

**REPUBLIC OF TURKEY  
SAKARYA UNIVERSITY  
INSTITUTE OF SOCIAL SCIENCES  
ECONOMICS**

**TAX COMPETITION, OFFICIAL DEVELOPMENT  
ASSISTANCE AND MACROECONOMIC PERFORMANCE  
IN SUB-SAHARAN AFRICA**

**HAMAN MAHAMAT ADDI**

**DOCTORAL THESIS**

**Supervisor: Prof. Dr. Ekrem GÜL**

**DECEMBER - 2021**

**REPUBLIC OF TURKEY  
SAKARYA UNIVERSITY  
INSTITUTE OF SOCIAL SCIENCES**

**TAX COMPETITION, OFFICIAL DEVELOPMENT  
ASSISTANCE AND MACROECONOMIC PERFORMANCE  
IN SUB-SAHARAN AFRICA**

**DOCTORAL THESIS**

**Haman Mahamat ADDI**

**Institute Department : Department of Economics**

**“This thesis was defended face to face on 07/01/2022 and was unanimously approved by the jury members whose names are listed below.”**

<b>JÜRİ ÜYESİ</b>	<b>KANAATI</b>
Prof. Dr. Ekrem GÜL	Approved
Prof. Dr. Sezgin AÇIKALIN	Approved
Prof. Dr. Şuayyip ÇALIŞ	Approved
Doç. Dr. Meltem ERDOĞAN	Approved
Dr. Ünal Ozan KAHRAMAN	Approved

## **RESEARCH ETHICS DECLARATION FORM**

I hereby certify that I am the sole author of this thesis and I declare that all information presented in this document has been obtained following academic rules and ethical conduct. I also fully acknowledge all the consequences of violating these rules by plagiarism or any other way.

### **Studies that require Ethics Committee Approval are as follows;**

- Any research that require data collection from participants using questionnaire, interview, focus group study, direct observation, and experiment and interview techniques alike.
- Using of humans and animals (including materials/data) for experimental or other scientific purposes,
- Clinical trials conducted on humans and animals,

### **Do you need any ethics committee approval document?**

Yes

No

**HAMAN MAHAMAT ADDI**

**07/01/2022**

## **ACKNOWLEDGMENTS**

I would like to thank my esteemed supervisor Prof. Dr. Ekrem GÜL for his advice, help, and patience during my Ph.D. study. My gratitude extends to Dr. Ünsal Ozan KAHRAMAN for his treasured support and encouragement. Additionally, I am deeply grateful to “YTB: Yurtdışı Türkler ve Akraba Topluluklar Başkanlığı“ for the funding opportunity to undertake my Ph. D. at Sakarya University.

I would like to express my sincere gratitude to Marisol Nouboug Kueko, senior transfer pricing at KMPG France, for her insightful comments and suggestions that helped me examine tax competition via transfer pricing techniques. My special thanks go to Attahir Babaji Abubakar for his technical support regarding econometrics. Furthermore, I would like to extend my sincere thanks to Osama Naji for his help with Excel, and Nurhusein for his help in looking for the data.

Finally, for their tremendous understanding and encouragement, I would like to express my extreme gratitude to my parents: Mr. and Ms. Mahamat Addi; my siblings Ibrahim, Madinatou, Fadila, Djeba, and especially Khalimat (for her “Hamma bon djangué!”).

**HAMAN MAHAMAT ADDI**

**07/01/2022**

## TABLE OF CONTENTS

<b>ACRONYMS</b> .....	<b>iii</b>
<b>LIST OF FIGURES</b> .....	<b>v</b>
<b>LIST OF TABLES</b> .....	<b>vi</b>
<b>ABSTRACT</b> .....	<b>viii</b>
<b>ÖZET</b> .....	<b>ix</b>
<b>INTRODUCTION</b> .....	<b>1</b>
<b>CHAPTER 1: TAX COMPETITION, OFFICIAL DEVELOPMENT ASSISTANCE AND MACROECONOMIC PERFORMANCE: A THEORETICAL AND AN EMPIRICAL ANALYSIS</b> .....	<b>13</b>
1.1. Tax Competition And Macroeconomic Performance .....	13
1.1.1. Horizontal Tax Competition Models .....	13
1.1.2. Vertical Tax Competition Models .....	25
1.2. Public Aid and Macroeconomic Performance.....	48
1.2.1. Aid Flows to Sub-Saharan Africa: An Overview .....	49
1.2.2. Aid and Macroeconomic Performance: A Point of the Literature.....	55
<b>CHAPTER 2: TAX COMPETITION, OFFICIAL DEVELOPMENT ASSISTANCE AND MACROECONOMIC PERFORMANCE: METHODOLOGY</b> .....	<b>73</b>
2.1. Tax Competition and Macroeconomic Performance in Sub-Saharan African Countries: Methodology .....	73
2.1.1. Horizontal Tax Competition and Macroeconomic Performance in Sub-Saharan African Countries: Methodology .....	73
2.1.2. Vertical Tax Competition and Macroeconomic Performance in Sub-Saharan African Countries: Methodology .....	84
2.2. Official Development Assistance and Macroeconomic Performance.....	85
2.2.1. Model Specification .....	85
2.2.2. Estimation Technique.....	86

<b>CHAPTER 3: TAX COMPETITION, OFFICIAL DEVELOPMENT ASSISTANCE AND MACROECONOMIC PERFORMANCE: RESULTS, DISCUSSION AND POLICY RECOMMENDATIONS.....</b>	<b>90</b>
3.1.Tax Competition and Macroeconomic Performance in Sub-Saharan African Countries: Results, Discussions and Policy Recommendations.....	90
3.1.1. Horizontal Tax Competition.....	90
3.1.2. Vertical Tax Competition.....	103
3.2.Official Development Assistance and Macroeconomic Performance in Sub-Saharan African Countries: Results, Discussions and Policy Recommendations .....	114
3.2.1. Descriptive Statistics .....	115
3.2.2. Diagnostic Tests and Regression Analysis.....	117
<b>CONCLUSION .....</b>	<b>140</b>
<b>REFERENCES .....</b>	<b>144</b>
<b>APPENDIX.....</b>	<b>158</b>
<b>CURRICULUM VITAE .....</b>	<b>172</b>

## ACRONYMS

<b>ADB</b>	: Asian Development Bank
<b>AfDB</b>	: African Development Bank
<b>AusAID</b>	: Australian Agency for International Development
<b>CB</b>	: Cobb-Douglas
<b>CCAD</b>	: Development Aid Coordination Committee
<b>CCE</b>	: Common Correlated Effects
<b>CEN-SAD</b>	: Community of Sahel Saharan-States
<b>COMESA</b>	: Common Market for Eastern and Southern Africa
<b>CPI</b>	: Corruption Perceptions Index
<b>DAC</b>	: Development Assistance Committee
<b>EAC</b>	: East African Community
<b>ECCAS</b>	: Economic Community of Central African States
<b>ECOWAS</b>	: Economic Community of West African States
<b>EDF</b>	: European Development Fund
<b>EU</b>	: European Union
<b>FDI</b>	: Foreign Direct Investment
<b>HIPC</b>	: Heavily Indebted Poor Countries
<b>IDA</b>	: International Development Association
<b>IGAD</b>	: Intergovernmental Authority on Development
<b>IMF</b>	: International Monetary Fund
<b>LMIC</b>	: Low and Middle-Income Country
<b>MNC</b>	: Multinational Company
<b>NEPI</b>	: Normalized Economic Performance Index
<b>ODA</b>	: Official Development Assistance

<b>OECD</b>	: Organization of Economic Cooperation and Development
<b>OLS</b>	: Ordinary Least Square
<b>PCSE</b>	: Panel Corrected Standard Errors
<b>SADC</b>	: Southern African Development Community
<b>SSA</b>	: Sub-Saharan Africa
<b>UNDP</b>	: United Nations Development Programme
<b>USAID</b>	: United States Agency for International Development
<b>WB</b>	: World Bank



## LIST OF FIGURES

<b>Figure 1</b> : Aid And Growth In Africa.....	158
<b>Figure 2</b> : DAC Donor Countries' Aid to Africa (USD Billion, Values Shown For 2017, Net Bilateral Disbursement) .....	53
<b>Figure 3</b> : ODA to Africa by Largest Bilateral Donors Since 1970 (USD Billion, 2016 Prices and Exchange Rates, 3 Years Average Net Bilateral Disbursement) .....	53
<b>Figure 4</b> : ODA to Africa by Sector Since 1996 (As A Percentage Of Total ODA To Africa, 3-Year Average Commitments) .....	54
<b>Figure 5</b> : The Modified Magic Square .....	82
<b>Figure 6</b> : Tax Effort by Regions .....	107
<b>Figure 7</b> : Tax Effort and Transfer .....	108
<b>Figure 8</b> : Regional Tax Revenue and Population-Level .....	108
<b>Figure 10</b> : NEPI Evolution from 2005 To 2019 .....	111
<b>Figure 11</b> : Corruption Perceptions Index 2019 .....	159
<b>Figure 12</b> : Histogram Of ODA.....	168
<b>Figure 13</b> : Histogram Of Log (ODA) .....	169
<b>Figure 14</b> : Histogram Of Trade Openness .....	169
<b>Figure 15</b> : Histogram Of Log (Trade Openness) .....	170
<b>Figure 16</b> : Foreign Direct Investment Inflows to Sub-Saharan Africa .....	170
<b>Figure 17</b> : Foreign Direct Investment Inflows to Sub-Saharan Africa .....	171

## LIST OF TABLES

<b>Table 1</b> : Variables Description .....	160
<b>Table 2</b> : Sub-Saharan African Countries .....	160
<b>Table 3</b> : Data Description and Source .....	88
<b>Table 4</b> : Comparative Analysis .....	91
<b>Table 5</b> : Comparative Analysis .....	91
<b>Table 6</b> : Descriptive Statistics .....	92
<b>Table 7</b> : Correlation Matrix .....	94
<b>Table 8</b> : Correlation Matrix of Coefficients .....	95
<b>Table 9</b> : Evidence of Horizontal Tax Competition in Sub-Saharan Africa for $A_{ij} = \frac{1}{d_{ij}} / \sum_j \frac{1}{d_{ij}}$ .....	98
<b>Table 10</b> : Evidence of Horizontal Tax Competition in Sub-Saharan Africa for $A_{ij}$ being a Contiguity Matrix .....	99
<b>Table 11</b> : Macroeconomic Performance and Horizontal Tax Competition.....	101
<b>Table 12</b> : Regional Tax Revenue and Grant (In Tanzanian Shillings).....	105
<b>Table 13</b> : Tax Effort By Regions.....	106
<b>Table 14</b> : Estimation Result.....	109
<b>Table 15</b> : Estimation Result.....	111
<b>Table 16</b> : Descriptive Statistics .....	115
<b>Table 17</b> : Comparative Analysis .....	116
<b>Table 18</b> : Comparative Analysis .....	116
<b>Table 19</b> : Matrix of Correlations .....	164
<b>Table 20</b> : Variance Inflation Factor.....	118
<b>Table 21</b> : Serial Correlation Test.....	165

<b>Table 22</b> : Heteroscedasticity Test.....	119
<b>Table 23</b> : Pesaran (2015) Test for Weak Cross-Sectional Dependence. ....	119
<b>Table 24</b> : Pooled OLS .....	120
<b>Table 25</b> : Robust Fixed Effect Results .....	121
<b>Table 26</b> : Robust Random Effect Results.....	122
<b>Table 27</b> : Prais-Winsten Regression, Correlated Panels Corrected Standard Errors (Pcses).....	123
<b>Table 28</b> : Difference and System GMM Estimation Results .....	131
<b>Table 29</b> : Estimated Values of $\alpha_0$ .....	132
<b>Table 30</b> : System GMM Estimation Results .....	133
<b>Table 31</b> : Cross-Sectional Time-Series FGLS Regression.....	166
<b>Table 32</b> : Cross-Sectional Time-Series FGLS Regression.....	167

## **ABSTRACT**

**Title of the thesis:** Tax Competition, Official Development Assistance, and Macroeconomic Performance in Sub-Saharan Africa

**Author:** Haman Mahamat Addi

**Supervisor:** Prof. Dr. Ekrem GÜL

**Accepted date:** 29.11.2021

**Number of pages:** ix (Pre-text)+185 (thesis)

Despite the enormous flows of foreign direct investment and aid in direction to Africa, sub-Saharan Africa still struggles to improve macroeconomic outcomes. This thesis aims to analyze tax competition and foreign aid as contributing elements of macroeconomic performance in sub-Saharan Africa. The study employs the gravity model, static and dynamic panel techniques to data spanning from 2005 to 2019 for analysis. The findings not only reveal evidence of horizontal tax competition and vertical tax competition but also show that these competitions have negative effects on macroeconomic performance. Likewise, foreign aid exerts negative effects on macroeconomic performance in the region. This may be explained by several reasons including the nature of tax competition models similar to the monopolist competition market, and the inefficiency of aid to reduce poverty. Hence, we recommend policymakers to further efforts in fighting against corruption, fraud, tax evasion, and profit shifting by improving transparency and exchange information; fighting against embezzlement, taking much more severe sanctions against officials who are involved in, and improving governance. Furthermore, a better accountability system should be developed. That system should be transparent and include all forms of aid from all international agencies. That could guarantee that aid is strictly used for development purposes only. Besides, to ensure a better impact of aid, governments should channel aid inflows to key sectors such as education, health, and infrastructure. In short, aid should be tailored to poverty reduction.

**Keywords:** Horizontal tax competition, vertical tax competition, foreign aid macroeconomic performance, gravity model, sub-Saharan Africa.

## ÖZET

**Başlık:** Sahra Altı Afrika'da Vergi rekabeti, Resmi Kalkınma Yardımı ve Makroekonomik Performans

**Yazar:** Haman Mahamat Addi

**Danışman:** Prof. Dr. Ekrem GÜL

**Kabul Tarihi:**29.11.2021

**Sayfa Sayısı:** ix (ön kısım) + 185 (tez)

Afrika'ya yönelik muazzam doğrudan yabancı yatırım ve yardım akışına rağmen, Sahra altı Afrika hala makroekonomik parametrelerini iyileştirmek için mücadele etmektedir. Çalışmamız, Sahra altı Afrika'daki makroekonomik performansı etkileyen vergi rekabeti ve dış yardımları analiz etmeyi amaçlamaktadır. Çalışma, analiz için 2005'ten 2019'a kadar olan veriler ile yerçekimi modeli, statik ve dinamik panel tahmini tekniklerini kullanmaktadır. Bulgular, sadece yatay vergi rekabeti ve dikey vergi rekabeti ile ilişkiyi ortaya koymakla kalmamakta, aynı zamanda bu rekabetlerin makroekonomik performans üzerinde olumsuz etkileri olduğunu da göstermektedir. Aynı şekilde, dış yardımlar da bölgedeki makroekonomik performansı olumsuz yönde etkilemektedir. Bu durum, tekeli rekabet piyasasına benzer vergi rekabeti modellerinin doğası ve yoksulluğu azaltmak için yapılan yardımların yetersizliği gibi çeşitli nedenlerle açıklanabilir. Elde edilen bulgular ışığında politika yapıcılara şeffaflığı ve bilgi alışverişini geliştirerek yolsuzluk, dolandırıcılık, vergi kaçakçılığına karşı mücadelede daha fazla çaba göstermelerini; zimmete para geçirme ile mücadele etmek, kamuda söz sahibi olan yetkililere karşı çok daha ağır yaptırımlar uygulamak ve yönetimi iyileştirmek gerektiği belirtilmelidir. Ayrıca, daha iyi bir hesap verebilirlik sistemi geliştirilmelidir. Bu sistem şeffaf olmalı ve tüm uluslararası kuruluşlardan gelen her türlü yardımı içermelidir. Böyle bir düzen kurulabildiği takdirde yardımın yalnızca geliştirme amaçları için kullanıldığı garanti edilebilir. Ayrıca, yardımın daha etkili olmasını sağlamak için hükümetler, gelen yardımları, eğitim, sağlık ve altyapı gibi öncelikli ve önemli sektörlerle yönlendirmelidir. Kısacası, yardım yoksulluğun azaltılmasına uygun hale getirilmelidir.

**Anahtar Kelimeler:** Yatay vergi rekabeti, dikey vergi rekabeti, dış yardımın makroekonomik performansı, çekim modeli, Sahra-altı Afrika.

# INTRODUCTION

## Study Subject

Economic policy depicts all decisions taken by policymakers to act on the economic activity. It has two main instruments: monetary policy and fiscal policy. While monetary policy is all the measures taken by monetary authorities (central bank and treasury) to control the economy's money quantity, fiscal policy implies all decisions taken by the government for influencing macroeconomic conditions, by increasing or decreasing expenditures (government spending). With the globalization of recent decades, countries have come together in economic and monetary unions. Thus, governments no longer control only fiscal policy.

Indeed, fiscal policy is equipped with some levers such as tax revenues and official development aid, for developing countries. Taxes have long been one of the best ways of financing fiscal policy and have many varieties. Taxes represent assets transferred from people to the government. The last decades have known an increase of economic integration through the world; thus, to attract more investments, especially Foreign Capital, governments and even national jurisdictions (municipalities) tend to provide tax incentives such as reduction of capital income tax rate. This practice, leading to competition between entities, is called tax competition.-

Keen (2008) defined tax competition as a “strategic tax-setting in a non-cooperative game between jurisdictions (whether countries or states or provinces within a federation) with each setting some parameters of its tax system concerning the taxes set by others.” In another word, tax competition represents a strategic game between taxing jurisdictions (such as states or municipalities), which try to enhance their attractiveness by reducing their taxation to attract investments to their territories. The phenomenon of tax competition can be both explicit and implicit. For Tannenwald (1999), there is an explicit tax competition when governments enact tax laws and regulations to reinforce the attractiveness of their jurisdictions to investors. Though there is an implicit tax competition when to extenuate the consequences of tax competition, governments change the pursuit of other tax policy goals such as equity, neutrality, simplicity, revenue adequacy, or tax exporting. Talpoş and Crâşneac (2010) recognize several forms of tax competition. Hence, according to the governments ‘objectives, the tax instruments used

and the hierarchical relations of different entities involved, the phenomenon of tax competition may take different forms. Indeed, governments' goals lead to tax competition by attracting capital; cross-border shoppers, and high skilled labor characterized by their mobility.

Following the instrument involved, tax competition can be done either through tax rates (each jurisdiction attempts to low down its tax rate to attract more investment) or through tax bases (authorities use deductions on taxation base such as grant deductions), or even through expenditure. This latter is called "expenditure competition" and represents competition made by increasing government expenditures such as infrastructures (transport, health, and others) to increase productivity and thus attract investments.

Following the hierarchical relations of intervenors, there are vertical and horizontal tax competitions.

Vertical tax competition is happening when in a decentralized political system; different levels of government (central, regional, local) collect taxes on the same tax base. Wilson and Wildasin (2004) considered this form of competition as a narrower definition of tax competition.

Vertical tax competition implies competition between governments (central, region, local) at the same level. Vertical tax competition is considered the narrowest definition according to Wilson and Wildasin (2004).

However, tax competition may also be based on non-fiscal variables. Oates (2001) recognizes environmental standards contribute to tax competition. Indeed, authorities compete between them by reducing environmental standards. In the same vein, Sinn (1997) upholds the fact that governments independently compete with each other by lowering quality standards for domestic products, as long as the most production is exported.

Nevertheless, tax competition should not be confused with yardstick competition. The latter takes place in a political market. In this approach, governments (municipalities) are opportunists; they are not benevolent and seek to maximize their utility to the detriment of those of the population. Consequently, people, considered here as voters, compare the combination tax system-public services of their own and neighboring jurisdictions to maximize their utilities and vote accordingly (See Tiebout, 1956) and Salmon, 1987).

Hence, the difference between yardstick competition and tax competition is that in the case of yardstick competition, voters are immobile such as expenditure in education or income tax; they give their vote to candidates who have performed well compared to other jurisdictions. i.e. here candidates have to raise (cut) taxes or expenditures in response to neighbor jurisdiction. This competition is higher during elections. Thus, the coefficient of the reaction function here has to be positive. As for tax competition, the sign of the coefficient of the reaction function has to be positive as well but voters are mobile: capital taxes, hitting firms, and investments that are highly mobile across jurisdictions. They can move from one jurisdiction to another looking for a better tax/expenditure ratio.

Although the first model of tax interactions did not emerge until the second half of the 1950s, it is important to note that, Catherine the Great, in 1763 gave tax incentives to foreign merchants to settle down in Russia, produce, sell and export their products out of the empire for ten years (Weightman, 2007). Quak (2018) shows that a 1% reduction in corporate tax rate rises the inflow of FDI between 1.7% and 3%. Moreover, this sensitivity to FDI is enhanced by economic integration.

Yet enough, this practice has always been accompanied by decreases in tax revenues, needed to finance public expenditures. Governments mostly finance their expenses through taxation; tax competition, leading to a reduction of the tax rate, it follows a Nash equilibrium, characterized by a weak level of public good's supply and a low local tax rate compared to the social optimum. Thus, following Hoyt (1991), the more jurisdictions there are, the more the equilibrium moves away from the social optimum. Jurisdictions would gain more by cooperating but due to the lack of trust, they will betray each other by choosing the non-cooperation equilibrium (Nash equilibrium in a prisoner's dilemma). Hence, "a race to the bottom" may appear and may negatively influence fiscal policy.

In a matter of fact, even if tax competition has the advantage to drive funds toward countries via investments (FDI), this practice is not without inconvenience. As the decline in taxation could negatively affect public expenditures furniture in the future.

Although recurrent in more integrated economies such as the EU or the US, it should be noted that broadly African countries but especially those of sub-Saharan Africa are been facing tax competition since the 1990s (Quak, 2018).



