interest amounts to 532 US$ and is statistically

significant on the one percent level. For the economic interpretation of this value, I return to the average level of GDP per capita that we observed in Sub-Saharan countries in table 3. The average GDP per capita amounted to 1257 US$ which implies that the introduction of an equity capital market is associated with a rise of GDP per capita of 532/1257 = 42%. In terms of economics, this is considerable.

Now note that this value is robust to the omission of fixed effects. The 95% confidence interval of model 1 with fixed effects lies within 283 US$ - 781 US$. The coefficient of model 2 without fixed effects is 493 US$$ and stays within that interval. In contrast to my expectations, omitting fixed effects implies that we underestimate the effect of introducing stock markets. A reason could be that the use of fixed effects also captures the status quo on financial literacy, which I presume to be quite low in Sub-Saharan countries. Omitting fixed effects implies omitting this factor, which is why the measured coefficient decreases.

When controlling for variables in model 3, our coefficient amounts to 852 US$ and is highly significant at a 1% level. Note that I test the residuals from this regression for stationarity, to ensure I do not run into the spurious regression problematic. The results are mixed: Panel unit root tests à la Im, Pesaran and Shin (2003) suggest that residuals are stationary, while the Fisher type unit root test developed by Choi (2001) does not. Given those mixed results, I decide to continue my analysis. The constant amounts to 742 US$. The R^2 is 0.84 and implies that the model including control variables, time effects and fixed effects has the best fit. The estimated coefficient is higher than in model 1 and 2. I suspect that this is not due to the inclusion of control variables, but rather to the smaller sample size of model 3 (amounting to 1358 observations). I address this issue again further below.

Table VIII

REGRESSION TESTING GDPPC IN LEVELS[9]

	(1)	(2)	(3)	(4)	(5)
post*treat	532***	493***	852***	890***	470***
	(-4.19)	(4.31)	(6.71)	(7.24)	(3.02)
Services, VA (% of GDP)	-	-	1.77	-	-
			(0.34)		
Manufacturing, v.a (% of GDP)	-	-	47.5***	-	-
			(4.80)		
Agriculture, v.a (% of GDP)	-	-	25.7***	-	-
			(4.19)		
FDI, net inflows (% of GDP)	-	-	-9.76	-	-
			(-1.96)		
Domestic credit to private sector (% of GDP)	-	-	48.9***	-	-
			(11.90)		
Net ODA received (% of gross capital formation)	-	-	-0.5	-	-
			(-0.22)		
Fixed Effects	Yes	No	Yes	Yes	No
Time Effects	Yes	Yes	Yes	Yes	Yes
R^2	0.61	0.13	0.84	0.82	0.11
Constant	728	162	742	1901	126
N	2085	2085	1358	1358	1358

Source: World Bank Indicator Databank. Results for the estimation of Equation (1), including/omitting fixed effects/ control variables. Post*treat takes on the value 0 before the introduction of capital markets, and 1 in the year of and all years subsequent to the introduction of capital markets. It remains 0 in countries that never introduced capital markets (the control group). Countries that introduced capital markets prior to 1970 form part of the treated group throughout 1970-2018 (Nigeria, Somalia, South Africa and Zimbabwe). Number of observations in Columns (3) lower due to missing datapoints in the different control variables. Columns (4)-(5) repeat the exercise in the first two columns, but based on the sample in Column (3). T-values in brackets. *** significant at a 1% level; ** significant at a 5% level *; significant at a 10% level;

Looking at industry shares, an increase of 1% in the GDP share of manufacturing is associated to a 48 US$ higher GDP per capita. This compares to 26 US$ for an equivalent increase of the agricultural sector share. Although the coefficient for value added as share of GDP is slightly positive for services, amounting to 1.77 US$, it is not significant. I view this in light of Baumol's disease, which suggests that the rise of the service sector is associated to slower economic growth. My findings on the role of industry shares

[9] The base year for time effects is 1970. Base country for the fixed effects is Angola

emphasize that in order to reach higher income levels (in terms of GDPPC), it would be helpful if capital market financing was used to reinforce capital intensive sectors, especially manufacturing. This may help economies step over this disease.

The coefficient of foreign direct investment net inflows as a percentage of GDP amounts to - 9.76 and is only significant at 10% level. On the other hand, domestic credit to the private sector as percent of GDP is highly significant. An increase of 1% in the domestic credit to private sector as share of GDP is associated to a rise of income by 49 US$. Net ODA has a slightly negative coefficient of -0.5. Note that, however, the coefficient is not significant.