Indeed, tax competition creates a huge shortfall in Low and Middle-Income Countries' (LMICs) funds. Quak (2018) estimates this loss at around 500-650 billion annually; this is around 1% of their GDP. This ratio increases to 1.5% if other tax losses such as those related to portfolio capital are incorporated.

Alongside the aforementioned traditional forms of tax competition, there is another form instigated by transfer pricing manipulations.

Transfer pricing is the price paid by multinational companies (MNCs) while buying from their foreign affiliates. Indeed, to gain from the international tax system, MNCs can manipulate transfer prices they charge on transactions between related parties within the MNC group. More accurately, MNCs charge low (high) prices while selling (buying) from (to) foreign affiliates located in low-tax countries. This technique occurs in transactions in goods and services in form of royalties and licensing payments on intellectual property rights held abroad (see Liu et al, 2017). As a result, the profit shifting stimulated by transfer prices, hinders governments to collect taxes properly. Furthermore, with transfer pricing, double taxation may occur. For instance, to increase tax revenues from MNCs one government may necessitate a high transfer price on exports, while another may require a low one on imports to raise its profits taxes. This situation favors double taxation. To remedy this, in 1993, the European arbitration convention decided to implement an international coordinated tax policy (Mansori and Weichenrieder, 2001). In another hand, to fight against profit shifting caused by transfer price manipulations, tax authorities focused on international tax law, particularly on the arm's length principle.

The arm's length principle is born out from the article 9 of the Organization for Economic Cooperation and Development (OECD) and stipulates that transactions between MNCs and their foreign affiliates should be charged with the same price that would have been charged if companies were unrelated. In the case where MNCs do not respect this principle, OECD has provided a penalty. This would explain why MNCs pay great attention to its application (see Cools and Emmanuel, 2007). Introducing transfer-pricing strategies in the study aims to investigate the impact of transfer pricing methods on tax competition, and therefore on economic performance. Worded differently, *what could be the effect of transfer prices on the magnitude of tax competition, and consequently on macroeconomic performance?*

Following the literature on profit shifting strategies, it appears that contrarily to horizontal and vertical, tax competition based on transfer pricing supposes that the competition exists only between the home (where the parent company is located) and the host (where the subsidiary is located) countries. Indeed, horizontal and vertical competition models supposed that the competition starts before the installation of foreign investment. Transfer price-based models assume tax competition to be set on corporate profits taxes and is therefore established after the installation of the subsidiary in the host country.

Studies on income shifting reveal that transfer-pricing manipulations affect tax revenues, GDP distribution across countries responsible for its creation, the level of firms' location, and employment (see Harris et al., 1993). Thus, it is worthy to say that transfer pricing may affect macroeconomic performance.

Meanwhile, alongside tax competition, foreign aid may affect economic performance as well.

Due to the embryonic level of capital markets and the low level of tax revenues of developing countries, caused either by unfavorable tax competition or by weak mechanisms of tax resources' mobilization, official aid is often used as an important palliative for financing fiscal policy in those countries.

Official Development Assistance (ODA) is determined by the Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD). ODA represents a foreign aid flow given by rich countries to developing countries to foster their economic development.

DAC nowadays counts 30 members<sup>1</sup> and sets aid collecting and distribution conditions. However, DAC members are not the only donor countries; there are non-DAC countries as well (see Manning, 2008).

The following criteria must be respected by any funds to be considered as ODA:

---

<sup>1</sup>[www.oecd.org](http://www.oecd.org)

- The funds must be provided by official agencies, including state and local governments, or by their executive agencies. Aid may be offered bilaterally, directly from country to country, or may be provided multilaterally, through development agencies;
- The funds exclude any loan and credits for military purposes;
- The funds must be concessional, meaning that, they include grants, soft loans<sup>2</sup>, and provision of technical assistance.

Thus, aid does not be considered as a grant only. Aid represents soft loans and technical assistance as well.

Historically, aid takes its origins from providing military assistance to the various war stakeholders. Indeed, following Williams (2015), Germany, in the 18th, subsidized some of its allies. Likewise, Keenleyside (1966) argued that the comprehensive technical support mission asked by the king of Monrovia to the Emperor Michael III of Byzantine during the 9<sup>th</sup> century represents a different form of assistance. Similarly, financial supports provided by European powers (especially the French and the British) to their colonies such as the Colonial Development and Welfare Fund and the Colonial Development Corporation in the 19<sup>th</sup> and 20<sup>th</sup> centuries, to enhance colonies' infrastructures and thus their economic growth, represent the ancestors of nowadays aid (Ali and Zeb, 2016).

Furthermore, for the technical assistance, Rist (2002) states that during the period 1929-1941, the League of Nations provided to China (at the request of the latter), 30 experts in the field of education, transport, and the organization of rural cooperatives, for the efforts of modernization of the country.

However, the structure and scope of nowadays aid follow two major postwar developments: the Marshall Plan and some international organizations such as the United Nations.

During 1948-1951, a broad program to rebuild Europe devastated by war formally called the "European Recovery Program" or simply the "Marshall Plan" has been implemented

---

<sup>2</sup> Soft loans represents loans in which the grant element is at least 20% of the total.

in Europe. In a cold war context, the aim of the plan which cost almost 13 billion dollars<sup>3</sup>, was to rebuild a strong Europe, able to cope with the rise of communism.

The second line of development is marked by the founding of international organizations. Truly, these organizations conduct studies assessing the impact of aid and they frame the process of collecting and allocating funds. These organizations, such as the Bretton Woods Institutions, including the World Bank Group with its regional branches like the African Development Bank (AfDB), the Asian Development Bank (ADB), or the International Monetary Fund (IMF), made loans at a better than market rates to the poorest countries (Rist, 2002). In addition, many ministries and national organizations, specialized in aid allocation were created. For instance, the United States Agency for International Development (USAID); the Australian Agency for International Development (AusAID), and many others (Murad and Zeb, 2016). Hence, in the 1960s, it has been decided that donors should contribute at 0.7% of their Gross National Product (GNP) as the benchmark. Though accepted by the majority of donors, only a few of them (Denmark, Luxembourg, the Netherlands, Norway, and Sweden) have reached that target (Williams, 2015).

Besides these “good Samaritan” objectives, political, commercial, ideological, and strategic interests (McKinlay and Little, 1978) motivate ODA. Indeed, during the cold war, it has used by the United States and the Soviet Union to compel recipient countries (mostly newly independent ones) not to be close to the other side. Thus, in the 1950s, the Soviet Union became the first donor country chiefly to communists’ developing countries (Mosley, 1987). This constituted a danger for the future of capitalism. For this reason, Hancock (1989) states: *“In the view of Washington policy-makers there was a grave danger that - left to their devices - the emergent states might fall under communist domination...aid quickly came to be seen as the means of achieving this political end”*.

In the 1980s, with the end of the cold war and the advent of the debt crisis witnessed by African, Asian, and Latin American countries, considered as the main recipient of ODA, completely different conditions were born. In fact, due to internal and international macroeconomic disequilibria, these countries have been unable to fulfill their financial engagements (debt crisis). To diagnose those disequilibria and to foster development, the

---

<sup>3</sup> <https://www.marshallfoundation.org>

Bretton woods Institutions (IMF and WB) dictate them structural reforms through a program called Structural Adjustment Programs (SAPs).

The indebted countries had to clean up their public spending; reduce the government's lifestyle; increase taxes; give priority to the private sector through privatization (neoliberalism) and for some of them, undergo devaluations (for instance, the one of CFA Franc made in 1994). These countries had to reach the completion point of the Heavily Indebted Poor Countries (HIPC) Initiative, to get economic assistance and loans as they used to receive in the past.

Nevertheless, almost half a century after the official start of ODA, it should be noted that the main recipient countries are located in Africa. The latter has received 31.67% of the total ODA flow in 2016 (OECD, 2018). Moreover, sub-Saharan Africa represents the major recipient of foreign aid in the continent<sup>4</sup> and paradoxically has the largest number of LDCs (33 out of 47 that exist on the planet)<sup>5</sup>. This calls into question the effectiveness of ODA.

Although aid helped rebuild Europe after the second war and foster Asian economies (see Lyons, 2014), unfortunately, the same cannot be said for Sub-Saharan African economies. More subtly, it can be noted from graph 1 (Appendix) that despite the astronomical amounts received per annum by Sub-saharan African countries (\$49,274,130 billion in 2017<sup>6</sup>), their GDP per capita growth has experienced a reduction, and even for some years were negative.

In contradiction, according to Sachs (2005), aid represents the catalyst that will pull out the “bottom billion” from extreme poverty by 2025.

Therefore, these findings make ambiguous not only the efficiency of tax competition but also that of foreign aid on macroeconomic performance in Sub-saharan Africa.

Macroeconomic performance is one of the main concerns of governments around the world. It represents how well a country is doing in reaching key objectives of government policy. The ultimate objective of each government is the improvement of its population's lifestyle, intermediate objectives are normally used to achieve it. Hence, Kaldor (1971)

---

<sup>4</sup> See (OECD, 2018)

<sup>5</sup> <https://unctad.org>

<sup>6</sup> <https://data.worldbank.org>

defined four goals namely: growth rate, full employment, foreign balance, and price stability. Even if some of them are conflictive (full employment and price stability), those goals have been gartered in what is commonly called “Kaldor’s Magic Square” of economic policy.

The initial formulation of Kaldor did not contain any equation neither a table nor a graphical illustration. This has been remedied later on by Karl Schiller, a german economist and politician leader of the Social Democratic Party (see Medrano-B and Teixeira, 2013), who represents Kaldor’s objectives in a graph. Hence, providing minor adjustments, the technique has been used by several countries since the 1970s. Several studies animated by the worries of analyzing economic performances of individual countries or by the comparative performance among a set of countries or regions have been done (Saavedra-Rivano and Teixeira, 2017 and Addi, 2020).

Though most of these studies have concerned European and American economies, it should be noted that Sub-Saharan African economies have been involved as well (for instance, see Porhel, 2007).

Sub-Saharan Africa (SSA) comprises 48 countries African countries, located in the south of the Sahara. Indeed, it contains all African countries except Arab countries of North Africa (Egypt, Morocco, Mauritania, Algeria, Libya, and Tunisia). With a total population estimated at more than a billion<sup>7</sup>, a climate that varies from a region to another, SSA is considered as one of the richest regions in natural resources of the world. Indeed, dispersed all over the area, SSA detains 3% of the world’s gas reserves, 4% of oil and 23% of uranium, 25% of bauxite, 56% of cobalt, 28% of diamond reserves (Seck et al., 2019).

SSA owns for most of its countries a humid tropical climate. Which is propitious for agriculture. Thus, the area is counted among the largest producers of agricultural raw materials such as cocoa whose production is worldwide dominated by Ivory Coast and Ghana. As for Cameroon and Nigeria, they are respectively ranked fifth and seventh globally (World Bank Group, 2016). Furthermore, SSA is ranked among the largest producers of coffee (Ethiopia and Uganda as an example), palm oil (Nigeria and Ghana

---

<sup>7</sup> <http://worldpopulationreview.com/continents/sub-saharan-africa-population/>

for example), cotton (Burkina Faso), maize (South Africa), natural rubber (World Bank Group, 2016).

Victoria Falls in Zambia and Zimbabwe, the Mozambican and Malagasy beaches, the national parks of South Africa or Kenya, ancient buildings (mosques, churches, and mausoleums) in Ethiopia, or even Safari in Senegal and many other places constitute privileged tourist sites of SSA. Actually, according to the World Travel and Tourism Council (2018), travel and tourism have contributed to GDP at 2.7% in 2017. Moreover, the council forecasted that this ratio would reach 4.4% per annum throughout the period 2018-2028.

Despite all these potentialities, SSA remains the poorest region in the world (Bicaba et al., 2017). 33 of 47 LDCs that exist on the planet are located in SSA. Tough climatic conditions (horn of Africa for instance), leading to food insecurity and climate refugees as well; access to potable water and electricity; maritime piracy (Gulf of Guinea) and terrorist groups (Al Shebab in the East and Boko Haram in the West); corruption; youth unemployment and civil wars represent some evils that are undermining the region in recent decades. However, a possible way out is given by Moyo (2009). Following the author, the cause of some problems such as corruption, slower economic growth, and poverty remains ODA. She argues that “cutting off the flow would be far more beneficial”. Albeit, one of the possible reasons could also be recurrent tax competition in the region since the 1990s (Quak, 2018).

Thus, tax competition, fostering foreign investment (FDI), leads to lower tax revenue. One of the compensatory tools to this phenomenon could be ODA. The latter has mixed results: while some authors consider it to be advantageous for recipient countries' economic development (Sachs, 2005), others consider it as a hindrance to their economic development (see Moyo, 2009). In these circumstances, it is important to ask *what the contribution of tax competition and Official Development Assistance on macroeconomic performance in sub-Saharan Africa is?* In other words, *what are the impacts of tax competition and Official Development Assistance on the macroeconomic performance of sub-Saharan African countries?*

This main question drove on two sub-questions:

- *Does tax competition promote macroeconomic performance in SSA?*

➤ ***Does Official Development Assistance foster macroeconomic performance in SSA?***

Those questions require a deep analysis of theories related to both tax competition and foreign aid.

**Objective Of The Study**

Likewise, following those questions, the main objective and the secondary ones may be driven on. Hence, the study has as main objective: the analysis of tax competition and ODA as contributing elements of macroeconomic performance in SSA. Narrowly focused, the assessment of tax competition's effect on macroeconomic performance in SSA and the examination of ODA's influence on macroeconomic performance in SSA constitute the secondary objectives of the study.

Accordingly, to achieve these objectives, two hypotheses are required:

- **Tax competition positively affects macroeconomic performance in SSA;**
- **ODA negatively influences macroeconomic performance in SSA.**

**Importance of the Study**

This thesis has threefold implications: theoretical; empirical; and economic.

From the theoretical and empirical perspectives, this study has compiled and reviewed several papers including horizontal tax competition [For instance Quak, (2018)], vertical tax competition [Xing and Zhang (2018) for example], transfer price malpractices [Flaen (2017); Davies et al. (2018) for instance], and foreign aid [For instance Maruta et al. (2019)] in relation with economic indicators such as FDI and economic growth. However, this thesis, not only compiled and reviews the existing studies but extends the literature by analyzing tax competition (horizontal and vertical), and foreign aid as explanatory variables to the sub-Saharan African countries' macroeconomic performance. Furthermore, this study employs novel statistic techniques (such as the Normalized Economic Performance Index developed by Medrano-B and Teixeira, 2013), and estimation techniques (such as the Panel Corrected Standard Errors or the Generalized Method of Moments), and spatial econometric model (such as the gravity model).



Therefore, to the best of our knowledge, no study has never explored this in the case of sub-Saharan Africa yet.

As an economic implication, this thesis aims *to reshape economic policies in sub-Saharan Africa by providing crucial recommendations. Worded differently, this thesis aims to boost the economic performance in SSA by making good use of tax revenue and foreign aid.*

### **Method of the Study**

This study employs novel statistic techniques (such as the Normalized Economic Performance Index developed by Medrano-B and Teixeira, 2013), and estimation techniques (such as the Panel Corrected Standard Errors or the Generalized Method of Moments), and spatial econometric model (such as the gravity model). Therefore, to the best of our knowledge, no study has never explored this in the case of sub-Saharan Africa yet.

This thesis contents three chapters. To deal with the necessary precondition to the methodology, chapter 1 reviews the theoretical and the empirical literature focusing on tax competition and ODA, and their effects on macroeconomic performance. Then, the methodology related to the impact of tax competition and ODA on macroeconomic performance in SSA is presented in Chapter 2. Finally, Chapter 3 gives the results and recommendations.

# **CHAPTER 1: TAX COMPETITION, OFFICIAL DEVELOPMENT ASSISTANCE AND MACROECONOMIC PERFORMANCE: A THEORETICAL AND AN EMPIRICAL ANALYSIS**

The phenomenon of globalization has marked the last decades and has had consequences an increase in production factors, public aid, and tax bases. This has led to the development of important literature, both theoretical and empirical.

To provide the necessary conditions to the methodology, this chapter aims to review the existent literature related to the effect of tax competition (1.1) and public aid (1.2) on economic performance.

## **2.1. 1.1. Tax Competition and Macroeconomic Performance**

The existent literature on tax competition is grouped in two categories: Horizontal (1.1.1) and vertical (1.1.2) models of tax competition. Besides, this section extends the concept of tax competition by presenting transfer pricing-based tax competition (1.1.3).

### **Horizontal Tax Competition Models**

Tax competition theory began with the innovative Tiebout's (1956) hypothesis of “vote with the feet”. The author assumes a mobile labor force to such extent that, people are free to move from a jurisdiction (region or State) to another to maximize their respective utilities. They are constrained by tax contributions and public goods/services provided. Indeed, each region attracts individuals to settle down by providing public goods/services financed by local taxes. Worded differently, taxes are collected from residents in such a way that each resident's payment equalizes the cost of public goods or services provided.

However, due to an atomistic of jurisdictions, none of them can alone alter the utilities of people to drag them to a jurisdiction. Then, Tiebout's (1956) model is quite similar to a competitive market, where utility is considered as price and land rent as profit. Therefore equilibrium in a such model is Pareto-optimal since, at the equilibrium, authorities can not feasibly improve some individual utilities without making anyone's one worse off.

Consequently, since there is competition among jurisdictions, leading to lower taxes and a better provision of local public goods/services (public expenditure), Tiebout (1956) developed an efficient migration decisions model. Tiebout's hypothesis (1956) oriented

several studies including Brueckner (1983), Wildasin (1987), and Krellove (1993) among others. However, to assess more efficiently tax competition, some authors extended the Tiebout model (1956) to many directions. Hence, White (1975), Fischel (1975), and Richter and Wellisch (1996) integrated mobile firms in the analysis.

Indeed, for White (1975) and Fischel (1975), it is firms that benefit from public goods (infrastructures) in such a way that their marginal costs equalize the volume of public expenditure provided by jurisdictions. Thus, firms efficiently choose their location accordingly and even if there are limited jurisdictions, competition among regions will lead to an efficient bidding process.

Richter and Wellisch (1996) went further in the extension of the model by considering a federation encompassing local jurisdictions. Then, both household and firm mobilities from one jurisdiction to another. Firms move from a region to another to maximize their profits while households look for their utilities. Additionally, jurisdictions offer public goods and local public factors to residents and firms respectively. The authors also consider immobile households which utility is maximized by their related jurisdictions. Since jurisdictions are in a perfect competition system, an efficient equilibrium will be set up. In a case where jurisdictions can not guarantee that equilibrium, then, the central government can intervene to correct the inefficient local behavior.

Opposite to these efficiency results, miscellaneous literature claims that tax competition leads to a non-efficient firm location. Indeed, according to Wilson (1999), this inefficiency is mainly explained by an interregional externality. This externality, called in the literature “fiscal externality”, occurs when a jurisdiction decides to lower taxes to maximize its residents' welfare. As a result, its fiscal policy financing will be compromised and by spillover effect, the other jurisdictions will experience a decline in their tax rates and public good provision. A different kind of spillover effect is defined by Wilson and Wildasin (2004). For them, even with an efficient taxation system, a spillover can occur. For instance, a region within a government competes and attracts a firm in its land. This firm produces in the region and sells to all the other regions. Transport costs will be lower and will lead to a reduction of the price. Therefore, only one region attracts the firm but all the regions benefit by getting a high consumer surplus.

Meanwhile, Wilson (1999) describes another type of interregional externality: “pecuniary externality” which arises when a region is large enough to affect the product or factor prices of other regions. However, as opposed to Wilson (1999), (Bond and Samuelson (1986) proposed a different explanation of the inefficiency. In fact, for them, the main reason why there is inefficiency is the existence of informational asymmetries. These asymmetries explain tax holidays. Tax holidays represent tax reductions offered by jurisdictions to firms for a certain period (the early years of operations) to attract investors. However, at the end of the period, those firms are highly taxed.

After the Tiebout hypothesis and Oates's (1972) contributions on tax competition, the first formalization is ascribed to Zodrow and Mieszkowski (1986) and Wilson (1986).

### **Zodrow and Mieszkowski’s (1986) Model**

The model considers a system of  $I$  regions<sup>8</sup> in which firms are located. Each firm produces a single output by using mobile capital and immobile labor factor which is considered to be land by the authors, and later on, to be labor by Wilson (1999). This immobile factor is fixed and inelastically supplied by the residents who possess a fixed endowment of capital. Besides, capital is supposed to move freely across regions. Residents supply their total labor force and receive a salary:

$$W = f(k_i) - k_i f'_K(k_i)$$

Once produced, the output is sold to the government and residents as intermediate and final goods respectively. The model contains a utility function which is given by:

$$U(C, G)$$

Where  $C$  depicts the private consumption and  $G$ , the consumption of public good.  $C$  is financed by a consumer representative through wage and revenue from an endowment of labor and capital. In addition, the fixed capital supply of the whole economy is obtained by summing the total capital endowment across all the regions ( $\bar{K} = \sum_i^I k_i$ ) and representative resident is supposed to possess a part  $\alpha_i$  of the total capital ( $\bar{K}$ ).

---

<sup>8</sup> Regions here are considered as cities, provinces, states, or countries.

The technology of production is given by a constant returns production function and without substitution effects among factors. Since labor is considered in the model as a fixed factor, the function is then written as follow:

$$f(k_i); f'_K > 0 \text{ and } f''_{KK} < 0$$

Firms location in a particular region is dictated by the tax system of that region, then, the total cost supported by each firm is:

$$k_i(r + t_i)$$

Where  $r$  represents the after-tax return on capital;  $k_i(r + t_i)$  represents the demand for capital and  $(r + t_i)$ , the cost of capital.

Therefore, the profit maximization of each firm is given:

$$\text{Max } f(k_i) - k_i(r + t_i)$$

Since the whole capital is supposed fixed, when a stock of capital moves to a region, the marginal productivity of capital in that region decreases, and the stock is invested until the point when the same net return ( $r$ ) is obtained everywhere (equilibrium).

$$f'_K(k_i) = r + t_i$$

As each region is smaller than the whole economy,  $r$  is considered to be constant; so  $d(r) = 0$  (pure competition). Assume that  $\phi$  is the magnitude of capital outflow following a rise on  $t_i$

$$\phi = \frac{\delta k_i}{\delta t_i} = \frac{1}{f''_{KK}} < 0$$

The previous relation shows that, if a region determines the tax rate without taking into account the effect of that tax on the neighboring regions, it may lead capital to shift away to another region where tax is more affordable. Thus,  $\phi$  represents the distorting effect of capital taxation.

Being financed by taxes, rising a unit of  $G$  requires to increase  $t_i$ . To this extent, capital will be more costly and the demand for capital will experience a decrease in the region, causing capital to shift away to another region in which the tax burden is more reasonable. However, if rising  $t_i$  does not have any direct impact on the after tax-return on capital ( $r$ )

to the region's point of view, though, the representative resident will be indirectly affected through its wage income.

Meanwhile, rising taxes in a particular region has the advantage of its tax revenue system. Hence, a benevolent government will look for the right tax rate which will maximize the residents' utility while respecting both residents and government constraints.

$$\text{Max } U_i = U(C_i; G_i)$$

$$\text{Under these constraints: } \begin{cases} C_i = f(k_i) - (r + t_i)k_i + r\frac{\bar{K}}{I} - \theta_i \\ G_i = t_i k_i + \theta_i \end{cases}$$

$$\text{As a result of the equation, } MRS_{G;C} = \frac{U'_G}{U'_C} = -\frac{dC_i}{dG_i}$$

$$\text{With } dC_i = f_K dk_i - r dk_i - k_i dt_i - d\theta_i - t_i dk_i \text{ and } dG_i = t_i dk_i + k_i dt_i + d\theta_i$$

Since capital is mobile,  $dC_i = -k_i dt_i - d\theta_i$ . Then, the equilibrium is given by:

$$\frac{U'_G}{U'_C} = \frac{1}{1 + \frac{t\phi}{k}}; \phi = \frac{\delta k_i}{\delta t_i}$$

With a lump tax ( $t = 0$ ), Samelson's condition is verified:  $MRS_{G;C} = MRC_{G;C}$ . Then, it would be better for governments to adopt a lump tax but in reality, they collect tax on capital ( $t > 0$  and  $dt > 0$ ), and therefore a Cournot-Nash competition will result.

$\frac{t\phi}{k}$  is the elasticity of the demand for capital and represents the cost of shifting capital from a region that rises its tax rate. This situation, creating a positive externality in other regions, depends on the number of regions involved in the competition. Indeed, the more the competition is accurate, the more  $\frac{t\phi}{k}$  in a region is weak. When  $\frac{t\phi}{k} < 0$ , the marginal utility of government expenses is bigger than the marginal utility of private consumption. Thus, the region in charge will not be able to compensate for the capital outflow. Therefore, at the equilibrium, the public good is not sufficient. To remedy this, all the other regions must increase their tax rate simultaneously at the same rate, however, none of them will apply such policy since there is an incentive to not rise the tax for attracting mobile capital.

In sum, this model encourages governments to tax immobile residents (by applying a lump sum tax) rather than mobile capital for getting optimum public goods. Tax on mobile

capital may lead to tax externality which can be harmful to the region that increases its tax. Worded differently, the region that will increase its tax rate would experience a capital outflow towards another region where the rate is reasonable. Then, the region responsible for the rise would face difficulties in producing sufficient public goods for its residents. Consequently, for each region willing to attract mobile capital, a mechanism of a race to the bottom would be set ending up in a Nash-Equilibrium.

### ***Limits of Zodrow and Mieszkowski's (1986) Model***

Following Cassette (2007), the model is based on some strong hypotheses limiting its relevance. These hypotheses are:

- *The model assumes the total volume of capital is fixed.* This can mitigate saving accumulation, and consequently lessen investment. Indeed, capital is saved whenever its taxation rises. When the tax rate decreases, that saved capital is used to finance investment.
- *The model assumes that there is perfect mobility of physical capital.* In another word, physical capital is free to move from a region to another without suffering from any transaction cost. In reality, it is the financial capital that can freely move without suffering from transaction costs and not the physical capital (see Coates, 1993) and Lee, (1995).
- *The model assumes all the regions in the whole economy to be identical in all their characteristics.* This situation leads to symmetric Nash equilibrium, while in reality, each region has its particularity, characteristic, history, in short, regions are different.
- *The model considers a lump-sum tax on immobile residents.* This does not allow households to deal between labor and leisure, then in the market, the equilibrium is always reached.
- *The model assumes there is an equal distribution of wealth among residents.* The reality is far away from that. The case of sub-Saharan Africa is a counter-example. Indeed, among the 19 unequal societies that exist around the world, sub-Saharan Africa encompasses 10<sup>9</sup>. Among them is South Africa, one of the most developed African countries and the world's most unequal country as well (Ighobor, 2018).

---

<sup>9</sup> <https://www.un.org/africarenewal/magazine/december-2017-march-2018/closing-africa%E2%80%99s-wealth-gap>

- The model finally supposed regions as to many that they can not control the after-tax return on capital. In another word, they are price-takers.

However, taking into consideration the aforementioned limits, the Zodrow and Mieszkowski's (1986) approach to tax competition has been improved in many studies. The main studies in the fields are going to be presented.

### 1.1.1.2. Governments' Strategic Behavior: The Wildasin's (1988) Approach And Other Extensions

#### Governments' Strategic Behavior: The Wildasin's (1988) Approach

Wildasin (1986) relaxed some hypotheses of Zodrow and Mieszkowski (1986). Indeed, Wildasin assumes that regions are not too many but possess reasonable sizes in such a way that they can alter the after-tax return on capital ( $r$ ). Then,  $r_i = r(t_i)$ ; where  $i$  represents regions. In this model, production function, hypotheses on government, public goods production, and households wage function are all similar to Zodrow and Mieszkowski (1986). Public goods financing is different, however. Wildasin (1986) assumes public goods are financed uniquely by tax collection on capital. More precisely, a region  $i$  applies an optimum tax rate ( $t_i^*$ ) on capital, to maximize its residents utility, and knowing other regions tax rate system. This model leads to a Nash Equilibrium in the tax rate.

More accurately, this model is formalized as follow:

$$\text{Max } U_i = U(C_i; G_i)$$

Under these constraints: 
$$\left\{ \begin{array}{l} C_i = f(k_i) - (r + t_i)k_i + \alpha_i r \bar{K} \\ G_i = t_i k_i \\ K = K(t) \text{ and } r = r(t) \\ t_j = t_j^*; \forall j \neq i \end{array} \right\}$$

With  $\alpha_i = 1/I$  a part of I possesses by residents.

As result, each region is incited to reduce its tax rate until there is an equalization of all the economy's rates. The loss of tax revenue is rewarded by capital inflow.

After the point where tax rates are equal all over the economy (country), any region that rises its rate would see capital escaping from its land to another



( $dK_i/dt_i < 0$  and  $dK_j/dt_i > 0 \forall j \neq i$ ). Then, in the region responsible for the increase, not only capital will flee but, the region will not be able to finance its public goods as before and, its residents will experience a lessening of their salaries. This will be reflected in their consumption, and consequently in their utility.

### ***Other Extensions***

Since governments collect taxes on households and firms to finance public goods, two different kinds of public goods must be considered:

- *Public goods intended for all residents* (such as sports infrastructures);
- *Public goods for firms* (also called productive public goods), help boost their production by improving the marginal product. These public goods encompass road infrastructures among others. Thus, externalities created by that kind of public goods only benefit firms located in the region. Then, firms would be willing to pay taxes in exchange for public goods they receive.

As opposed to Zodrow and Mieszkowski (1986), who assumed that at the equilibrium, public goods are supplied insufficiently, Noiset (1995), assumes that at the equilibrium, the level of public investment may be too high if the elasticity between the capital of a region and productive public goods is positive and higher than the one between capital and tax rate. Besides, unlike Zodrow and Mieszkowski (1986), this model assumes that even if a region alone increases its tax rates, capital will flee to another region only if the increase of tax revenue (caused by the increase of tax rate) does not boost the productive public goods.

In sum, Noiset (1995) proposed a model in which governments compete in productive public investment supply. This competition would lead to a rise of public goods more than the effectiveness condition would require. As result, there would be an over-production of public goods to attract capital. The optimal equilibrium for all the regions would then require them to reduce their level of productive public investment. However, following Matsumoto (1998), this result is obtained because the number of firms per region is considered fixed. Dropping this hypothesis would lead to non-sufficient public goods at the equilibrium.

For Dhillon et al., (2007), Noiset’s result is due to a marginal estimation of public goods. Indeed, since Zodrow and Mieszkowski (1986), the marginal estimation (additional quantity of production following the rise in productivity associated with a marginal unit of public investment) is always less than the marginal cost of the public good. That is why at the equilibrium, the level of the public good is not sufficient. Similarly, Bénassy-Quéré et al., (2007) argued that the quantity of goods that a resident is ready to give up to gain an extra public investment is higher at the equilibrium. Nevertheless, this preference for public investment decreases the marginal productivity of capital is highly sensitive to public investment. Besides, the authors claim that public production is a source of inefficiency which is boosted by competition.

Even though since Zodrow and Mieszkowski (1986), several studies such as Wilson and Janeba (2005); or Mintz and Tulkens (1986) claim that whenever a region rises its tax rate from the equilibrium situation, the other regions would decrease their tax rate (the slope of the reaction function is negative), Chirinko and Wilson (2017) argue that the slope of the reaction function can be positive, negative, or null depending on a key elasticity. Besides, the authors affirm that rather than considering a “race to the bottom”, tax competition is better explained by states “riding on a seesaw”.

Indeed, Chirinko and Wilson (2017) based on the following equations:

$$\frac{d_{\tau}^*}{d_{\tau}^f} = \frac{\eta_{\zeta,y}\Gamma}{\left(\eta_{\zeta,y}\Gamma + \left(\frac{\tau\pi}{\zeta(1-\tau\pi-s)^2}\right)\right)}$$

With  $\zeta \equiv g/c$ ;

$$\Gamma \equiv \eta_{y,K}(\eta_{y,\tau}) \geq 0$$

Where  $\tau$  represents the capital income tax rate;  $\pi$  is the capital income;  $s$  the sale tax rate;  $\tau$ ,  $\tau^f$ ,  $g$ , and  $c$  represent the home state tax rate, the foreign state tax rate, public good consumption, and private good consumption respectively. Further,  $\eta_{\zeta,y}$  the income elasticity of public goods relative to private goods;  $\Gamma$  is the product of  $\eta_{y,K}$  and  $\eta_{y,\tau}$ .

Then, optimizing the previous equation considering the elasticities gives:

$$\frac{d\left(\frac{d^*}{d\tau}\right)}{d(-\eta_{y,\tau})} = \left( \frac{\eta_{\zeta,y}\Gamma^*\eta_{y,K^*}\left(\frac{\tau\pi}{\zeta(\tau\pi+s)}\right)^2}{(\eta_{\zeta,y}\Gamma + \left(\frac{\tau\pi}{\zeta(\tau\pi+s)}\right)^2)} \right) \begin{pmatrix} = 0 \text{ if } \eta_{\zeta,y} = 0 \\ > 0 \text{ if } \eta_{\zeta,y} > 0 \\ < 0 \text{ if } \eta_{\zeta,y} < 0 \end{pmatrix}$$

Therefore, the reaction function slope magnitude depends on the interaction between capital mobility ( $-\eta_{y,\tau}>0$ ) and the income elasticity of public goods relative to private goods ( $\eta_{\zeta,y}$ ). Then, if  $\eta_{\zeta,y} < 0$ , the slope of the reaction function will be negative (“riding on a seesaw”); if  $\eta_{\zeta,y} > 0$ , the slope of the reaction function will be positive (“racing to the bottom”).

The empirical literature on horizontal tax competition includes Leibrecht and Hochgatterer (2012); Egger et al. (2010); Wu and Hendrick (2009); and Durán-Cabré et al. (2015). Indeed, Leibrecht and Hochgatterer (2012) parsed out the responsibility of tax competition among jurisdictions in the fall of corporate tax rates. To do this, they focused on the empirical literature. They affirm that due to seek of profit; governments compete with each other in reducing tax rates, conducting then to a race to the bottom. Leibrecht and Hochgatterer (2012) admit that though it is difficult to isolate the contribution of tax competition in the drop of tax rates, their empirical literature survey reveals the responsibility of tax competition in lowering tax rates among jurisdictions. Therefore, the authors recommend future empirical studies in the field to focus on finding an adequate model allowing a better consideration of necessary preconditions to tax competition. In a more empirically-based study, Wu and Hendrick (2009), investigate the effect of vertical and horizontal tax competition. Indeed, due to the correlation between some variables and the error term, the authors employed a spatial lag model based on the maximum likelihood estimation procedure. The study takes into account municipal governments, and other local governments (counties and school districts) present in Florida, for two years (2000 and 2004). Following the findings, there is evidence of both horizontal and vertical tax competition. However, regarding the vertical competition, the study finds that when the counties increase their property tax rate, the municipalities decrease theirs. This is because of sustainable relationship between services both jurisdiction provide. Meanwhile, Egger et al. (2010) based on a tax reform of 1999 to evaluate the impact of equalizing transfers of business tax policy of municipalities of the State of Lower-Saxony (Germany) over ten years (1994-2004). They include socio-economic variables such as population; income per capita and unemployment rate, and

they perform a switching regression model to eliminate a possible bias of self-selection. The results show a significant effect of the reform upon tax policy of the studied municipalities for the four years after its implementation. This is therefore in line with their theoretical expectations. Besides, they conclude by arguing that fiscal equalization indirectly appears to be a base of coordination, which incite municipalities to reduce their taxes to attract more tax base. This explains the fall registered by the federal corporate tax from 56% on retained income in 1980 to 26.25% in 2001.

Further, based on spatial econometrics, Durán-Cabré et al. (2015), Liu et al. (2018); and Xing and Zhang (2018) investigate evidence of horizontal tax competition. Hence, by adopting a spatial panel autoregressive model, Durán-Cabré et al. (2015) tested the existence of horizontal tax competition between 15 Spanish decentralized administrations over 1987-2009. Considering audit policies as the main variables of the model, the authors employ four different estimation methods: GMM-IV; 2SLS; the Jackknife 2SLS (JN2SLS); and the Fuller estimator. The findings show a positive slope of the audit reaction function. However, their main finding is the existence of horizontal interactions among jurisdictions, just as the theory predicts. Besides, another result reveal that adding legislative power on statutory tax parameters reduces tax competition regarding enforcement policies at the jurisdictional level. Then, they conclude by arguing that: decentralization is more likely to enhance the transparency of the competition. In the same vein, for the context of China, Liu et al. (2018) considered 279 Chinese provinces over 2004 to 2013. They employed an instrumental variable approach and proved that the tax reaction function's slope is positive. Worded differently, Liu et al. (2018) found evidence of horizontal tax competition among Chinese localities (provinces), which is intensified when the sharing ratio at the sub-provincial level increases. Then, the authors noted that fiscal incentive among those localities seems to be the driver of China's rapid economic growth. Similarly, to evaluate the effects of horizontal and vertical tax competition on local tax collection in China over a period going from 1995 to 2009, Xing and Zhang (2018) determined a local tax effort by dividing local tax revenue by its GDP. Moreover, they adopt a spatial econometrics approach focusing on yardstick competition of local effort. The findings reveal evidence of both vertical and horizontal tax competition in the Chinese context. Indeed, among other reasons, driven by the desire to gain favors in yardstick for promotion, provincial governments are involving in a horizontal tax

competition. In addition, the wealthy provinces such as Shanghai and Guangdong tend to have large tax effort because the marginal cost of collecting tax is relatively low in these regions, since taxpayers are able to pay their taxes.

More recent contributions encompass Chirinko and Wilson (2017) and Podvieszko et al. (2019).

Aiming to evaluate if tax competition among U.S. states was following a racing to the bottom or riding on a seesaw approach, Chirinko and Wilson (2017) considered a panel of 48 U.S. states for the period going from 1965 to 2006. Following their results, the slope of the reaction function is negative. Thus, they disclose that tax competition is better characterized by states riding on a seesaw than racing to the bottom. Besides, they argue that the reaction function does not appear immediately but needs time to be set, just like in a dynamic strategic game. Then, they argue that the theory needs to replace static Nash models with dynamic game approaches. Besides, the downward pressure is not triggered by tax competition; rather, by aggregate shocks that affect states in more or less the same way. Further, Chirinko and Wilson (2017) rejected the hypothesis of the immobility of capital and the hypothesis postulating that the nation's capital supply is perfectly elastic. Finally, they linked the welfare properties of tax coordination to the nature of the reaction function's slope. The concept of welfare considerations in tax coordination has interested Konrad and Schjelderup (1999) and Vrijburg and de Mooij (2016). Indeed, while Konrad and Schjelderup (1999) show that a positive slope reaction function means improving welfare, Vrijburg and de Mooij (2016) demonstrate that tax coordination may lead to a lessening in welfare when the tax reaction function's slope is negative, questioning then the predictions of yardstick completion. Indeed, this latter predicts a positive slope of the tax reaction function.

For the context of the European Union, Podvieszko et al. (2019) employed decision support techniques such as the Simple Additive Weighting (SAW) model to evaluate tax competition among 28 EU members over 1995-2018. Following the findings, tax competition leads to lower income tax rates from 35.5% to 27.3% among the old EU members, and from 29.4% to 18.4% among the new ones. Consequently, to attract more investment, all the EU members in general, and especially the new entrants like Lithuania and Poland the downward pressure entailed a lessening in tax revenues and therefore

impeded budget to GDP ratios. They highlighted other determinants of tax competition such as high growth and low labor cost, which help Lithuania and Poland to become more competitive. They conclude by claiming that tax competition is important for the new EU members to reach their convergence objectives.

To sum up, to attract foreign investment, jurisdictions do compete with each other generally by reducing their tax rates; ending up in a race to the bottom (see Zodrow and Mieszkowski, 1986) or to a ride on a seesaw (Chirinko and Wilson, 2017). Thus, revision of tax rates in a region pushes other regions to alter theirs and creates instability tax revenues, necessary to finance public goods. Most often, this situation ends in a non – optimal level of public goods. The empirical verifications are done through statistics, econometrics, and spatial econometrics show the evidence of horizontal tax competition among regions and explain the economic performance of countries (see for instance Liu et al. 2018).

Although tax competition manifests horizontally, it is worth highlighting more recent studies pointed existence of another kind of tax competition: Vertical tax competition

### **Vertical Tax Competition Models**

Vertical tax competition appears when in a federal system (or a decentralized State), and due to sharing the same tax bases, tax decisions of one jurisdiction affect tax revenues at another level. This kind of competition produces inefficiencies depending on whether governments are benevolent or not, and on whether the game is played following Nash or Stackelberg's strategies (Clingman and Clingman, 2009). Indeed, if the federal government (higher-level government) is benevolent and leader in the Stackelberg game, it would reduce the inefficiencies related to vertical tax competition by using subsidies and grants. In another word, higher-level government, in this case, would face inefficient high tax rates but would help fix vertical inefficiencies occurring at lower-level governments.

However, if both kind of governments simultaneously set their tax rates (Nash game), the higher-level government tax decision cannot affect the lower ones but can induce efficient overall tax rates.

In the case where the central government is not benevolent, a lessening in tax rates from the Nash equilibrium level would improve welfare and raise tax revenues.

Taxation on the same tax base by different level governments is born out from works of Flowers (1988) and Johnson (1988), which then are considered as pioneers in the field.

***Pioneering Vertical Tax Competition Models.***

Johnson (1988) and Flowers (1988) are considered pioneers in the field.

***1.1.2.1.1. Johnson (1988) Vertical Tax Competition***

Johnson (1988) assumes a country with  $N$  individuals getting paid following a wage rate of  $w_i$ . All income (wage) is coming from labor, and the net income of individuals is given by  $(1 - t)w_iL_i + \beta$ . Where  $L_i$  represents the labor force;  $t$  is the tax rate, and  $\beta$  is a demogrant<sup>10</sup> payment. Besides, the labor supply is a negative function of political parameters of both central and local governments.

$L_i = f[(1 - t)w_i, \beta]$ ; where  $f_2 \leq 0$ . The following equation gives the effect of change in government parameters.

$$dL_i = -f_1w_id_t + f_2d\beta. \tag{1}$$

Then, the marginal budget constraint is:

$$Nd\beta = \sum[w_iL_id_t + tw_idL_i]. \tag{2}$$

Thus, following the previous equation, the added demogranants ( $Nd\beta$ ) must be financed extra tax revenue, which is the sum of the added tax revenue,  $d_t$ , applied to the wage ( $w_i$ ) plus the effect of change in  $L_i$ .

Therefore, the government's policy constraint is:

$$\frac{d\beta}{dt} = \frac{\sum[w_iL_i - tf_1w_i^2]}{n - t\sum f_2w_i} \tag{3}$$

When government are unresponsive,  $f_1 = f_2 = 0$ , and  $d\beta/dt$  is simply the average labor income. However, when  $L_i$  responds to economic incentives,  $d\beta/dt$  is either greater than average labor income or less than it, depending on whether redistribution increases or

---

<sup>10</sup> A demogrant is a grant based on purely demographic principals such as age and sex.

decreases total money income. Johnson (1988) considers the case in which redistribution decreases total money, to show that individuals always prefer a higher incremental demogrant, *ceteris paribus*.