Model 3 has less observations due to the lower existence of data availability. For comparability we therefore estimate again regressions 1 and 2 with the subsample of 1369 observations and label them Model 4 and 5 respectively. In model 4, excluding the control variables, the coefficient amounts to 890 US$ and is as well significant at a 1% level. Clearly, omitting control variables leads to an upward bias of the coefficient of interest. But, how does equity capital market financing correlate with the industry structure, for example? To see this, consider that investors will direct their resources to those projects that exhibit the highest returns, i.e. are most innovative and performing. In this view, the manufacturing sector offers more opportunities than services. So, the higher the manufacturing share, the more financing will be attracted through equity capital markets. Also, consider the share of domestic credit: Clearly, the better financial markets are already developed, the lower should be the effect of introducing an additional form of financing such as equity capital markets. Leaving out controls, the coefficient is upward biased because equity capital markets tend to be implemented in those economies that already have well-established financial markets. Also, the constant increases in value to 1901 US$. Now, omitting country fixed effects in model 5 we see that the coefficient amounts to only 470 US$. Leaving out country fixed effects again seems to bias our results downward. The R^2 in model 5 amounts to 0.11. Model 3 with an R^2 of 0.84 and including control variables has the highest fit.

5.2 GDP per Capita growth

We now undergo a regression testing on GDP per capita growth. As we are analyzing a differenced value, we omit the constant and fixed effects. In model 6 we exclude the control variables. We find a positive coefficient of 0.47. So, compared to prior the introduction of equity capital markets, treated countries exhibit a higher coefficient. However, the model implies that the introduction of equity capital markets is not associated to statistically significantly higher GDP per capita growth.

As in our analysis on GDP per capita in levels, we now repeat the regression including our control variables. Model 7 has a higher coefficient for post*treat than model 6 at a 5% significance level. This might be accompanied by the lower sample size of 1340 observations. After the introduction of equity capital markets, treated countries exhibit a GDP growth which is 1 percentage point higher than prior the introduction.

We now conduct regression of model 6 with our sample used in model 7 to make it comparable. We observe a higher coefficient of interest when excluding control variables. It is highly significant on a 1% level. Again, the reason for this upwards trend might be that capital markets correlate with the industry structure. Though, not controlling for specific sectors, FDI, domestic credit, and ODA might bias the estimation of the coefficient.

Table IX

GDP PER CAPITA GROWTH IN POST PERIOD

	(6)	(7)	(8)
postxtreat	0.47	0.91**	0.99***
	(1.26)	(2.51)	(2.83)
Services v.a (% of GDP)	-	0	-
		(-0.05)	
Manufacturing, v.a (% of GDP)	-	-0.05*	-
		(-1.72)	-
Agriculture, v.a (% of GDP)	-	-0.02	-
		(-1.59)	-
FDI, net inflows (% of GDP)	-	0.012	-
		(-0.52)	
Domestic credit to private sector (% of GDP)	-	0.003	-
		(-0.39)	
Net ODA received (% of gross capital formation)	-	-0.003	-
		(-2.16)	
Fixed Effects	No	No	No
Time Effects	Yes	Yes	Yes
R^2	0.08	0.13	0.13
N	2053	1343	1343

Source: World Bank Indicator Databank. Results for the estimation of Equation (2), including/omitting control variables. Post*treat takes on the value 0 before the introduction of capital markets, and 1 in the year of and all years subsequent to the introduction of capital markets. It remains 0 in countries that never introduced capital markets (the control group). Countries that introduced capital markets prior to 1970 form part of the treated group throughout 1970-2018 (Nigeria, Somalia, South Africa and Zimbabwe). Number of observations in Columns (2) lower due to missing datapoints in the different control variables. Column (3) repeats the exercise in the first column, but based on the sample in Column (2). T-values in brackets. *** significant at a 1% level; ** significant at a 5% level *; significant at a 10% level;

5.2 Time varying effects

We now want to analyze whether the introduction of equity capital markets had time-varying effects in the 10 years post to the introduction of stock markets on treated countries.

Similar to the works of Fuchs-Schündeln & Funke (2001) and Naceur (2008), we will create a dummy variable for every year. For instance, eq_imp0 will take the value 1 in the year of implementation of stock markets and 0 in all other years. Eq_mp1 will take

the value 1 one year after the introduction of capital markets, 0 otherwise and so on for each year until year 10. We will compare the regression including the dummies with our results from before when we just specified the post period of equity market implementations. Further we will compare our results with the literature that estimated similar regressions, but taking into consideration the banking sector, stock markets, and debt markets as indicators for the development of capital markets.