Further, Johnson (1988) assumes a federal system comprising  $n$  similar States. Both central and local governments impose proportional taxes to finance demogran-  
ts in such a way that taxes paid by residents of a particular state is a sum of both federal tax ( $t_f$ ) and local tax ( $t_s$ ) governments:  $\beta = \beta_t + \beta_s$ . States being identical, the initial level of state taxes and their benefits are all equal. Thus, he assumes that no migration can be made from one state to another.

The new marginal budget constraint is:

$$Nd\beta_s = (\sum w_i L_i) dt_s + t_s (\sum w_i dL_i) \quad (4)$$

Accordingly, the federal government is assumed to respond following the equation below:

$$nNd\beta_f = t_f (\sum w_i dL_i) \quad (5)$$

Then, considering the previous equations, local states finance demogran-  
ts as follows:

$$\frac{d\beta}{dt_s} = \frac{\sum w_i L_i - (t_s + t_f/n) \sum f_1 w_i^2}{N - (t_s + t_f/n) \sum f_2 w_i} \quad (6)$$

If the federal state increases its tax rate, its marginal budget constraint would be:

$$Nd\beta_s = t_s (\sum w_i dL_i) \quad (7)$$

Then, the federal-state can finance demogran-  
ts as follows:

$$\frac{d\beta}{dt_f} = \frac{\sum w_i L_i - t \sum f_1 w_i^2}{N - t \sum w_i f_2} \quad (8)$$

Johnson (1988) shows that if  $\frac{d\beta}{dt_f} < \frac{d\beta}{dt_s}$ , everyone in the state would prefer to redistribute using state taxes rather than federal ones. A necessary and sufficient condition for this condition to be true is given by:

$$N \sum f_1 w_i^2 - (\sum w_i L_i) (\sum f_2 w_i) > 0 \quad (9)$$

However, following (3), (9) is true if and only if redistribution decreases money incomes. Thus, the author shows that every resident of a state will choose to redistribute using state taxes rather than federal taxes, in the case where there is no migration, no reaction



function by other states (response), and where redistribution decreases money incomes. Merely, for Johnson (1988), whenever redistribution reduces money incomes, every resident of a state would prefer to redistribute using state taxes; and whenever redistribution rises money incomes, every resident would choose to redistribute using federal taxes.

Furthermore, Johnson (1988) considers a situation in which a change in one state's tax rate is followed by changes in other states' tax rates. More accurately, what would happen if residents of a state think that an increase in  $t_s$  is followed by the same increase in  $k$  other states ( $0 < k < n - 1$ ). For the author, federal tax revenues will be modified since money incomes change in  $k + 1$  states. Thus, (6) will become as follows:

$$\frac{d\beta}{dt_s} = \frac{\sum w_i L_i - (t_s + t_f/n) \sum f_1 w_i^2}{N - [t_s + t_f(k+1)/n] \sum f_2 w_i} \quad (10)$$

When  $k = n - 1$ , and all other states respond, the residents are indifferent between federal and state taxes but for each other case where  $k < n - 1$  and some states respond, residents will prefer to redistribute using state taxes, though that preference is weak

Further, Johnson (1988) releases the hypothesis of non-migration. In this case, an increase in state tax would encourage high-income residents to leave the state, and attract low-income residents to settle down. Additional demogrants would then decrease. The preference of redistribution using state or federal taxes depends on the strength of the migration, but also the reaction function of other states. Indeed, if other states increase their taxes following an increase in a particular state, high-income residents of that particular state would move to neighboring states only if these states did not increase their taxes (in the same proportions) in response to the rise made by the first state.

Pioneering vertical tax competition models include Flowers (1988) as well.

#### **1.1.2.1.2. Flowers (1988) Vertical Tax Competition**

Just like Johnson (1988), Flowers (1988) developed a model based on two kinds of governments: the federal government and local state, sharing the same tax base, in a Leviathan context. Federal and state maximize their revenue like in a monopoly situation. Meaning that the marginal cost of the relevant government demo is equal to the marginal production cost plus the tax rate of the other government.

In addition, the model allows state taxes to be deducted from federal taxes. Then, if  $(1 - z)$  represents the part of the state taxes that can be deductible, the market price must be  $(t_f + zt_s)$ . Moreover, if the taxed good's marginal production cost is nil, the following relation can be derived:

$$t_f = (1 - z)t_s - Q\left(\frac{\delta Q}{\delta P}\right)^{-1} \quad (11)$$

$$t_s = -\frac{Q}{z}\left(\frac{\delta Q}{\delta P}\right)^{-1} \quad (12)$$

$$P = -Q\left(\frac{\delta Q}{\delta P}\right)^{-1}z^{-1} \quad (13)$$

Where P and Q represent the equilibrium price and quantity, respectively.

The derivative of P concerning z is as follow:

$$\frac{dP}{dz} = \left[\frac{Q}{z^2}\left(\frac{\delta Q}{\delta P}\right)^{-1}\right] \left[1 + \frac{1}{z}(1 - Q)\frac{\delta^2 Q}{\delta P^2}\left(\frac{\delta Q}{\delta P}\right)^{-2}\right]^{-1} \quad (14)$$

Therefore, if  $\frac{dP}{dz} < 0$ , any increase in deductibility causes the equilibrium price (P) to increase.

Following (1); (2); and (3), the equilibrium price (P) is a combination of both federal and state tax rates. P lies then on the backward line of the Laffer curve, which means inefficiency since the joint revenue maximization will be overdone.

### **Other Contributions**

The literature identifies four different factors, which influence tax competition in a federal system. They are expenditure effect; complementary or substitutability of tax effect; revenue effect; and deadweight loss effect (see Da Costa Campos et al., 2015). While Boadway and Keen (1996) analyzed the two first effects, Besley and Rosen (1998) adopted the four effects on commodities tax.

Indeed, following the same tax base, the expenditure effect represents the reaction function of one government level to another, which increases its tax rate. Worded differently, this effect represents the reaction function of a state expenditure following an increase in the federal rate tax. This reaction function results in a reduction of the state expenditure, thus a reduction of the state tax rate. Then, a decreasing slope of the response function characterizes this effect. Meanwhile, the complementary or substitutability

effect represents the change registered in fiscal revenue of tax levied on a tax base, following a modification in one tax rate. Unlike the previous effect, this one leads to ambiguous reaction functions with uncertain slopes. Similarly, the deadweight loss effect entails an ambiguous reaction function. This effect occurs when a marginal disutility of tax on a particular good rises with its tax rate.

The revenue effect occurs when both federal and state use the same tax base, and the federal government raises its tax rate. This action would lead to a lessening in state tax revenue. To maintain its tax revenue, the state raises its tax rate as well. Hence, this effect has a positive sloped reaction function.

Karkalakos and Kotsogiannis (2007) consider a vertical tax model in which governments (federal and states) are benevolent. There are  $N$  states, and each state is considered as a firm, which produces according to the production function  $F_i(K_i)$ , with  $F'_i(K_i) > 0$  and  $F''_i(K_i) < 0$ .  $K_i$ , being the capital invested in the state  $i$ , represents the taxation base of both federal ( $t_f$ ) and state ( $t_s$ ). Then,  $\tau_i = t_s + t_f$ . In addition,  $K_i$  freely mobile and produces a single return  $\rho$ ; then  $F'_i(K_i) - \tau_i = \rho$ . Thus, the demand for capital in the state  $i$  is  $K_i(\rho + \tau_i)$  where:

$$K'_i(\rho + \tau_i) = \frac{1}{F''_i(K_i)} < 0 \quad (15)$$

Further,

$$\Pi_i(K_i) = F_i(K_i) - F'_i(K_i)K_i \quad (16)$$

From (1) and (2), the following relationship is derived:

$$\Pi'_i(\rho + \tau_i) = -k_i(\rho + \tau_i) < 0 \quad (17)$$

Assuming that  $M_i$  citizens reside in each state  $i$ , consumption preferences of a resident  $j \in M_i$  on two periods, and over the levels  $g_i$  and  $G$  of public goods provided by state  $i$  and the federal government, respectively are expressed by  $C_{i1}^j$  and  $C_{i2}^j$ . Thus,  $U_i^j(C_{i1}^j, C_{i2}^j, g_i, G)$  represents the utility function of a consumer  $j$  residing in a state  $i$ . This utility function is assumed to be increasing and concave. During the first period, each resident  $j$  of a state  $i$  has a fixed endowment of income  $e_i^j$ , and during the second period, he gets the principal of his capital and the relevant interest, and per capita income produced after taxes in his state. It is given by the following expression:

$$\Pi_i^j(\rho + \pi_i) = \frac{\Pi_i(\rho + \pi_i)}{M_i} \quad (18)$$

If  $s_i(\rho)$  denotes the aggregate saving in state  $i$ ,  $s_i(\rho) = \sum_{i=1}^{M_i} s_i^j(\rho)$ . The equilibrium market condition is then:

$$\frac{\delta\rho}{\delta\pi_i} = \frac{K_i'(\rho + \pi_i)}{\sum_{l=1}^N S_l'(\rho) - \sum_{l=1}^N K_l'(\rho + \pi_i)} \in (-1,0) \quad (19)$$

Based on (15) and (19), the following expressions are defined:

$$\left. \begin{array}{l} \frac{\delta K_i}{\delta \pi_i} = k_i' \left( 1 + \frac{\delta \rho}{\delta \pi_i} \right) < 0, \quad i = 1, \dots, N \\ \frac{\delta K_l}{\delta \pi_i} = K_l' \frac{\delta \rho}{\delta \pi_i} > 0, i \neq l, \quad i = 1, \dots, N \end{array} \right\}$$

Therefore, according to the previous expressions, a tax increase in capital in state  $i$  reduces the capital of that particular state but increases the one of another state  $l$ .

Further, tax revenues and equalization entitlements represent state  $i$ ' spending. To define the equalization system, the authors consider a base for the revenue source to represent, as closely as possible, the real base of the revenue source. The average federal income is obtained by the ratio of the aggregate state revenue per the nationwide base. Thus, just by dividing that fraction by the total population of any state, it is possible to find the per capita income tax of that state.

Besides, Karkalakos and Kotsogiannis (2007) assume that equalization entitlement received by state  $i$  is given by  $\varpi_i = \tilde{t}(\tilde{k} - k_i)$ ; where  $\tilde{t}$  is the proportion (fraction) of national revenue state average,  $\tilde{k}$  is the national per capita income, and  $k_i$  is the per capita tax base of state  $i$ . More precisely,  $\tilde{t} = (\sum_{i=1}^N t_i K_i / \sum_{i=1}^{\tilde{N}} K_i)$ ,  $\tilde{k} = (\sum_{i=1}^N t_i K_i / \sum_{i=1}^N M_i)$ ,  $k_i = K_i / M_i$ .

$$\text{Also,} \quad g_i = t_i K_i + M_i \varpi_i \quad (20)$$

$$G = \frac{T \sum_{l=1}^N K_l - \sum_{l=1}^N M_l \varpi_l}{N} \quad (21)$$

If the aggregate welfare of state  $i$  is denoted by  $W_i(\rho, \pi_i, g_i, G, \xi_i) = \sum_{i+1}^{M_i} V_i^j(\rho, \pi_i, g_i, G, \xi_i)$ , where  $\xi_i$  represent the vector of characteristics commons to all

states, maximizing  $W_i(\rho, \pi_i, g_i, G, \xi_i)$  subject to the conditions (20) and (21), allows state  $i$  to choose its tax rate, while the tax rates of the federation and other states are supposed fixed. In another word, based on (15); (17); and (19), maximizing citizens welfare respects the following condition:

$$\frac{\delta W_i(t_i, \pi, T, \xi_i)}{\delta t_i} \equiv \psi_i(t_1, \dots, t_i, \dots, t_N, \varpi(t), T, \xi_i) = 0 \quad i = 1, \dots, N \quad (22)$$

Where  $\varpi(t)$  depicts the states' reliance on the rights of payments represented in vector  $t = (t_1, \dots, t_i, \dots, t_N)$ . A close analysis of  $W_i(\rho, \pi_i, g_i, G, \xi_i)$  shows that states, while states determine their tax rates, they pay no attention to the damages caused to other regions. The result is a shrinkage in the federal tax base. This phenomenon is known as “vertical tax competition”. This competition is more important in presence of equalization rights.

Finally, the Nash equilibrium of the model is obtained by solving the following simultaneous equation system of reaction functions.

$$t_i = f_i(t_1, \dots, t_i, \dots, t_N, T, \xi_i), \quad i = 1, \dots, N \quad (23)$$

As it can be noticed, each state  $i$  integrates into its tax rate, the tax systems of the federal government and other states, and common characteristics for all states as well.

Contrary to the horizontal tax competition studies, the empirical studies on vertical competition are less dense. Thereby, they include Wu and Hendrick (2009); Burge and Rogers (2018); Da Costa Campos et al. (2015); and Xing and Zhang (2018).

Wu and Hendrick (2009) focused on the property tax levied by local governments of the state of Florida. They considered a panel of 341 and 354 observations (counties; schools; and municipalities) for 2000 and 2004 respectively. By using the maximum likelihood approach, they reveal a presence of vertical tax competition between municipal government and school districts and between municipalities and counties. More accurately, an increase in school districts' property tax of 1% leads to an increase of 0.17% and 0.46% increase in the municipal property tax; while a ten-percent raise in the county's property tax rate results in a 1.4% and 2.3% decrease in the municipal tax rate. In the same context of the U.S., Burge and Rogers (2018) looked for pieces of evidence of vertical competition between the state of Oklahoma, its counties, and its municipalities.

By retaining some municipalities as leaders and others as followers, they employed a regional framework of regression rather than spatial econometrics. Particularly, they adopted two equations: one for the leaders and one for the follower municipalities. The findings show that while leaders do not face vertical crowding out effect, the follower municipalities do. Besides, the results suggest that increasing Oklahoma State's tax rate would hinder municipalities to increase their revenue capacity.

The cases of emergent markets such as Brazil and China were investigated by Da Costa Campos et al. (2015) and Xing and Zhang (2018). To parse out the vertical impact caused by vertical tax competition on the Brazilian economy, Da Costa Campos et al. (2015) adopted a panel data technique to estimate reaction functions of 26 Brazilian states in response to the federal government tax system, during 1995-2009. They estimated two different models. The first considers that both states and federation set their taxes simultaneously, just like in a Cournot-Nash strategic game. The second model assumes that the federation behaves as a leader in a Stackelberg strategic game. In another word, following the second model, states set their taxes once the federation has set up its taxation. Then, for both models, following the findings, there is a positive and statistically significant reaction function of states in response to the federation. Worded differently, in both Cournot-Nash and Stackelberg strategic games, each increase of the federation tax rate is followed by an increase of states taxes. The first model is considered as the most suitable to describe the situation since the magnitude of reaction functions obtained through Cournot-Nash consideration is higher than the one obtained through Stackelberg assumptions. Besides, the study confirms evidence of vertical tax competition among federations and states in Brazil. This conducts to over-taxation that might partly be explained by the revenue effect. In fact, due to increases in federation's tax rate, states respond by increasing their taxes to avoid tax revenue lessening. In addition, Da Costa Campos et al. (2015) found evidence of horizontal tax competition among neighbor states. In the same vein, to measure to what extend vertical tax competition contributes to local tax collection in China during 1995-2009, Xing and Zhang (2018) employed spatial econometrics techniques by highlighting the importance of yardstick competition in local tax effort. Following the results, vertical tax competition has a positive and significant effect on determining tax efforts in China. Furthermore, they show that rich regions such as Shanghai and Guangdong contribute the most to tax effort because of the low level of

the marginal cost of collecting tax in such regions. They recommend Chinese authorities give more autonomy to local governments in collecting taxes.

To recapitulate, alongside horizontal tax competition, there is vertical tax competition. This latter appears when in a federal system (or a decentralized State), and due to sharing the same tax bases, tax decisions of one jurisdiction affect tax revenues at another level. This kind of competition produces inefficiencies depending on whether governments are benevolent or not, and on whether the game is played following Nash or Stackelberg's strategies (Clingman and Clingman, 2009). Considered as pioneers in the field, Flowers (1988) and Johnson (1988) developed strong theoretical approaches to vertical tax competition. The authors highlighted evidence of tax competition among governments of different levels of competency, by integrating Cournot-Nash and Stackelberg's strategic game approaches, and by considering the fact that government is benevolent or not. Empirical verifications mostly made with the help of econometric techniques show evidence of vertical tax competition among different levels of government when the tax base is the same. Then, for better economic performance, recommendations sustaining more autonomy to local governments have been made (see for instance Xing and Zhang, 2018).

Horizontal and vertical tax competition analyzes tax competition from the point of view of governments (federal and states). Would not it be wise to consider the competition from the taxpayer (international companies) perspective?

### **Introduction To Transfer Pricing**

Globalization has helped multinational corporations (MNCs) improve their tax avoidance strategies. One of them is transfer price or transfer pricing. Transfer pricing is the price paid by MNCs while buying from their foreign affiliates. Indeed, to gain from the international tax system, MNCs can manipulate transfer prices they charge on transactions between related parties within the MNC group. More accurately, MNCs charge low (high) prices while selling (buying) from (to) foreign affiliates located in low-tax countries. This technique occurs in transactions in goods and services in form of royalties and licensing payments on intellectual property rights held abroad (see Liu et al, 2017). As a result, the profit shifting stimulated by transfer prices, hinders governments to collect taxes properly. Furthermore, with transfer pricing, double taxation may occur.

For instance, to increase tax revenues from MNCs one government may necessitate a high transfer price on exports, while another may require a low transfer price on imports to raise its profits taxes. This situation favors double taxation. To remedy this, in 1993, the European arbitration convention decided to implement an international coordinated tax policy (Mansori and Weichenrieder, 2001). In another hand, to fight against profit shifting caused by transfer price manipulations, tax authorities focused on international tax law, particularly on the arm's length principle.

The arm's length principle is born out from the article 9 of the Organization for Economic Cooperation and Development (OECD) and stipulates that transactions between MNCs and their foreign affiliates should be charged with the same price that would have been charged if companies were unrelated. In the case where MNCs do not respect this principle, OECD has provided a penalty. This would explain why MNCs pay great attention to its application (see Cools and Emmanuel, 2007).

Literature on transfer pricing is less dense than the literature on horizontal and vertical tax competition. Before presenting studies on transfer pricing, it would be wise to parse out in-depth transfer pricing mechanisms.

### **Multinational Company and Transfer Pricing**

In this sub-section, generalities about transfer pricing and the nexus between transfer pricing and the international tax system are presented.

#### **1.1.3.1.1. Generalities about Transfer Pricing**

The aforementioned definition of transfer pricing helps highlight two important elements: companies must be related and they must be located in different countries. However, transactions between MNCs and their affiliates also concern unpaid services; freely provision of employees, or intangible assets, if it turns out that they should have been remunerated following the arm's length principle.

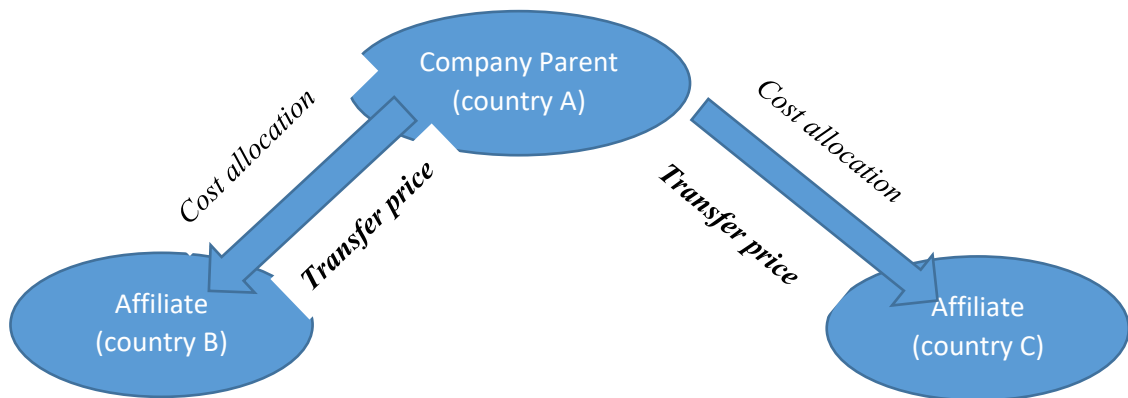
*Example 1.* When a company is located in country A and sells, items to its affiliate in country B, the selling price constitutes a transfer price.





**Transfer price**

**Example 2.** When a company located in country A, charges corporate cost allocations to its affiliates located in other countries, the corporate cost allocation is a transfer price.



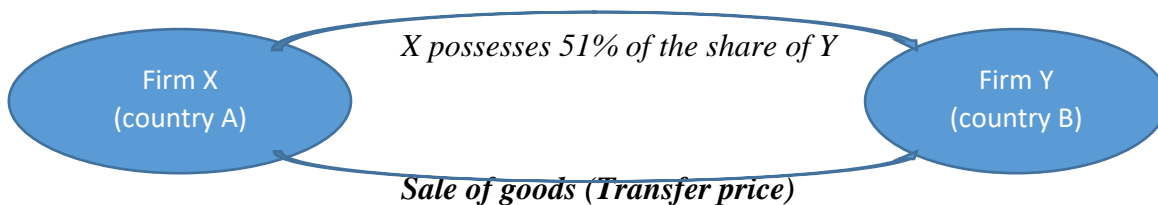
**Example 3.** When a company located in country A, produces and sells goods to its affiliate in country B, which will sell them to consumers, the selling price is a transfer price.



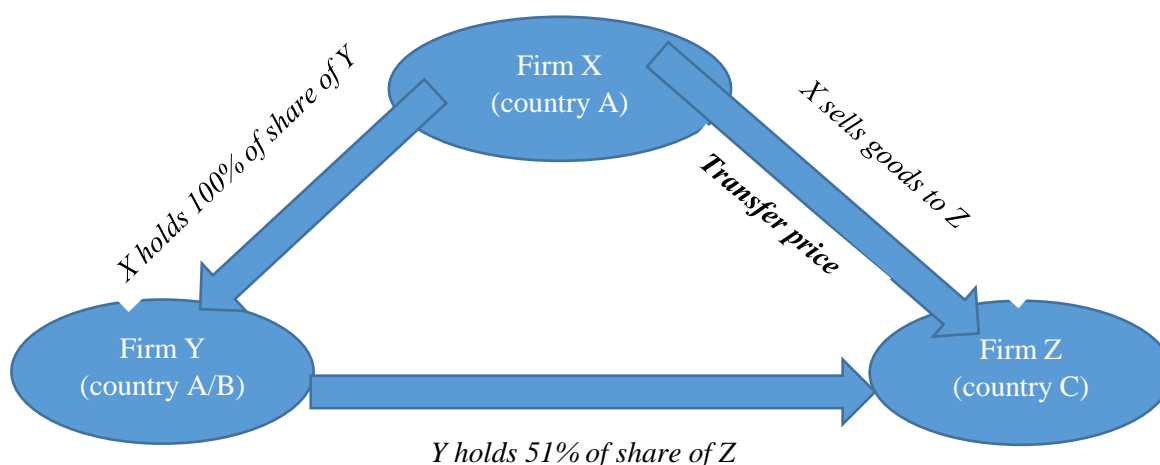
The relationship between MNCs and their affiliates follows either legal dependence or de facto dependence.

There is legal dependence between companies when one enterprise possesses more than 50% of the share of another company (ies).

**Example 4.** When a company possesses 51% of the share of another company located abroad, each transaction between them is done following a transfer pricing



**Example 5.** Supposed that company X holds 100% of the share of company Y. Y holds 51% of the share of company Z. Both X and Y are located in country A (Y can be located in another country, B for instance), whereas Z is located in country C. Besides, let us assumed that X sells merchandises to Z. The selling price is a transfer pricing.



On another hand, there is de facto dependence between companies when one of them can impose a real decision regarding economic conditions on another company (ies).

### 1.1.3.1.2. Transfer Pricing And International Tax System

To guarantee fair international taxation, avoid disputes between tax authorities, and avoid double taxation, OECD has developed the arm's length principle. This principle stipulates that transactions between MNCs and their foreign affiliates should be charged with the same price that would have been charged if companies were unrelated. More precisely, OECD allows five different kinds of prices to be fitted with the transfer price<sup>11</sup>:

- 3 traditional methods
- o The comparable price on the market;

<sup>11</sup> See Direction Générale des Impôts de France (2006)

- The resale price minus;
- The cost-plus method.
- 2 transaction methods
- Method of profit-sharing;
- Method of net margin.

Each of those methods is receivable if MNCs can justify it and if those methods follow the arm's length principle.

The arm's length principle is enforced by a penalty when MNCs divert from its application (see Cools and Emmanuel, 2007).

Having presented generalities on transfer pricing, studies on the matter can easily be reviewed then.

### **Transfer Pricing A Review Of The Literature**

Literature on transfer pricing is grouped into two: Early studies and contributions that are more recent.

#### **1.1.3.2.1 Early Studies**

Early studies include Grubert and Mutti (1991); Harris et al. (1993); and Hines and Rice (1994) which all found evidence for profit shifting.

Indeed, Grubert and Mutti (1991), to parse out the evidence of profit shifting from low tax countries to high tax countries and to investigate the effect of such action towards foreign investment and trade patterns, employ a cross-section analysis on a dataset of 1982, belonging to 33 countries. The findings show that pre-tax profits depend on tax differentials across countries. For instance, American MNCs' exports to their affiliates located in low-tax countries depend on profit-shifting incentives. However, when total export of the U.S. to these countries is considered, tax incentives do not play a too much important role anymore. Also, they find that statutory tax rates seem to contribute more to income shifting as opposed to effective tax rates. Besides, while tariffs are more appropriate to increase sales in the local market, lower taxes are more important for boosting exports in third markets.

In the same vein, Harris et al. (1993) use a methodology similar to Grubert and Mutti (1991) for 200 American companies observed over 5 years to investigate income shifting practices. They consider as a dependent variable, firm's current U.S. federal tax liability divided by either its U.S. assets or its U.S. sales. Since MNCs do repatriate their income from their affiliates in low-tax countries, it is worth noting that the findings show that this ratio (the aforementioned dependent variable) may be higher than for MNCs for domestic companies. Hence, having an affiliate in a low-tax country (Ireland or the Four Dragon Asian countries for instance) is associated with a low U.S. tax ratio, whereas having a subsidiary in a high-tax country is associated with a high U.S. tax ratio. Then, following the results, they argue that MNCs can shift income out of high-tax countries to the U.S. and from the U.S. to low-tax countries. They conclude by claiming that income-shifting strategy contributes to a lessening of taxation on multinational companies. Besides, Harris et al. (1993) suggest companies do not resort to income shifting strategy only for tax avoidance. Indeed, other reasons are capital control avoidance and reduction of political risks. In the same context, Hines and Rice (1994) evaluate the ability of U.S. firms to shift their incomes and real business activities between high-tax countries and low-tax countries. After considering several tax havens, and employing OLS regression and instrumental technique, they find evidence of profit shifting incentives and show that American multinational companies appear to adjust the employment of productive inputs (capital and labor) according to local taxes. Besides, they claim that the endogenous location of inputs, combined to income shifting capacities stimulate elasticity between total taxable profit and tax rates. This elasticity may partly explain how low-tax governments behave. For instance, for a small government with a small endogenous tax base, a corporate tax rate comprises between 5% and 8% indicates a revenue maximizing choice. In addition, Hines and Rice (1994) show that tax policies in the havens may influence U.S. tax collection. Indeed, following data of 1982, 38% of tax revenues due the U.S. government from foreign operations is due to tax haven affiliates. The study, by the help of regression, also show that a rise of tax rate in the havens would most likely affect negatively the U.S. government by engendering additional foreign tax credits. Whereas, low tax in the havens would likely generate fewer foreign tax credits.

To sum up, profit shifting constitutes a tax avoidance from the country in which wealth is created. Then, the tax authority of the concerned country would not collect taxes from

the companies (MNCs' affiliates) and that wealth will not contribute to the GDP of the country. More precisely, such practice would affect tax revenues; GDP distribution across countries responsible for its creation; the level of firms' location and employment (see, for instance, Harris et al., 1993). Hence, it is worthy to say that transfer pricing may affect macroeconomic performance.

Early literature confirms a correlation between pre-tax profits and tax differentials across countries. What about recent literature?

#### **1.1.3.2.2 Recent Studies**

Recent contributions on transfer pricing include Flaaen (2017); Davies et al. (2018); Vicard (2015); Cristea and Nguyen (2016); Hebous and Johannesen (2016); and Liu et al. (2017).

Indeed, Flaaen (2017) employs transaction-level data from the U.S. Census to parse out transfer price manipulations of American MNCs, by comparing the transfer prices to the arm's length principle. Following the results, the difference between the arm's length price and the export transfer price increases for low-tax countries in the period following the passage of a one-time dividend repatriation tax holiday. However, the gap between the arm's length price and the import transfer price decreases for low-tax countries during the same period. These findings constitute a possibility of transfer price manipulation. Indeed, by shifting income from the U.S. to tax havens through transfer pricing mechanisms, American multinational companies could declare their profits in low-tax countries, and then could bring that profit back to the U.S. under the term of the tax repatriation holiday. This strategy is known as "round-tripping". However, unlike Flaaen (2017), Vicard (2015) also looks into the matter through French multinationals. He realizes that the scale of transfer pricing has grown steadily since the early 2000s, and has reduced the French corporate tax base by 8 billion USD in 2008. In addition, he highlighted that through transfer pricing, French MNCs reduce their tax contribution by 10%. More precisely, just like Davies et al. (2018) after him, Vicard (2015) investigate the compliance of intra-firm prices concerning the arm's length principle. Hence, the author employs a model based on a difference-in-difference approach. Indeed, his strategy is based on the difference between the arm's length prices and the intra-firm ones, and its correlation with the corporate income tax rate of each partner country compared

to France. A larger gap for a given product in destinations with lower corporate tax rates would be interpreted as transfer pricing evidence. The study considers a total of 9,695 different products by 66,112 firms as export to 32 OECD countries, and 9,799 different products by 78,011 firms as import to 32 OECD countries. The findings reveal direct evidence of transfer pricing manipulations to shift income in low-tax countries. Thus, these manipulations have led to a decrease of the French export by 0.8% and an increase of its import by 0.5% during 2008. Finally, the empirical results show that each increase of one percent in tax differential in all partner countries entails a decrease of the consolidated profit before interest and tax of the MNCs trading with related firms by 0.5%. Similarly, for the same context of France, Davies et al. (2018) use firms level data of 1999 and investigate the determinants of transfer prices. Their study, based on a fixed-effect model with iteration, helps compare the price applied for foreign trade with the arm's length price for a given product across countries. Following the authors, the systematic and significant relation between the diversion from the arm's length price and the tax differential across countries is an indication of transfer price malpractices. Besides, Davies et al. (2018) construct a data set at a firm-product-destination level for both intra-firm and arm's length export prices. The findings reveal an absence of tax avoidance evidence if tax havens destination is ignored. For transfer pricing practices, the results found their presence in the case of large MNCs. Therefore, they highlighted the importance of their results through two main reasons: Firstly, their results uphold OECD's (2013) statement that low-tax countries differ from tax havens that provide a tax environment that is particularly flexible to tax avoidance. Secondly, the findings imply that transfer pricing is primarily due to a small number of firms. They conclude by arguing that with appropriate enforcement is possible to increase significantly revenues at a low cost. Nonetheless, Liu et al. (2017) propose a different way of thinking than Davies et al. (2018). Indeed, Liu et al. (2017) analyzed the case of the U.K. By merging three databases, they construct a unique dataset from 2005 to 2011, and as opposed to Hebous and Johannesen (2016) who focused on imports, Liu et al. (2017), based their study on exports, including more than 1,000 different companies. Based on econometric estimations, they find that an increase of one percentage point in tax difference reduces related party export prices to low-tax countries by 3% compared to the arm's length prices.

The study shows that U.K. multinationals shift their profit away to low-tax countries to avoid paying taxes. This phenomenon has been increasing since 2009 when the U.K. has shifted from a national taxation system to a territorial one. To circumvent transfer pricing malpractices, Liu et al. (2017) demonstrate that transfer pricing manipulations are concentrated the most in R&D companies. This information can help the government know where to focus to fight against tax avoidance.

As opposed to Davies et al. (2018), the authors argued that transfer pricing mispricing in goods is not focused in tax havens, rather, it is concentrated in low-tax, non-havens. This argument explains that transfer mispricing in goods requires large trade flows to help shift income internationally. Large trade flows can find low-tax countries but not in tax havens. Then, Liu et al. (2017) recommend tax authorities focus more on MNCs with affiliates in low-tax and medium-tax, non-haven countries than on the ones with affiliates in tax-havens.

Cristea and Nguyen (2016) were interested in the case of Danish companies. The highlighted reasons for departing from U.S. data are simple. First, from a global policy perspective, it is useful to analyze the behavior of multinationals headquartered out of the U.S.; second, as opposed to the U.S., Denmark like several countries uses a territorial taxation system<sup>12</sup>. Then, the study opens doors for income shifting investigations out of the context of the U.S. Finally, the fact that Denmark imposes moderate tax rates contributes enforces the choice of this country for the analysis. Hence, based on the export dataset from 1999 to 2006, they found robust evidence of transfer pricing strategy to shift income to low tax jurisdictions. More precisely, the findings show that a 10-percentage decrease of the tax rate in low-tax countries is accompanied by a decrease of 5.7 percent in the export of the MNCs that have affiliates in the country, compared to non-related companies. This decrease is more important for differentiated products (6.5%) and even more for companies that created affiliates during the studied period (9.1%). This corresponds indeed to a tax revenue loss estimated at 3.21 of Danish multinationals' tax returns. In the same vein of investigating income-shifting incentives, Hebous and Johannesen (2016) consider the case of Germany. They find moderate effects of transfer

---

<sup>12</sup> In the world, there are two kind of taxation systems: territorial and national taxation systems. In territorial system, only income provided from activities of the resident of the country is taxed; whereas, in national system, national are imposed for profit earned around the world.

mispricing on government revenues. Indeed, the study adopts a unique firm-level dataset of virtually all German multinationals and uses as an empirical technique, a linear probability model specified as follow:

$$Trade_{ics} = \alpha + \beta_1 Haven_c + \beta_2 Affiliate_{ic} + \beta_3 (Affiliate_{ic} * Haven_c) + \mu_i + \gamma X_c + \varepsilon_{ics}$$

With  $Trade_{ics}$  being a measure of trade in service  $s$  between company  $i$  and country  $c$ ;  $Affiliate_{ic}$  a dummy variable indicating whether company  $i$  has an affiliate in country  $c$ ;  $Haven_c$  is a dummy variable as well. It indicates if country  $c$  is a tax haven or not;  $\mu_i$  are firm-level fixed effects including all firm characteristics such as size and sector;  $X_c$  is a vector of country-level gravity controls such as GDP and distance to Germany.  $\beta_3$  represents the coefficient on the interaction between haven and Affiliate.

The estimation reveals a positive and significant of coefficients of *Haven*. This suggests that the main reason why there are more transactions (import) between MNCs and their affiliates in tax havens than between MNCs and their affiliates in non-tax havens, is genuinely specialization in service industries. Worded differently, tax havens are genuinely specialized in services. The comparison between  $\beta_3$  and  $\beta_1$  gives the intensity of affiliate trade stimulated by income shifting. Then, following that comparison, the excess transaction (import) from affiliates in tax havens ranges from 10% of normal affiliate transaction (import), in “Other business services”, to more than 60%, in “Financial services<sup>13</sup>”. To conclude, Hebous and Johannesen (2016) claim that not more than half of imports from tax havens are tax-motivated; tax revenue losses from transfer pricing manipulations are therefore considered moderate.

In sum, it appears that multinationals through these practices avoid paying taxes in countries where wealth is created. To remedy this, governments, with the help of the arm’s length principle, fight against an income-shifting strategy. However, it is worth asking what could be the effect of transfer prices on the magnitude of tax competition, and consequently on macroeconomic performance?

---

<sup>13</sup> “Other business” services and “Financial services” represent categories of services analyzed in the study.



### 1.1.3.2.3. Transfer Pricing And Level Of Tax Competition

This sub-section presents studies that cover the interaction between transfer pricing mechanisms and tax competition among jurisdictions. These studies include Mansori and Weichenrieder (2001); Elitzur and Mintz (1996); and Klemm and Liu (2019) among others.

Indeed, Mansori and Weichenrieder (2001) analyze the level of competition among tax jurisdictions that focus on transfer pricing regulations as strategic variables. The study lies on strategic game theory and assumes a simple model where there is a multinational which has subsidiaries in two countries: Canada (country A) where goods are produced and the U.S. (country B), where there are consumed. The affiliate located in Canada by exporting goods from a low (high) tax country to a high (low) tax country would expect an intra-firm price as high (low) as possible so that the highly-taxed affiliate will have zero profit, and the less-taxed will earn all the profit. Nevertheless, each taxing authority can impose a required transfer price to the affiliates. Then, while country A (the exporting country) will prefer a higher transfer price, the other will require a lower transfer price. The multinational is a price taker in this model. Meaning that it takes the two transfer prices as given. The multinational then maximizes the sum of after-tax profits produced by its two affiliates by determining the level of intra-firm trade. Therefore, the U.S. based affiliate (import country) reports the following pre-tax profit:

$$\pi_{U.S.} = R(S) - SQ$$

With  $R'' < 0$  represents the revenue earned by selling an  $S$  unit of a good, and  $Q$  is the transfer price set by the U.S. tax authority. Similarly, the following equation characterizes the Canadian based subsidiary:

$$\pi_{Ca} = Sq - C(S)$$

Where  $C$  is the cost of producing  $S$  units of output, and  $q$  is the transfer price required by the Canadian tax authority.

The multinational must then give a part  $T$  of its profit earned from its U.S. subsidiary to the U.S. government as tax payment, and a part  $t$  of its Canadian earned profit to the Canadian government. Hence, the firm's problem is to choose  $S$  to maximize its profit given by:

$$\pi = (1 - T)R(S) - (1 - t)C(S) + TSQ - tSq$$

By applying the first-order condition, the following equation is given:

$$(1 - T)R' = (1 - t)C' + tq - TQ$$

Thus, following the aforementioned equation, an increase of the Canadian transfer ( $q$ ) price tends to rise the marginal revenue and decrease the volume of sales, whereas a rise in the American required transfer price ( $Q$ ) leads to an increase in sales.

Alongside multinational problems, Mansori and Weichenrieder (2001) highlighted governments' problems as well. So, the U.S. government has to maximize its tax revenues given by:  $TR_{U.S.} = T[R(S) - SQ]$ ,  $Q \geq 0$

Then, after applying the first-order condition,  $Q = \max \left[ \frac{qt}{T(2-T)} + \frac{1-t}{2-t} C' - \frac{\beta(1-T)^2}{\alpha(2-T)T}; 0 \right]$ ;  
with  $\beta \equiv \alpha b - \frac{1-t}{1-T} \alpha C'$ .

For the Canadian government, the problem is to maximize its revenues given by:  $TR_{Ca} = t[Sq - C(S)]$ . Hence, its transfer price is:  $q = \max \left[ Q \frac{T}{2t} + \frac{1}{2} C' + \frac{\beta(1-T)}{2\alpha t}; 0 \right]$ .

Therefore, it appears that both U.S. and Canadian required transfer prices are increasing functions of each other, and the marginal cost of production.

The results reveal a non-cooperative equilibrium characterized by different required transfer prices by the U.S. and Canada. This leads to double taxation and a reduction of the level of intra-firm trade. However, they highlight that both governments and firms would benefit from cooperation. This is in total opposition with the view of the “public choice” school, which considers governments as “Leviathan”, and then tends to over-taxation.

In the same vein, Elitzur and Mintz (1996) proposed a simple model to investigate the interactions between multinationals and governments' tax authorities. More precisely, they assume a case of a multinational in a home country (Japan for instance), producing inputs that are sold to its affiliate located abroad (the U.S. for example). That affiliate uses the input to manufacture a good to be sold in a competitive market (the Japanese market). The model assumes also the existence of a local managing partner that controls the affiliate. The parent company pays the managing partner following a lump-sum

transfer and a portion of the subsidiary's profit. The parent sets the intra-firm price while the partner determines the amount of input needed. Besides, both parent and subsidiary pay source-based corporate profits tax to the home and the host countries respectively. However, based on transfer pricing rules, both home and host governments determine the amount of tax that both the parent and its affiliate should pay. Then, based on some simplifications, the study derives the optimal payment based on a share of profits, transfer price, and lump-sum transfer determined by the parent firm. This optimal payment depends on the input cost production, the agency cost, and the level of tax rates in both home and host countries. The results reveal transfer-pricing rules affect the intra-firm level of the transaction. More particularly, without these rules, there is an incentive to transfer price manipulations in such a way that a higher tax rate in the home country would result in low intra-firm prices. Worded differently, without transfer price rules, there is an incentive to income shifting from high tax-country to low-tax country. The study extended the analysis to a non-cooperative game between countries (home and host) which maximizes their tax revenues. Both countries can observe the amount of output produced by the parent company. However, the host country is not directly aware of the nature of the agreement between the affiliate and its local managing partner, and the transfer price set by the parent is also not directly observed by the host country. This game ends with a Nash-Equilibrium in tax rates. This equilibrium depends on shifts in variables such as the home country's production costs, agency costs, and productivity of the affiliate. Then, Elitzur and Mintz (1996) conclude by suggesting that host governments can increase their tax rates on foreign subsidiaries if they can induce changes in productivity and cost to increase multinationals' profits. Furthermore, they find tax harmonization to be advantageous for all stakeholders (home and host governments; parent and affiliate companies; managing partners). In a recent study, Klemm and Liu (2019) parsed out the effect of profit shifting and its countermeasures on real investment and tax competition. Their findings reveal that profit shifting modifies capital distribution among countries. More subtly, relatively low-tax countries are more likely to attract capital and gain revenue, whilst countries with high taxes are more likely to gain capital but lose revenue. This creates pressure on tax authorities that have many instruments to react. Choosing the best instrument is not easy for them, however.

In fine, the first part of this chapter reviews both theoretical and empirical literature on the nexus between tax competition and macroeconomic performance. Then, it appears that tax competition has two main forms: horizontal and vertical competitions.

Indeed, horizontal tax competition occurs when jurisdictions do compete with each other generally by reducing their tax rates; ending up in a race to the bottom (see Zodrow and Mieszkowski, 1986) or to a ride on a seesaw (Chirinko and Wilson, 2017). Hence, revision of tax rates in a region pushes other regions to alter theirs and creates instability of tax revenues, necessary to finance public goods. Most often, this situation ends in a non –optimal level of public goods in regions. The empirical verifications are done through statistics, econometrics, and spatial econometrics show the evidence of horizontal tax competition among regions and explain the economic performance of countries (see for instance Liu et al. 2018).