The identification strategy builds on the following reduced form equation:

$$(3)\ y_{it} = c + \propto_i + \delta_t + \beta_t post\_imp_{it} * treat_{it} + \boldsymbol{\gamma} X_{it}$$

where "post_imp$_{it}$" takes on value 1 in year t after implementation, and value 0 in all other years (as described above). The remaining parameters are as before.

Table 10 shows a positive coefficient on the same year of the introduction of equity capital markets, but it is not statistically significant. The introduction of equity capital markets for the treated countries is associated to a growth of 408 US$ of GDP per capita in levels in the year of introduction. This positive effect, though in levels, is coherent with the results of Fuchs-Schündeln and Funke (2001) who regressed real GDP per capita growth on stock market liberalization indices on a panel data of 27 countries. Naceur et al. (2008) assessed two similar cases based on the countries of the MENA region and a sub-sample including 7 countries. His results are rather different. The growth rate of GDP per capita in the year of liberalization is negative and statistically insignificant. Also here I do not find statistically significant effects.

TABLE X
ESTIMATING THE COEFFICIENT FOR EACH YEAR AFTER

GDPPC	Coefficient	[95% Conf. Interval]	
postimp0	408	-153	969
	(1.43)		
postimp1	596**	35.9	1155
	(2.1)		
postimp2	596**	52.1	1139
	(2.15)		
postimp3	685**	125	1244
	(2.4)		
postimp4	745***	186	1305
	(2.61)		
postimp5	772***	213	1332
	(2.71)		
postimp6	95.9	-482	674
	(0.33)		
postimp7	177	-402	755
	(0.6)		
postimp8	259	-319	837
	(0.88)		
postimp9	-9	-586	568
	(-0.03)		
postimp10	-130	-706	447
	(-0.04)		
Services, v.a (% of GDP)	5.66	-4.74	16.1
	(1.07)		
Manufacturing, v.a (% of GDP)	61.7	42.3	81
	(6.26)		
Agriculture, v.a (% of GDP)	22.1	9.93	34.2
	(3.57)		
FDI, net inflows (% of GDP)	-9.9	-19.8	0.02
	(-1.96)		
Domestic credit to private sector (% of GDP)	52.3	44.1	60.6
	(12.45)		
Net ODA received (% of gross capital formation)	-0.03	-0.5	0.43
	(-0.14)		
Fixed Effects	Yes	-	-
Time Effects	Yes	-	-
R^2	0.84	-	-
N	1353	-	-

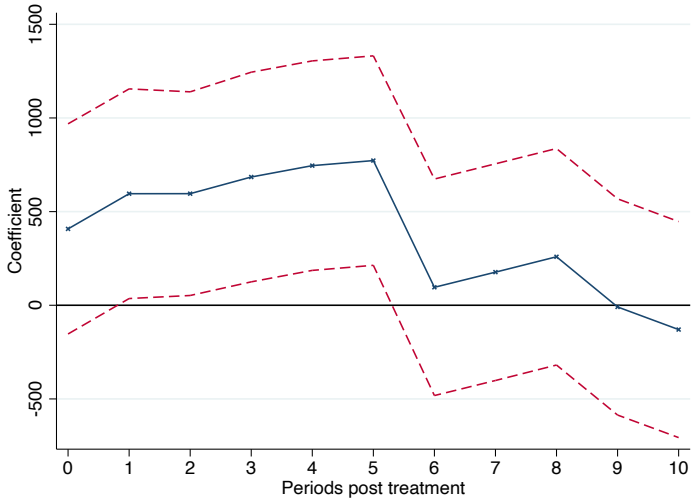
Note: Source: World Bank Indicator Databank. T-values in brackets. Results for the estimation of Equation (3), including/omitting fixed/time effects and control variables. where "post_impit" takes on value 1 in year t after implementation, and value 0 in all other years (as described above). It remains 0 in countries that never introduced capital markets (the control group). Countries that introduced capital markets prior to 1970 form part of the treated group throughout 1970-2018 (Nigeria, Somalia, South Africa and Zimbabwe; Sample consideration that I noted for table 5 remain valid here, T-values in brackets. *** significant at a 1% level; ** significant at a 5% level *; significant at a 10% level;

For better visualization of the patterns in my coefficients, consider Figure 1. Observe that the coefficient turns out to be significant at a 5% level starting from the first year after the introduction of equity capital markets. You can deduct this from the fact that the lower red line (which marks the bottom of the 95% interval) does not cross the zero-line anymore. Overtime, the coefficient rises, i.e. it seems like introducing equity capital markets is associated with a higher GDP per Capita only with a certain time lag. Note that the coefficients even reach a 1% significance level in the fourth and fifth year after the introduction. The coefficient reaches its peak in the fifth year with 772 US$. In comparison, the effect of market liberalization on GDP growth in the work of Fuchs-Schündeln and Funke (2001) reached a peak in year four.