Meanwhile, alongside horizontal tax competition, there is vertical tax competition. This latter appears when in a federal system (or a decentralized State), and due to sharing the same tax bases, tax decisions of one jurisdiction affect tax revenues at another level. This kind of competition produces inefficiencies depending on whether governments are benevolent or not, and on whether the game is played following Nash or Stackelberg's strategies (Clingman and Clingman, 2009). Considered as pioneers in the field, Flowers (1988) and Johnson (1988) developed strong theoretical approaches to vertical tax competition. The authors highlighted evidence of tax competition among governments of different levels of competency, by integrating Cournot-Nash and Stackelberg's strategic game approaches, and by considering the fact that government is benevolent or not. Empirical verifications made mostly with the help of econometric techniques show evidence of vertical tax competition among different levels of government when the tax base is the same. Then, for better economic performance, recommendations suggest more autonomy to local governments (see for instance Xing and Zhang, 2018).

Besides, this sub-section introduces transfer-pricing practices in the analysis. Transfer price is the price paid by multinationals during their transactions with their affiliates located abroad. It appears that multinationals generally manipulate their prices to avoid paying taxes by shifting their profits to their affiliates in low-tax countries. To fight against these malpractices, OECD has developed the “arm’s length principle”.

Introducing the transfer-pricing strategy in the study aims to investigate the impact of transfer pricing methods on tax competition, and therefore on economic performance. Worded differently, what could be the effect of transfer prices on the magnitude of tax competition, and consequently on macroeconomic performance?

Following the literature on profit shifting strategies, it appears that contrarily to traditional tax competition forms (horizontal and vertical), tax competition based on transfer pricing supposes that the competition exists only between the home (where the parent company is located) and the host (where the subsidiary is located) countries. Indeed, horizontal and vertical competition models supposed that the competition starts before the installation of foreign investment. Transfer price-based models assume tax competition to be set on corporate profits taxes and is therefore established after the installation of the subsidiary in the host country.

Studies on income shifting reveal that transfer-pricing manipulations affect tax revenues, GDP distribution across countries responsible for its creation, the level of firms' location, and employment (see Harris et al., 1993). Thus, it is worthy to say that transfer pricing may affect macroeconomic performance.

After presenting studies on tax competition and macroeconomic performance, it is important now to present literature on Official Development Assistance on macroeconomic performance.

## **2.2. Public Aid And Macroeconomic Performance**

There are three different forms of international aid: Foreign Direct Investment (FDI), Official Development Assistance (ODA), and Foreign Trade. In this thesis, public aid, foreign aid, or simply aid indicate ODA.

As defined in the introduction of this study, ODA is a government aid determined by the DAC members (including 30 members) to promote the economic development and welfare of developing countries. Although nowadays form of foreign aid is born from the Marshall Plan of reconstruction of Europe after WWII, history ties back the origins of aid to the ancient past. Indeed, for Keenleyside (1966) the comprehensive technical support mission asked by the king of Monrovia to the Emperor Michael III of Byzantine during the 9<sup>th</sup> century, represent a different form of assistance. Similarly, financial supports

provided by European powers (especially the French and the British) to their colonies such as the Colonial Development and Welfare Fund and the Colonial Development Corporation in the 19<sup>th</sup> and 20<sup>th</sup> centuries, to enhance colonies' infrastructures and thus their economic growth, represent the ancestors of nowadays aid (Ali and Zeb, 2016).

The nexus between foreign aid and macroeconomic performance has sparked vast literature. Then, based on the degree of dependency of aid; the aid's pro-cyclicality and volatility; and the uses of foreign aid, the existent literature lies on three groups. The first category includes studies that acknowledge positive aid effectiveness on macroeconomic performance. The second group encompasses studies that strongly contradict the aforementioned first type, and the last category comprises studies that highlight insignificant effects of aid on macroeconomic performance.

This section presents an overview of aid in sub-Saharan Africa since the independence but also the literature regarding the effect of aid on economic performance.

### **Aid flows to sub-Saharan Africa: An overview**

Grouped in the Development Assistance Committee (DAC), donor countries send every year a part of their GNP as aid allocation to help the underdeveloped world. However, aid allocation to Africa during the years following the independence differs from the allocation received during the last years.

#### **Overview Of Aid Allocation To Sub-Saharan Africa: Years Following The Independences**

In each of the four regions of sub-Saharan Africa, the case of one country will be highlighted.

#### **Central African Region: The Case Of Cameroon**

Following the report of UNECA (1998), Cameroon has received about 3 billion dollars as aid allocation from its independence (1960) to 1985. Eighty-five percent (% 85) of this allocation came from bilateral assistance given mainly by Germany; France, the U.S.; Canada; and Benelux. For the multilateral assistance, the main contributors were institutions such as the European Development Fund (EDF); the African Development

Bank (AfDB); and the United Nations Development Programme (UNDP). From 1974, the country started receiving allocations from other donors such as Saudi Arabia. However, since that time, Cameroon started borrowing a huge amount of money from the international market to finance its industrial development. Unfortunately, the country failed to honor its commitments. This led Cameroon to the debt crisis at the end of the 1980s.

During 1986-1996, Cameroon received 200 million dollars from multilateral assistance and 93 million from bilateral. 84 percent of this allocation was absorbed by the sectors such as economic management; agriculture; and natural resources. During 1993/1994, the volume of aid to Cameroon largely surpassed the national contribution to public investment (about 80 percent of public investment consisted of aid). Besides, the report noted the important role played by aid in helping Cameroon finance its budget deficit. Aid became too important to Cameroon that it has occupied a place in the government's national budget. In addition, in 1995, the country created an organ: the Development Aid Coordination Committee (CCAD) in charge of discussions between the country and the donors (both bilateral and multilateral).

### **West Africa: The Case Of Guinea**

Just like other African countries, Guinea has important natural resources but remains among the least developed countries. Aid has largely been a pillar of the country's development.

According to the report of UNECA (1998), as Guinea experienced socialism in years following its accession to independence, the country has received 1,278 million dollars mainly as bilateral assistance from socialist countries such as the Soviet Union or China. That amount has been given to the country during 1958-1984. However, though limited, the report highlights the presence of multilateral assistance coming from Western countries. The main sectors absorbing aid allocation the most are the mining sector and physical infrastructures.

Although the country receives a huge amount of aid allocation, the reality shows that Guinea experienced one of the lowest economic performances in entire sub-Saharan

Africa, with a level of debt around 92 percent of the GDP and an overdue external payment estimated at 300 million dollars.

After leaving socialism to the economic and political liberalization, Guinea aid allocation coming from multilateral donors has largely increased. Indeed, from 1984 to 1998, the report noted that the country has received 3.3 billion dollars principally from the World Bank; the Paris Club; and the AfDB. Not surprisingly, aid from socialist countries decreased as the country adopted liberalization. Aid seems then to be a weapon for the ideological war between socialist countries and western countries (see Friedman, 1995).

Changing the composition of donors led to a change in the main sector where aid is used the most. Then, this shifted from the mining sector under socialism to physical infrastructures under liberalization. Indicators of Guinea show a considerable improvement in the country's economic performance, compared to its earlier years of independence.

#### **East Africa: The Case Of Uganda**

According to the report of UNECA (1998), ODA in Uganda took a form of post-colonial assistance during the early years of its independence. Then, due to the financial difficulties, the country underwent during the 1970s, foreign aid helped finance Uganda's imports. Finally, since the 1980s, it is important to note that the Bretton Woods institutions (IMF and World Bank) are dominating ODA in Uganda. However, statistics show that only 9 percent of Ugandan's GDP has been sent as foreign aid between 1982 and 1985 as compared to a ratio of 13.4 percent of GDP between 1986-1996. This is explained by the political instability Uganda experienced during the beginning of the 1980s.

To absorb the bulk of aid, Uganda developed multi-sectoral projects such as the Economic Reconstruction Assistance and the Northern Uganda Rehabilitation Project. These projects absorbed respectively 75 percent and 46 percent of the total foreign aid. However, a changing trend is noted in the receiving sectors, which shifted from multi-sectoral to sector programs. Then the new-targeted sectors are mainly agriculture and industry.



Like other developing countries, Uganda failed to honor its commitments. The country then experienced the debt crisis of the 1980s. At the beginning of the 1990s, Uganda's debt reaches 2.6 billion dollars. The country was the first in Africa to be a part of the HIPC initiative of the World Bank. At the completion point of the initiative in 1998, Uganda has seen 650 million dollars of its debt relieved.

The report of UNECA (1998) claims that aid has had an important effect on the macroeconomic performance of Uganda. Indeed, aid favored consumption but also sustained economic growth. Nonetheless, aid has hurt the country's currency that had appreciated and then led to a decrease in the competitiveness of the export sector.

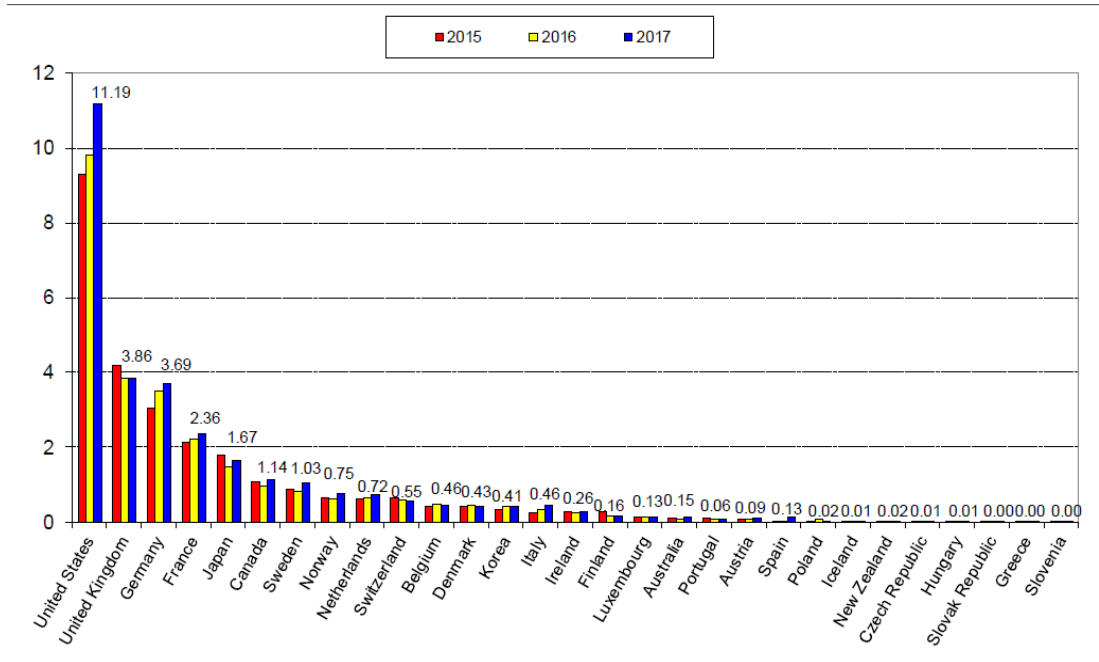
### **Southern Africa: The Case Of South Africa**

Although South Africa is one of the largest economies in Africa, aid has been considered as one of its main sources of revenue (See May 2006). The first assistance to the country started at the end of the 1970s and took the form of bilateral assistance given by the U.S. It was not until the beginning of the 1990s that South Africa started receiving ODA (Leshoro, 2013). Aid to the country was intended to improve institutions' quality and to build a new governance system during the post-apartheid years. Poverty reduction was a less concerning issue. Then, promoting growth has begun to interest donors (May, 2006). However, as opposed to Guinea or Uganda above mentioned, South Africa does not rely on foreign aid. The amount of ODA in the country is considered as an extra budget to unlock bottlenecks in the economy. Besides, though the country receives aid, it is important to note that by providing bilateral technical assistance, contributing to the South-South partnership, and bilateral co-operation, South Africa is a an aid provider country (Leshoro, 2013).

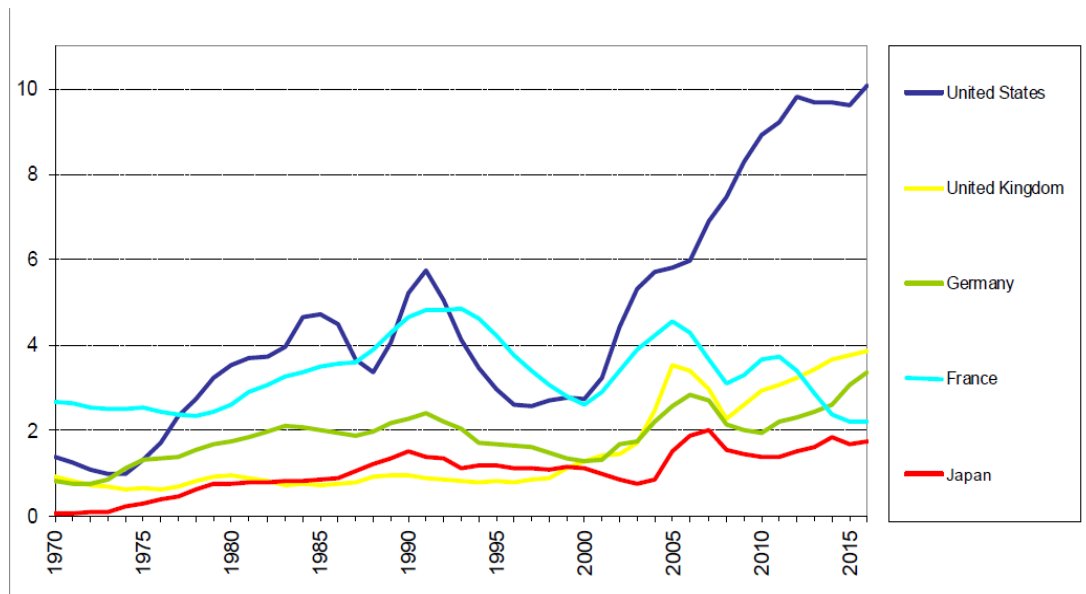
#### **1.2.1.2. Overview Of Aid Allocation To Sub-Saharan Africa: Nowadays**

Following OECD (2019), 9 of the top 10 ODA recipients in Africa are located in the sub-Saharan. These 9 countries alone have absorbed 38 percent (22,542 million dollars) of the total ODA directed to Africa in 2017. The continent has received an average of 27 956 million dollars as bilateral assistance between 2015 and 2017. Most of this allocation came from the U.S. (36 percent), the U.K (14 percent), Germany (12 percent), France (8

percent), and Japan (6 percent). Since 1970, these countries have been the largest contributors to bilateral aid to Africa (see graphs 2 and 3 for more details).



**Figure 2:** DAC donor countries' aid to Africa (USD billion, values shown for 2017, net bilateral disbursement)

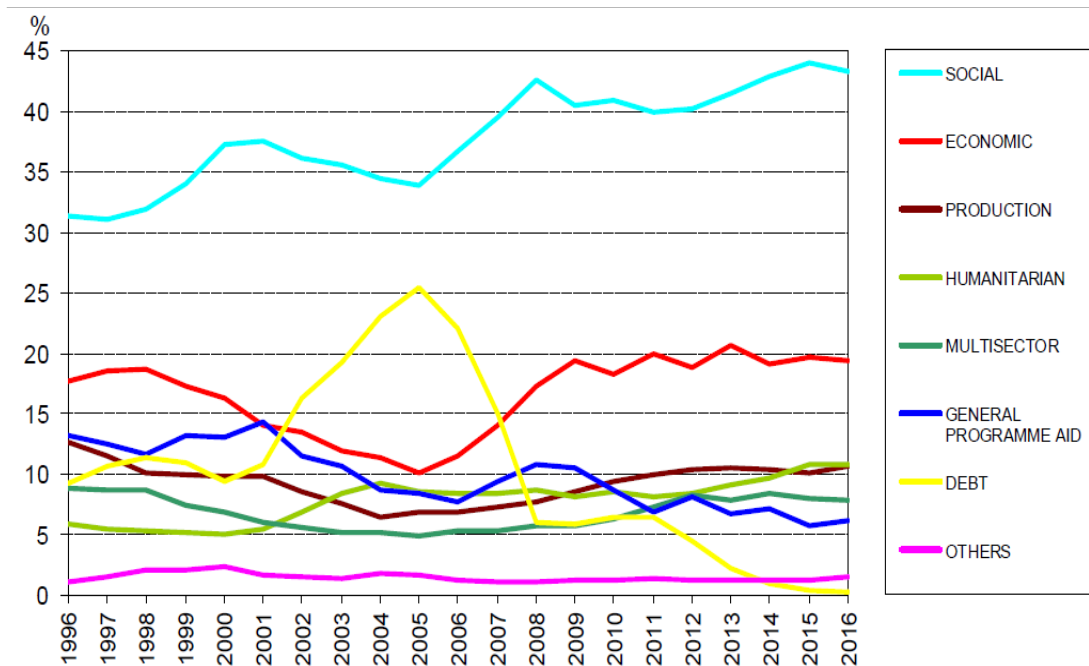


**Figure 3:** ODA to Africa by largest bilateral donors since 1970 (USD billion, 2016 prices and exchange rates, 3 years average net bilateral disbursement)

As for multilateral donors, IDA; EU Institutions; Global Fund; and African Development Fund represent the main contributors. These institutions alone have contributed 84 percent (3 years average) of the total aid in direction to Africa between 2015 and 2017.

Following OECD (2019) report, East African countries are the ones who have received the most from DAC the recent years. At the top of those countries, there is Ethiopia. Indeed, the country has received 7 percent (3 years average) of the total ODA directed to the continent between 2015 and 2017. Nigeria is the second aid receiving country in Africa. Though considered as the largest economy in the continent, Nigeria has received 5 percent (3 years average) of the total ODA sent to Africa during the same period. Tanzania; Kenya; and the Democratic Republic of Congo follow Nigeria. Each of them has absorbed 5 percent (3 years average) of the total ODA between 2015 and 2017.

The sectors absorbing aid the most in the continent are the social sector; economic sector; production sector; humanitarian sector; multi-sector; and general aid programs. The following graph describes the situation



**Figure 4:** ODA to Africa by sector since 1996 (as a percentage of total ODA to Africa, 3-year average commitments)

Then as it is shown from the above graph, the social sector is the one absorbing aid the most in Africa. From the social sector, OECD (2019) highlighted education; health; and water as the sectors absorbing the main aid allocation for the social sector.

To sum up, this sub-section gives general information about aid flows in Africa since the years following independence. Hence, the sub-region has received so far billions and billions of dollars as foreign aid assistance. The allocation of aid is given either by bilateral donors such as the U.S., U.K., and Germany or by multilateral institutions such as IDA, EU, and the AfDB. Aid allocation is absorbed by sectors, the main of them are social sectors; economic sector; production sector; humanitarian sector; multi-sector; and general aid programs. Based on the statistics given in this sub-section, one can say that aid has been positive to the macroeconomic performance of sub-Saharan Africa. However, it is worth noting that the bilateral allocation during the years following independence was far less than the multilateral allocation (ODA) mainly started during the 1970-1980s. Yet, African countries could not avoid the debt crisis of the 1980s. This could compromise the effectiveness of aid.

What does the literature say about the effect of aid on economic performance?

### **Aid And Macroeconomic Performance: A Point Of The Literature**

In this sub-section, studies are grouped following their effects on the economic performance of the recipient countries. Then, while some studies reveal positive impacts of foreign aid on macroeconomic performance (1.2.2.1), some claim that aid has a negative or insignificant effect on macroeconomic performance (1.2.2.2).

#### **Positive Effectiveness Of Aid On Macroeconomic Performance: A Point Of The Literature**

Investigations on aid effectiveness on economic performance are born out of Chenery and Strout (1966). Since then, numerous studies have emerged such as Papanek (1973); Mosley et al. (1987); Chaudhuri (1978); Levy (1987); Newlyn (1990); Roemer (1989); Adam and O'Connell (1999); and Davenport (1970).

Indeed, Chenery and Strout (1966) highlighted that most underdeveloped countries heavily rely on foreign aid to the point that aid represents a quarter of their gross

investment and roughly a third of their imports. Aid has become important enough to replace colonial relations. The aim followed by both donor and recipient countries is to strengthen economic development. Worded differently the importance of aid has increased enough to be considered by the modern theory of development as a factor production per se. Then, a country willing to transform its economy without foreign aid must guarantee accelerated growth from natural resources or imports paid by exports. In a case where growth is limited by some bottlenecks, factors of production such as labor and natural resources might be underused. To circumvent these bottlenecks, and stimulate fuller use of production factors, Chenery and Strout (1966) suggest the use of foreign.

Chenery and Strout (1966) developed the so-called Financial two-gap model. This model assumes the existence of a gap either between saving and investment or between export and import. Developing countries are not capable to fill these gaps by themselves. Then, a solution is found in relying on foreign aid to fill them up.

Chenery and Strout (1966) based their analyses on 50 underdeveloped countries during 1957-1962. Their conclusions have three parts :

The first one addresses the effectiveness of foreign aid. Indeed, they claim that in the short term, aid depends on its ability to relieve the shortage of skills, savings, and imports. Aid efficiency in the short term is measured by the amount of output generated by the release of fuller use of production factors thank to aid. During longer terms, the use that is made of initial rise becomes more important. Thus, the economy might be trapped indefinitely in a dependent relationship with foreign aid. However, the economy may avoid that dependency if the additional output (obtained from aid) is allocated to increase savings and reduce the trade gap.

The second part concerns recipient countries' policies. To avoid dependency on aid, the authors suggest different "self-help" measures in different phases of the transition. Hence, during the first phase, the growth is under a reasonable target rate. Therefore, recipient countries should increase the output by increasing qualitatively and quantitatively physical capital and human resource inputs. (Chenery & Strout, 1966) found that for countries whose initial level of investment is below the required one, a rate of investment growth of 10 to 12% is a reasonable target. Paradoxically, success in phase I would make phase III difficult to be successful.

As for the last part, policies about donor countries are highlighted. Donor countries are concerned with allocation and control policies to which are some objectives that motivate foreign aid such as socio-economic development of the recipient; political stability in countries that have special ties to the donors; and export promotion.

Empirical verification of Chenery and Strout (1966) includes Papanek (1973); Mosley et al. (1987); Chaudhuri (1978); Levy (1987); Newlyn (1990); Roemer (1989); Adam and O'Connell (1999); Davenport (1970) and more recently Pham and Pham (2020).

Although Papanek's (1973) contribution fails to contain econometric anomalies, he confirms Chenery and Strout's (1966) assumptions, by arguing that aid can fill the import-export gap and the saving-investment gap. Aid is therefore considered as positively affecting national income and growth.

In the same vein, Mosley et al (1987); Chaudhuri (1978); and Levy (1987) also confirm that aid has a positive effect on the economy.

Other studies such as Newlyn (1990); Roemer (1989); Adam and O'Connell (1999); and Davenport (1970) also find positive effects of aid on economic growth.

To study the impact of foreign aid on the economic growth of recipient countries, Pham and Pham (2020) employ an infinite-horizon endogenous growth framework. They point out that the amount of foreign aid has been continually rising since the agreement of the Millennium Development Goals (MDGs) in 2000. However, since previous literature on the concept reveals conflicting results on aid effectiveness, Pham and Pham (2020) particularly focused on why foreign aid is considered a blessing for some recipient countries and as a curse for others. To carry out this study, they employed a model in which public investment, financed by foreign aid and capital tax may foster the total factor productivity if large enough. Their findings reveal that if the recipient country is characterized by high productivity and good level of initial capital, foreign aid is not necessary to achieve development. However, if the initial conditions of the recipient are not good enough, multiple scenarios are highlighted:

- First, when foreign aid is good enough and/or efficiently utilized by the recipient that is characterized by good quality of initial conditions, the economy will experience growth without bounds for any level of initial capital stock. Then, aid will no longer be given to the country from some date on;

- Second, when foreign aid is good enough and the recipient country's quality of circumstance is at a moderate level, two different regimes can be observed:
  - The first one is characterized by the fact that the recipient focuses on its domestic investment. Then, if the country possesses sufficient initial capital and receives a high quantity of foreign aid, it can grow. Otherwise, it would either remain stable or collapse.
  - As for the second regime, the recipient focuses on sufficient foreign aid. Foreign aid amount, decreasing when the economy gets better, this regime ends up to a non-monotonicity of capital dynamics. This leads to two kinds of traps: the middle-income trap, which is a low steady-state; and the second trap called the poverty trap.

After Chenery and Strout (1966), another study that has contributed the most to the merits of foreign aid is the one of Burnside and Dollar (2000). Indeed, this study constitutes the basis of modern studies in this area.

For Burnside and Dollar (2000), growth in developing countries mostly depends on their policies. Then, to investigate the impact of aid on economic policies and growth, the authors adopted a new neoclassical growth model. The idea of their study is relatively simple. Because aid acts like an income transfer that may or may not produce growth, the outcome is up to how aid is used. Indeed, foreign aid can be invested or consumed. As supposed that aid is invested, both the incentive to invest aid and its subsequent productivity as capital will be affected by policy distortions, hence lowering the return to capital. Neoclassical theory supposed that in presence of higher distortions, aid effectiveness is lower. However, aid interacts with distortions in developing countries. Hence, Burnside and Dollar (2000) have constructed a new neoclassical growth model including institutional and policy distortions and estimated a panel of 56 countries over 1970-1973 to 1990-1993. Besides, they have constructed an index including three variables. Namely budget surplus; inflation rate; and openness. Their results reveal a positive effects of foreign aid in presence of good policies. In addition, when a country has average policies, the estimated impact of aid is found to be nil. This result is consistent with Boone (1996). They also highlighted that aid inflow is influenced by population (large countries receive less) and by some variables representing donors' strategic interests. Now considering these influences, they find no interest to allocate more aid to countries experiencing good policies according to the aforementioned index. Furthermore, they showed that while bilateral aid depends more on donors' interests,

multilateral aid takes into account variables such as population; income level; and policy. Thus, following their findings, bilateral aid tends to increase only government consumption without any positive effect on growth. Therefore, Burnside and Dollar (2000) recommend donors change their allocation principles to help aid affect growth in the developing world.

To investigate the effect of aid on the economy, Collier and Dollar (2002); Chauvet and Guillaumont (2003); and Hansen and Tarp (2001) based on Burnside and Dollar (2000) approach. Then, focusing on poverty reduction, Collier and Dollar (2002) consider the impact of aid allocation on poverty reduction in 59 developing countries. Just as Burnside and Dollar (2000) claim that aid, accompanied by good policies in receiving countries, has a positive impact on growth, Collier and Dollar (2002) highlight the importance of coherent allocation of aid to produce good results on poverty reduction. However, the authors argue that aid is not targeted to good environmental policies and countries suffering from severe poverty. Besides, aid allocation can be shifted away from poverty reduction to policy improvement only if there is positive effectiveness of aid on policy improvement. This is not possible in a bad policy environment. However, this idea of positive effects of aid conditioned by good policy environment upheld by Burnside and Dollar (2000) is rejected by Hansen and Tarp (2001). Nevertheless, due to the weakness of the theoretical literature in their time, Hansen and Tarp (2001) did not derive satisfactory empirical specifications and did not formulate useful testable hypotheses.

In the same context of a bad environment, Collier and Dollar (2002) found positive effects of aid on poverty reduction, however. Indeed, they estimated that the current aid allocation (the one of 2002) helps bring out permanently 10 million people out of poverty each year. As supposed that countries adopt efficient aid allocation, this number would increase to 19 million people per year.

Similarly, Chauvet and Guillaumont (2003) employ a GMM estimation technique on 5 years sub-periods from 1965 to 1999 for 59 developing countries. Their finding goes far beyond Collier and Dollar (2002) who considered only the effect of aid allocation on the quality of present policy. Indeed, Chauvet and Guillaumont (2003) analyze aid allocation in a broader context considering the present policy and its potential improvement, economic vulnerability, and also political stability of recipient countries. This idea is not



new because previous studies (see for instance Guillaumont and Chauvet, 2001) reveal that in developing countries affected by external or climatic shocks, aid's effect is more important as far as it avoids growth to be interrupted. Worded differently, in developing countries characterized with vulnerabilities (external shocks), aid participates in the sustainability of growth and reforms. However, due to possible negative effects of aid caused by its volatility, in another contribution, Chauvet and Guillaumont (2009) considered the time profile of aid disbursement into their analysis to investigate whether it contributes to increase or to decrease aid effectiveness. To do so, they considered the pro-cyclicality and contra-cyclicality of aid. They claim that aid contributes to stabilizing export volatility, but also and more generally, to reduce income volatility. More explicitly, when aid is pro-cyclical, export if export volatility is higher than aid volatility, aid stabilizes export; and in the case of contra-cyclicality of aid, if its volatility does not exceed a certain limit, aid is stabilizing. Finally, Chauvet and Guillaumont (2009) find that aid contributes to stabilize growth and conclude by linking the higher effectiveness of aid in vulnerable countries to its stabilizing effect.

Other contributions to the matter include Ekpo and Afangideh (2012) and Maruta et al. (2019). Indeed to test the impact of aid on the Nigerian economy, Ekpo and Afangideh (2012), for a period going from 1970 to 2010, adopted a macro-econometric model to indirectly parse out the effect of aid on the economic performance by considering sectors like agriculture and manufacturing. The main results reveal that foreign aid has a positive but insignificant effect on economic development in the country. However, aid is found to be significant in economic growth. Besides, they find evidence of Dutch disease and resource curse as the country mainly relies on crude oil production. They link this weak effect of aid to the non-involvement of Nigerians in the formulation and implementation of projects funded by ODA. Thus, they recommend the policymakers take part in the ODA program by efficiently coordinating all donor funds in productive projects, such as to not only boost economic growth but also stimulate development. Furthermore, they encourage Nigeria to diversify its economy away from the oil-based foundation into job-creating sectors such as manufacturing. Finally, as aid is volatile, Ekpo and Afangideh (2012) suggest policy-makers mobilize internal resources to finance sustainable growth and development. In a more large context, Maruta et al. (2019) consider 74 African, Asian, and South American developing countries over 1980-2016, and highlighted the

importance of institutional quality on the effectiveness of aid on growth. They took into account three sectors in which aid is applied. Namely Education; health; and agriculture. Contrarily to previous studies which aggregate all types of foreign aid into a single amount and then evaluate the effectiveness of that aggregate foreign aid on economic performance, Maruta et al. (2019) consider a desegregated approach of aid and assess the impact of each type of aid on growth. This technique allows them to highlight which kind of aid is most needed for the recipient countries and therefore help draw appropriate macroeconomic policies for better economic performance. Indeed, aid, if well oriented could boost economic growth of recipient countries. Based on Rostow's (1959) stages of economic development Maruta et al. (2019) point out the importance of agriculture for countries in an early stage of economic development. Then, following Azarnert (2008) and Turnovsky (2011), aid in education entails to long-term and permanent effect on human capital accumulation, which would raise the living standard of its recipients. Similarly, aid oriented through health help improve health services that decrease infant mortality, enhance productivity and wages, and therefore boost economic growth. Consequently, Maruta et al. (2019) retained agriculture; education; and health as sectors in which aid should be consider. Moreover, they include the importance of institutional quality in directing foreign aid to the most productive economic areas. Their findings show that among the agorementioned sectoral aids, education aid is more effective on economic growth. Broadly speaking, the effect of aid depends on regions in which receiving countries are located. Thus, while agriculture aid is found to be more effective in Africa, education aid is more effective in South America. As for health aid, it is found to be more effective in Asia. Furthermore, Maruta et al. (2019) show that the more institutional quality improves, the more the gap between marginal effect of education, health, and agricultural aids widen. Finally, foreign aid to be more effective, Maruta et al. (2019) recommend that donor countries and international organizations turn foreign aid flow towards educational sector of receiving countries when their institutional quality improves.

To sum up, both theoretical and empirical studies reveal the effectiveness of aid on the economy. The key studies in the matter are those of Chenery and Strout (1966) and Burnside and Dollar (2000). The first authors are the pioneers. They developed the “Financial two-gap model”, which has been adopted in several studies since then. The

financial two-gap model assumes the existence of a gap either between saving and investment or between export and import. Developing countries are not capable to fill these gaps by themselves. Then, a solution is found in relying on foreign aid to fill them up. The other major contribution in this area is the work of Burnside and Dollar (2000). For them, growth in developing countries mostly depends on their policies. The condition of a positive effect of aid is then the presence of a good environment (good policy) in recipient countries.

Extensions of these studies made by authors such as Mosley et al. (1987) and Chauvet and Guillaumont (2009) point out the importance of aid allocation in the developing world. Aid contributes positively to the macroeconomic performance of receiving countries.

Although studies highlight the positive effect of aid on the economy, there is little consensus on this matter.

#### **1.2.2.2. Negative Effectiveness Of Aid On Macroeconomic Performance: A Point Of The Literature**

Foreign aid is not considered by all to have positive effects. Some studies point out the negative side of foreign aid in receiving countries. Indeed, even authors such as Burnside and Dollar (2000) or Collier and Dollar (2002) praised the positive impact of aid on the economy; this is conditioned by an environment characterized by good policies. Besides, in a previous contribution, Collier and Dollar (1999) claim that above a certain threshold, aid begins to have negative effects on growth.

Among contributions showing negative effects of aid, there is Friedman (1995) and Easterly et al. (2004). Indeed, Friedman (1995) claims that foreign aid is widely considered a weapon for the ideological war between the U.S and Russia during the Cold War. Indeed, if the U.S refuses to help underdeveloped countries, they would find help from Russia and then adopt a totalitarian governance system. Generally, an argument suggests that the way to help them and consequently help spread democracy is to make capital and technical assistance free of charge. Then, following this view, foreign aid is the appropriate means or even more, the only appropriate means to help the underdeveloped world achieve its development objectives. Friedman (1995) disproves

this argument. For him, though foreign aid may attract some allies in the short term, in the long term, it will almost surely retard economic development and help communism to spread. Thus, Friedman (1995) suggests America promotes worldwide economic development via means that are consonant with a free market in underdeveloped countries. This would foster private and international investment and therefore help countries to take off. In a more ambitious study, Easterly et al. (2004), with more data and more countries, re-test the Burnside and Dollar (2000) findings. More specifically, the authors extended the Burnside and Dollar (2000) dataset from 1993 to 1997 and the number of the country from 56 to 62. Hence, their results reveal that extending the model dataset brings doubts about Burnside and Dollar's (2000) conclusions. Worded differently, the extended model does not confirm Burnside and Dollar's (2000) findings. In this case, aid does not promote growth in good policy environments. The authors went further by claiming that even when using the full available dataset proper to the original Burnside and Dollar (2000) period, aid does not lead to growth in good policy environments. However, Easterly et al. (2004) found opposite results to Burnside and Dollar (2000), they do not argue that aid is ineffective. They only presented the limitations of aid in explaining growth in good policy environments and therefore suggested that the infatuation behind aid in boosting growth in recipient countries with good policies should be tempered.

Empirical studies that end up on a negative effect of aid on economic performance include Lensink and White (2001); Islam (2005); Khan and Ahmed (2007); and Ali and Isse (2007) demonstrate the negative nexus between aid and economic performance. Indeed, while Lensink and White (2001), and Islam (2005) employ the Laffer curve specification, Khan and Ahmed (2007); and Ali and Isse (2007) rely on econometric regressions.

Lensink and White (2001) examine whether a high level of aid is harmful or not on the economy of recipient countries. Indeed, as the Laffer curve in taxation shows that after a certain limit of taxation, each rise in the tax burden is followed by a decrease in tax revenues, the Laffer curve in Lensink and White (2001) follows the same principle. Worded differently, in the beginning, aid is favorable to growth until it reaches its optimum. Afterward, each increase in aid level leads to a decrease in growth. Then, to illustrate that curve, Lensink and White (2001) use an endogenous growth model. The model considers three sectors: households; firms; and a government. Households are

supposed to be characterized by perfect foresight, to live infinitely, and their utility function is a constant intertemporal elasticity of substitution that they maximize under a constraint of budget. By using Euler condition, the following is established:

$$dc/c = (1/\phi)(r - \sigma) \quad (24)$$

With  $c$  being consumption;  $\sigma$  the rate of time preference and  $\phi$  the inverse of the elasticity of substitution.

Firms produce the following Cobb-Douglas production:

$$Y = BL^{(1-\alpha)}KG^{(1-\alpha)} \quad (25)$$

With  $\alpha < 1$ ;  $Y$  represents production;  $L$  is Labor;  $K$  is the capital stock;  $G$  is government expenditures, and  $B$  is a technological parameter.

Profits of firms are given as below:

$$\pi = BL^{(1-\alpha)}KG^{(1-\alpha)} - (r + \delta)K - \omega L \quad (26)$$

$\omega$  is the real wage rate and  $\delta$  a depreciation rate. For a firm in a competitive market,  $\omega$  and  $r$  are given. Then to reach the maximum level of profits, the following equation is relevant:

$$BK^{(1-\alpha)}G^{(1-\alpha)} = (r + \delta) \quad (27)$$

They assumed that foreign aid is channeled through the economy via the government. To simplify, Lensink and White (2001) assume that only foreign aid ( $A$ ) finances  $G$ . In addition,  $A$  represents a fixed percentage ( $a$ ) of production of the recipient countries. Thus,

$$G = A = aY \quad (28)$$

Using the Euler condition the economic growth ( $g$ ) is given by:

$$g = (1/\phi)(\alpha B^{(1/\alpha)})(La)^{1-\alpha/\alpha-\delta-\sigma} \quad (29)$$

Then they assumed that technology and aid are negatively related:

$$B = (1 - \beta a)B_0 \quad (30)$$

With  $0 < \beta < 1$  and  $B_0$  is the level of technology without aid. To parse out the impact of  $a$  in the economic growth, the following equation is driven:

$$\frac{dg}{da} = \left( \frac{1-\alpha}{\alpha} - \frac{\beta}{1-\beta a} \right) \left( \frac{1}{\phi} \left( (1-\beta)B_0 \right)^{\frac{1}{\alpha}} (La)^{\frac{1-\alpha}{\alpha}} \right) \quad (31)$$

The sign of this equation depends on the sign of the first value in the bracket. Then,

$$\left( \frac{1-\alpha}{\alpha} - \frac{\beta}{1-\beta a} \right) = \frac{1-\beta a(2-\alpha)-\alpha}{(1-\beta a)a} \quad (32)$$

The denominator is positive and for small values of  $\alpha$ ,  $\frac{dg}{da} < 0$  and positive for high values of  $\alpha$ .

$$a = \frac{1-\alpha}{\beta(2-\alpha)} \quad (33)$$

This shows then an inverse relationship between aid and productivity and can be presented in form of a Laffer curve.

Lensink and White (2001) based their empirical analysis following the below cross-sectional regression:

$$g = \alpha_j + \beta_{ij}I + \beta_{mj}M + \beta_{zj}Z + \mu \quad (34)$$

With I a set of variables always include in the regressions; M variables of interest (M includes aid/GDP and aid/GDP square); Z is a vector of national and international macroeconomic variables considered by other studies as being potentially important explanatory variables of GDP growth.

Lensink and White (2001) obtained an aid Laffer curve different from the expected theory. Indeed, they showed that the turning point of the curve above which aid starts affect growth negatively seems to be much higher than predicted by the calculations. Besides, results seem to depend on countries and specifications.

Similarly, Islam (2005) adopts the Laffer curve approach to investigate the matter. The findings reveal more than those of Lensink and White (2001). Indeed, Islam (2005) finds that an average level of foreign aid has little effect on growth. Besides, Islam (2005) argues that when the environment is not stable, aid is ineffective even in presence of good policies. However, good quality of policy is worthy in fostering growth while supported by increased amount of aid.

To carry his study, Islam (2005) develops an aid equation given as follows:

$$A_{it} = \alpha_0 + Z'_{it}\alpha_z + \varepsilon_{it}^a \quad (35)$$

Where  $A_{it}$  represents the allocation of aid,  $Z_{it}$  is a vector including variables such as a log of initial GDP per capita; infant mortality rate; population; and export instability index, and  $\varepsilon_{it}$  is the vector of error terms.

For a period 1968-1997, the study considered 65 countries. Namely, Central American countries (under the American influence); Egypt (as an American ally); Franc zone (having preferential treatment from France), and sub-Saharan African countries (receiving the bulk of aid from European countries).

Islam (2005) finds evidence of the Laffer curve in politically stable countries. The curve shows negative returns to aid when aid/GDP becomes higher than 5.8%. He concludes by claiming that aid allocation depends on parameters such as the country size of the recipient country, the level of development of its population, and the interest of donors rather than the nature of economic policy as argued by Burnside and Dollar (2000).

Khan and Ahmed (2007); and Ali and Isse (2007), contrarily to the previous authors, adopt econometric regressions. Thus, while Khan and Ahmed (2007), use an ARDL co-integration technique for the case of a single country, Ali and Isse (2007) adopt the panel regression technique.

Indeed, Khan and Ahmed (2007) investigate the nature of the link between aid and growth in Pakistan at both aggregate and disaggregate levels. Considering a frame period covering 1972-2006, they found a negative and insignificant effect of aid on growth at both aggregate and desegregate levels. More precisely, though Pakistan has received over US\$ 70 billion from 1960 to 2002 as foreign aid, the country's social indicators appear to be very poor. Following the results that reveal that aid does not affect economic growth in Pakistan rather creates more problems such as corruption, fiscal imprudence, and poor intuitions, they conclude that foreign aid, rather than a blessing is a curse for Pakistan. Then Khan and Ahmed (2007) suggest alternative financing resources such as export; foreign direct investment; and domestic investment as they exert a positive effect on the economic growth of Pakistan at both aggregate and desegregate levels. They recommend the policymakers reduce Pakistani's reliance on foreign aid and focus their attention on other financing methods especially on domestic investment; export; and foreign direct investment.

For a period going from 1975 to 2000, Ali and Isse (2007) analyze simultaneously the effect of trade and aid on the economic performance of more than 150 countries by employing a full information system of three-stage least-squares approach. Indeed the fact that many receiving countries experience low income and lack of trade, and restrictive trade policies push the author to investigate the effectiveness of foreign aid. Besides, contrarily to previous studies, the authors consider simultaneously the effect of foreign aid and international trade on economic performance. Following their results, both foreign trade and aid variables are significant. However, while international trade is found to affect economic performance positively, foreign aid affects negatively the economic performance of the recipient countries. More precisely, a 10% increase in foreign aid is to decrease GDP per worker between 1.2% and 3.5%. Then, foreign harms the receiving countries' economic performances. They finally give ways of improvement focusing on alternative policies to enhance the private sector, liberalize the economy and encourage economic productivity.

Some authors such as Dutta et al. (2013); Kalyvitis and Vlachaki (2012); and Djankov et al. (2008) extended the concept of aid to democracy. Hence, for a sample of 108 countries and a period 1960-1999, Djankov et al. (2008) find that aid negatively affects democracy. The same result is found by Kalyvitis and Vlachaki (2012) for a sample of 64 countries in the period 1967-2002.

Recent studies in the matter include Arazmuradov (2016); Sethi et al. (2019); Afawubo and Mathey (2017); and Bird and Choi (2020).