Our coefficients of interest follow an inverse U-shape, i.e. they seem to be limited in time as the coefficient decreases considerably in year 6 to 96 US$ and is not significant for this year and the years to follow. The coefficient rises again to 176 US$ and to 259 US$ in year 7 and 8 respectively, whereas it takes on a negative value in year 9 and 10 (note though, that none of these estimates are statistically significant anymore). This could signify that the capital inflows after the introduction of equity capital markets are more portfolio and short term orientated, as suggested by Naceur et al. (2008) for his analysis embedding market liberalization as a whole.

Note that the underlying regression used to estimate these coefficients includes control variables, which turn out to be crucial to generate statistically significant estimates of the time-varying coefficients. In general, one can say that these results are pretty much coherent with our previous Diff-in-Diff findings when analyzing the effect of introduction more generally. Both regressions put into evidence that the introduction of equity capital markets are positively correlated with GDP per capita. The findings of this additional exercise merely emphasize that these effects follow an inverse U-shape.

FIGURE 1 – Scatter plot of the Coefficient for respective years and their 95% confidence interval.



Source: World Bank Indicator Databank. The X-axis displays each year post introduction of stock exchange markets for treated countries. The Y-axis displays the coefficients estimated in equation 3 and its significance intervals.

6. CONCLUSION

This study focuses on the effect of recently introduced international stock exchange markets in the Sub-Saharan region. We used panel data ranging from 1970 until 2018 with a sample of 48 Sub-Saharan countries. Out of these 48 countries, 23 countries introduced international stock exchange markets and are part of the treated group, whereas the remaining 25 countries have not introduced such markets yet and form the control group.

In our first analysis we conduct Diff-in-Diff analyses. Our models differ in the sense that we include/exclude time fixed effects, country fixed effects and control variables to assess the impact of omitting certain variables. Leaving out control variables, the regression shows that the introduction of equity capital markets is associated with a rise of GDP per capita of around 42% (of the average of Sub-Saharan countries derived over the period of nearly 50 years).

We repeat the regression including control variables, fixed and time effects on a subsample due to the lower existence of data availability. When conducting the regression including control variables, introducing stock markets is associated to a rise of GDP per

capita of 850 US$. This model fits our prediction best with an R^2 of 0.84. Our analysis implies that countries who implemented equity capital markets have a better stand when it comes to the development of GDP per capita.

In our second analysis, we investigate the effect of the introduction on each single year in the post period until year 10. The aim is to investigate on the basis of our first analysis the dynamics of the adjustment process. We conclude that although the effect in the very year of capital market introduction is not significant, the implementation of equity capital markets is associated to GDP per capita in an inverse U-Shape. GDP per capita rises in the 5 following years. From year 6 onwards, GDP per capita decreases again, which implies that the effect is rather of short term relevance than long term. All in all, this confirms our previous results that countries can benefit from economic growth when introducing capital markets.

For future research, one needs to say that we use regressions with country fixed effects. Other promising control variables such as trade openness, efficiency of institutional frameworks would probably give more accurate results when estimating the effect of introducing capital markets on economic growth. However, these country specific indices were not available for our sample of Sub-Saharan countries. I anticipate that future data availability will enable research to take additional country specific but time-varying control variables into account, in order to quantify the importance of equity capital markets in a consistently and unbiased way.

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APPENDICES

TABLE XI

	Class.	Im, Pesaran & Shin			Fisher		
		T-Stat	Prob.	Unit Root	T-Stat	Prob.	Unit Root
GDPPC	Control	1.75	0.96	I(1)	1.91	0.97	I(1)
	Treated	-1.06	0.14	I(1)	0.18	0.57	I(1)
ΔGDPPC	Control	-20.68	0	I(0)	-7.15	0	I(0)
	Treated	-17.89	0	I(0)	-12.01	0	I(0)
Residuals from Model 3	Control	-2.14	0.02	I(0)	0.02	0.51	I(1)
	Treated	-1.74	0.04	I(0)	0.39	0.65	I(1)

Note: Dickey Fuller Test based on Im, Pesaran and Shin (2003), which tests H(0): All panels have a unit root against H(1): Some panels are stationary; and results from Choi's (2001) Fisher-type unit root tests for H(0): All panels contain unit roots against H(1): At least one panel is stationary.