Arazmuradov (2016) spares out the short-term impact of shocks on foreign direct investment and foreign aid on the macroeconomic performance of five central Asian countries, namely Kazakhstan; Uzbekistan; Kyrgyzstan; Tajikistan; and Turkmenistan). He uses an SVAR model to identify responses of domestic variables to external structural shocks. According to the results, external shocks strongly affect the small open economies of central Asia. Worded differently, the small open economies of central Asia are too weak to absorb external shocks. Then, shocks from foreign aid reduce growth whereas foreign direct investment's volatility leads to an increase. He concludes by claiming that good structural macroeconomic policies are likely to reduce countries' resilience to common external shocks. Besides, he argues that promoting supply-side policies such as



free trade could help boost the economic growth of the concerned countries. In the same context of Asia (India and Sri Lanka), Sethi et al. (2019) adopt time series methods such as the Johansen-Juselius test. They highlight that from 1960-61 to 2014-15, both countries have been receiving foreign aid. However, India, being the second most populated country in the world, scores lower GDP per capita than Sri Lanka that receives more foreign aid than India. Indeed, with time, India moves from receiving country to donor country (to Afghanistan, Bhutan, Nepal; and Africa). The originality of their study is that they include in it variables such as financial development; trade; domestic investment; and inflation rate to explain the relationship between foreign aid and economic growth. Following the results, in India, foreign aid Granger causes economic in the short-run but the impulse function shows that aid does not help economic growth in the long run. Nonetheless, in Sri Lanka, foreign aid does not have a significant impact on economic growth in both the short-run and the long run. Moreover, results from VAR modeling reveal for the case of Sri Lanka that aid affects negatively growth in the short-run, and this diminishes in the subsequent periods.

Hence, they recommend the policymakers of India and Sri Lanka focus on monetary and fiscal policies to stabilize their internal economic cycle but also to foster external economic transformation in accordance with the effectiveness of aid on growth.

Bird and Choi (2020) considered other forms of external finance alongside foreign aid such as remittances and foreign direct investment. On a sample of 51 developing countries, they run a fixed-effect model as well as the GMM to deal with heterogeneity. Following the findings, while foreign direct investment is significant and positively related to economic growth, the same cannot be said for remittances and foreign aid. Indeed remittances and aid are found to be either not significant or negatively related to economic growth. However, Bird and Choi (2020) conclude by stating that all three forms of finance are important for developing countries to achieve sustainable development.

The case of sub-Saharan Africa has interested Afawubo and Mathey (2017), who, on a sample of 45 sub-Saharan African countries, investigate the effect of aid volatility on savings and investment, with a special focus on institutional quality, during 1990-2013. Adopting the GMM regression technique, their results reveal that though aid is positively related to savings and investment, its volatility is harmful to them. However, they found

the institutional quality helps reduce that volatility. Afawubo and Mathey (2017) then highlight two important policy implications: First of all, the authors noted the necessity of both donors and recipients to consider the impact of external shocks in aid allocation; finally, they encourage sub-Saharan African countries to improve the quality of their institutions, since this helps reduce aid related volatility.

Still in the African context, one of the most virulent critics of aid comes from Moyo (2009). She argues that aid is hurting Africa. For her, aid is responsible for corruption, slow economic growth, and poverty in Africa. She then points out that unlike countries relying on aid, countries that do not depend on aid such as China, India, or even South Africa are economically successful. The solution consists then to foster entrepreneurship and market-oriented policies such as bond supplying to raise capital in non-traditional markets (due to challenges of traditional capital markets). Besides, African countries need to attract more foreign direct investments by adopting better tax policies, to emphasize trade with partners such as China. Finally, to help African countries reduce poverty and strengthen growth, donor countries have to stop financing aid.

Due to critics on aid effectiveness in promoting economic performance, Dijkstra (2018) gives empirical evidence making the matter seems less daunting. The findings reveal an exaggeration of critics. Indeed, aid has positively affected democracy since the end of the Cold War. Besides, after 1990, aid is found to be strengthening the democratization process in the recipient countries. However, they highlighted the negative impact of aid in authoritarian regimes. Hence, they argue that donors have to reduce aid in those countries, though aid could help maintain stability in authoritarian regimes by supporting the army. In another word, donors' intentions to help should be seriously considered. Both donors and recipients should agree on some principles such as the "Paris principles" of the DAC commission. Furthermore, Dijkstra (2018) points out the fact that non-DAC donors such as China and Vietnam are increasing but do not follow the Paris principles and even some DAC members backtrack from Paris principles. Such behaviors may further increase the negative effects of aid on governance.

To recapitulate, both theoretical and empirical pieces of literature show evidence of the negative effects of foreign aid on the economic performance of aid recipient countries. Considered as a weapon used to attract allies in the short term since the Cold War, for

Friedman (1995) in the long term, it will almost surely retard economic development and help communism to spread. Some studies such as Lensink and White (2001); Islam (2005) show that after a certain limit, aid becomes harmful for the recipient countries. One of the most virulent critics of aid comes from Moyo (2009). For her, aid is responsible for corruption, slow economic growth, and poverty in Africa. She then points out that unlike countries relying on aid, countries that do not depend on aid such as China, India, or even South Africa are economically successful.

### **Conclusion Of The Chapter**

To conclude, the first part of this chapter reviews both theoretical and empirical literature on the nexus between tax competition and macroeconomic performance. Then, it appears that tax competition has two main forms: horizontal and vertical competitions.

Indeed, horizontal tax competition occurs when jurisdictions do compete with each other generally by reducing their tax rates; ending up in a race to the bottom (see Zodrow and Mieszkowski, 1986) or to a ride on a seesaw (Chirinko and Wilson, 2017). Hence, revision of tax rates in a region pushes other regions to alter theirs and creates instability of tax revenues, necessary to finance public goods. Most often, this situation ends in a non –optimal level of public goods in regions. The empirical verifications are done through statistics, econometrics, and spatial econometrics show the evidence of horizontal tax competition among regions and explain the economic performance of countries (see for instance Liu et al. 2018).

Meanwhile, alongside horizontal tax competition, there is vertical tax competition. This latter appears when in a federal system (or a decentralized State), and due to sharing the same tax bases, tax decisions of one jurisdiction affect tax revenues at another level. This kind of competition produces inefficiencies depending on whether governments are benevolent or not, and on whether the game is played following Nash or Stackelberg's strategies (Clingman and Clingman, 2009). Considered as pioneers in the field, Flowers (1988) and Johnson (1988) developed strong theoretical approaches to vertical tax competition. The authors highlighted evidence of tax competition among governments of different levels of competency, by integrating Cournot-Nash and Stackelberg's strategic game approaches, and by considering the fact that government is benevolent or not. Empirical verifications made mostly with the help of econometric techniques show

evidence of vertical tax competition among different levels of government when the tax base is the same. Then, for better economic performance, recommendations suggest more autonomy to local governments (see for instance Xing and Zhang, 2018).

Besides, this sub-section introduces transfer-pricing practices in the analysis. Transfer price is the price paid by multinationals during their transactions with their affiliates located abroad. It appears that multinationals generally manipulate their prices to avoid paying taxes by shifting their profits to their affiliates in low-tax countries. To fight against these malpractices, OECD has developed the “arm’s length principle”. Introducing the transfer-pricing strategy in the study aims to investigate the impact of transfer pricing methods on tax competition, and therefore on economic performance. Worded differently, what could be the effect of transfer prices on the magnitude of tax competition, and consequently on macroeconomic performance?

Following the literature on profit shifting strategies, it appears that contrarily to traditional tax competition forms (horizontal and vertical), tax competition based on transfer pricing supposes that the competition exists only between the home (where the parent company is located) and the host (where the subsidiary is located) countries. Indeed, horizontal and vertical competition models supposed that the competition starts before the installation of foreign investment. Transfer price-based models assume tax competition to be set on corporate profits taxes and is therefore established after the installation of the subsidiary in the host country.

Studies on income shifting reveal that transfer-pricing manipulations affect tax revenues, GDP distribution across countries responsible for its creation, the level of firms’ location, and employment (see Harris et al., 1993). Thus, it is worthy to say that transfer pricing may affect macroeconomic performance.

The second part of this chapter gives information regarding the effect of aid on macroeconomic performance. First, an overview of aid in the African context shows that the sub-region has received so far billions and billions of dollars as foreign aid assistance. The allocation of aid is given either by bilateral donors such as the U.S., U.K., and Germany or by multilateral institutions such as IDA, EU, and the AfDB. Aid allocation is absorbed by sectors, the main of them are social sectors; economic sector; production sector; humanitarian sector; multi-sector; and general aid programs. Based on the

statistics given in this sub-section, one can say that aid has been positive to the macroeconomic performance of sub-Saharan Africa. However, it is worth noting that the bilateral allocation during the years following independence was far less than the multilateral allocation (ODA) mainly started during the 1970-1980s. Yet, African countries could not avoid the debt crisis of the 1980s. This could compromise the effectiveness of aid.

Then, studies regarding the matter are reviewed. It has emerged that both theoretical and empirical pieces of literature show evidence of the negative effects of foreign aid on the economic performance of aid recipient countries. Considered as a weapon used to attract allies in the short term since the Cold War, for Friedman (1995) in the long term, it will almost surely retard economic development and help communism to spread. Some studies such as Lensink and White (2001); Islam (2005) show that after a certain limit, aid becomes harmful for the recipient countries. One of the most virulent critics of aid comes from Moyo (2009). For her, aid is responsible for corruption, slow economic growth, and poverty in Africa. She then points out that unlike countries relying on aid, countries that do not depend on aid such as China, India, or even South Africa are economically successful.

Since the theoretical and empirical bases of the study are established, it is time to present the methodology.

## **CHAPTER 2: TAX COMPETITION, OFFICIAL DEVELOPMENT ASSISTANCE, AND MACROECONOMIC PERFORMANCE: METHODOLOGY**

The previous chapter helps construct the necessary methodology for this thesis.

The present chapter aims to present the analytical framework, the estimation technique, the econometric model specification, and finally to present the data used for the analysis.

Hence, the methodology regarding tax competition and macroeconomic performance will constitute the first section while the case of aid will follow in the last section of this chapter.

### **2.3. Tax Competition And Macroeconomic Performance In Sub-Saharan African Countries: Methodology**

This section comprises the methodology related to both horizontal and vertical tax competitions and macroeconomic performance in sub-Saharan Africa.

#### **2.1.1. Horizontal Tax Competition And Macroeconomic Performance In Sub-Saharan African Countries: Methodology**

To investigate the effect of horizontal tax competition on macroeconomic performance in SSA, it is worthy to first present the analytical framework.

##### **Analytical Framework**

Before analyzing the impact of horizontal incentives in the sub-Saharan context, the evidence of such competition should be set first. That evidence is get through the usage of spatial econometrics.

Indeed, the idea is to estimate the tax reaction function of a country (or municipality) in a Nash equilibrium situation by considering the other tax reaction functions (of other countries or municipalities). A tax base in a locality (country or municipality) is affected by the tax policy of that particular locality but also by the tax policies of neighboring localities. The spatial dimension included in the analysis leads to a general interdependency of tax choices. Consequently, there is a correlation of the tax ratio with itself in the analysis.

Two effects should then be considered:

- Spatial autoregression: meaning that there is an interdependence of the endogenous variable with itself in a different point of the space
- Spatial autocorrelation: Meaning that there is an interdependence of the error term throughout the space.

Roughly, the use of spatial econometrics help estimate tax reaction functions. When the slope of the estimated function is different from zero, there is evidence of strategic interactions. However, it is hard to say if those interactions mean horizontal tax competition or yardstick comparison. Supplementary evidence is necessary such as an estimation of the tax base (See Brett and Pinkse, 2000) or the introduction of political explanatory variables (Dubois et al., 2007), or even the utilization of economic weighting (Redoano, 2007).

The model is written as follow:

$$r = \alpha Z^1 r + XB + \vartheta \quad (1)$$

$$\vartheta = \delta Z^2 \vartheta + \varepsilon \quad (2)$$

$$\varepsilon \sim iid(0; \delta^2 \Omega) \quad (3)$$

- $r$  represents the vector of tax rates;
- $Z^1$  is the standardized square matrix of spatial interactions;
- $Z^2$  is the square matrix of spatial autocorrelation;
- $\alpha$  is the coefficient of slope to be estimated. The significance of  $\alpha$  proves the evidence (or not) of horizontal tax competition;
- $X$  includes socioeconomic characteristics and  $B$  is the vector of its coefficients;
- $\vartheta$  is the vector of residues. They are supposed to be either independent and identically distributed (iid) or spatially autocorrelated;
- $\delta$  is the spatial autocorrelation coefficient;
- $\varepsilon$  is the error term (iid)

In general, four types of models can be employed to estimate the evidence of horizontal tax competition.

- *Spatial Autoregressive Model (SAR)*

$$r = \alpha Z^1 r + \vartheta$$

In this model,  $\beta = \delta = 0$ ;  $E(\varepsilon) = 0$ ; and  $V(\varepsilon) = \delta^2 \Omega$

This model is not employed in the regression since it does not consider the interaction of neighbor localities.

- *Spatial Linear Model with Autoregression*

In this model, only  $\delta = 0$ . Hence,  $r = \alpha Z^1 r + XB + \vartheta$ . With  $E(\varepsilon) = 0$ ; and  $V(\varepsilon) = \delta^2 \Omega$

This model is adopted by Dubois et al. (2007) for cross-sectional analysis.

- *Spatial linear model with autocorrelation*

In this model,  $\delta = 0$ .

Thus,

$$\left\{ \begin{array}{l} r = \alpha Z^1 r + XB + \vartheta \\ \varepsilon \sim iid(0; \delta^2 \Omega) \end{array} \right\}$$

The spatial linear model with autocorrelation includes the autocorrelation in the error terms. One of the flaws of this model is this can designate the omission of a variable source of auto-regression.

- *Spatial Linear Model with Auto-Regression and Auto-Correlation*

Here,  $\beta \neq \delta \neq 0$ . Not including the autocorrelation in the error terms leads to unbiased but inefficient OLS estimators. In this model, however, the OLS here ends up in biased statistics.

The model specification here follows the general form above-mentioned.

$$\left\{ \begin{array}{l} r = \alpha Z^1 r + XB + \vartheta \\ \vartheta = \delta Z^2 \vartheta + \varepsilon \\ \varepsilon \sim iid(0; \delta^2 \Omega) \end{array} \right\}$$

### ***Forms Of Weighting Matrices ( $Z^1$ )***



The literature does not recognize a standard form of  $Z^1$ . Following the nature of taxes, weighting matrices are different. Some authors try different kinds of  $Z^1$  before taking the one producing the best results. However, one of the most used matrices is the contiguity matrix due to its simplicity.

The contiguity matrix is based on the idea of the proximity of countries. Hence, if a country (j) shares the same border with the country (i), a weight of 1 is attributed and zero otherwise.

$$\text{Then, } Z^1 \rightarrow \left\{ \begin{array}{l} z_{ij} = 1 \text{ if countries share same borders,} \\ z_{ij} = 0 \text{ otherwise,} \\ z_{ii} = 0 \text{ by convention} \end{array} \right\}$$

Likewise, based on the concept of neighborliness such as geographical distances between jurisdictions; GDP per capita distance weight; GDP and EU weights, other weighting matrices are constructed.

Weighting matrices based on geographical distances and GDP per capita distance imply that the more jurisdictions are close (either geographically or economically) the more they are to compete with each other.

Hence, for geographical distance, the element of the weighting matrix is  $Z_{ij}^D = \frac{1}{d_{ij}} / \sum_j \frac{1}{d_{ij}}$

$d_{ij}$  being the distance between the capital of the country  $i$  and the capital of the country  $j$ .

Likewise, for the case of GDP per capita, the elements of  $Z^1$  is:

$$Z_{ij}^{gdp} = \frac{1}{\sum_j \frac{1}{\sqrt{gdp_{it} - gdp_{jt}}}}, \quad i \neq j, \quad gdp \text{ is the GDP per capita, and } t \text{ represents the time.}$$

Meanwhile, for GDP and EU<sup>14</sup> weighting matrices, there is Stackelberg competition. i.e. one country (or group of countries) leads the game. Therefore, that country (or group of countries) has (have) high weight in the analysis compared to the rest of the countries.

$$\text{Thus, } Z_{ijt}^{GDP} = \frac{1}{GDP_{jt}} / \sum_j \frac{1}{GDP_{jt}}, \text{ and } Z_{ijt}^{CU} = \begin{cases} \frac{GDP_{jt}}{\sum_{t \in CU_{kt}} GDP_{jt}} & \text{if } j \in CU_{kt}, j \neq i \\ 0 & \text{if } j \notin CU_{kt}, j \neq i \end{cases}$$

---

<sup>14</sup> The term EU is changed to PTA and refers to Preferential trade agreement

With  $CU_{kt}$  representing countries belonging to a custom union  $k$  at the time  $t$ .

Another weighting matrix focused on the country's openness is considered by Redoano (2007). Indeed, this measure gives higher weight to open countries.

Following that weighting matrix, the more a country is opened, the more it can attract foreign investment. Redoano (2007) considered the following equation:

$$Z_{ijt}^{TO} = \frac{\sum_s TO_{jt-s}}{\sum_j \sum_s TO_{jt-s}}, s = 3,4,5, \text{ and } j \neq i$$

With TO representing the trade openness variable. To circumvent endogeneity and temporary fluctuation problems proper to that variable, Redoano (2007) employs a technique based on the average of three years together and the lag of the weight for three years as well.

Choosing a weight does not follow any theory. It is arbitrary. Some studies estimate many equations with different kinds of weights and decide the best among them.

### ***Elements Of The Matrix X***

X includes several variables grouped as follows:

- *Economic variables*: GDP per capita, PPP ( $GDPPC_{it}$ ) which consider countries' standard of living by purchasing power parity (PPP); foreign direct investment ( $FDI_{it}$ ) which evaluate the international investment coming to countries; trade openness ( $TO_{it}$ ) which tells how much countries are open; economic freedom index ( $EF_{it}$ ) which describes how free an economy is; private investment ( $I_{it}$ ) which is capital formation as a percentage of GDP; agriculture, forestry, and fishing value-added share of GDP ( $Agri_{it}$ ) which measures the size of the informal sector in the country; government general consumption as a percentage of GDP ( $G_{it}$ ); and Labor ( $L_{it}$ ).
- *Political variables*: Institutional quality index ( $IQ_{it}$ ) which measures how good institutions are in the country  $i$ ; Election dummy variable ( $Elec_{it}$ ) which takes 1 when there is election (executive and/or legislative) in the country  $i$  in year  $t$  and 0 otherwise; Percentage of women in the parliament ( $Wom_{it}$ ) which measures the composition of women in the parliament.

- *Socio-cultural indicators*: Total population ( $Pop_{it}$ ); Population density ( $Pdens_{it}$ ) and proportion of women ( $Pwom_{it}$ ).
- *Another variable*: Total area ( $Area_{it}$ ) which represents the total surface occupied by a country.

### **Determination And Justification Of Variables**

GDP per capita ( $GDPPC_{it}$ ) is a ratio of country  $i$ 's GDP to its total population.

$$GDPPC_{it} = \frac{GDP_{it}}{Pop_{it}}$$

GDP per capita evaluates the standard of living and economic wellbeing of people in the country  $i$ .

Trade openness ( $TO_{it}$ ) is a ratio of the sum of export and import to GDP.

$$TO_{it} = \frac{(X + M)_{it}}{GDP_{it}}$$

This ratio shows how much a country relies on international trade.

Economic Freedom ( $EF_{it}$ ) is an index annually calculated and publicly made available by the Heritage Foundation<sup>15</sup>. The economic freedom index is an average of four main key factors of the economic and entrepreneurial environment (each factor encompasses three variables) over which governments typically exercise policy control. Namely, they are Rule of law (property rights, judicial effectiveness, and government integrity); government size (tax burden, government spending, and fiscal health); regulatory efficiency (business freedom, labor freedom, and monetary freedom); and market openness (trade freedom, investment freedom, and financial freedom). The variables are between 0 and 100. Thus, the index is included between 0 and 100 as well. A high score on the index means high economic freedom. To avoid variable scale bias, and to be compliant with the rest of the variables in the model, the economic freedom index is considered between 0 and 1.

Institutional quality index ( $IQ_{it}$ ) is an average of “voice accountability”; “political stability and absence of violence”; “government effectiveness”; “regulatory quality”;

---

<sup>15</sup> <https://www.heritage.org/index/about>

“rule of law”; and “control of corruption” (see Table 1 of the appendix). All these variables are between -2.5 and 2.5. Higher values of the index mean the good quality of institutions (see Kaufmann et al., 2010).

Thus, following Edmark and Ågren (2008), the final equation is written as follows:

$$\begin{aligned}
 r_{it} = & \alpha_{0i} + \alpha A_{ijt} + \beta_0 GDP_{PC_{it}} + \beta_1 FDI_{it} + \beta_2 TO_{it} + \beta_3 EF_{it} + \beta_4 I_{it} + \beta_5 Agri_{it} \\
 & + \beta_6 G_{it} + \beta_7 i_{it} + \beta_8 L_{it} + \beta_9 IQ_{it} + \beta_{10} Pop_{it} + \beta_{11} Lang_{ijt} \\
 & + \beta_{12} Pdens_{it} + \beta_{13} Percwom_{it} + \beta_{14} Dist_{ijt} + \beta_{15} Area_{it} \\
 & + \vartheta \tag{4}
 \end{aligned}$$

$$z_{ij} = \left\{ \begin{array}{l} \text{Contiguity matrix: 1 if countries share same borders and 0 otherwise;} \\ \text{Geographical distance: } \frac{1}{d_{ij}} / \frac{1}{\sum_j \frac{1}{d_{ij}}} ; \\ \text{GDP per capita: } \frac{1}{\sqrt{gdp_{it} - gdp_{jt}}} / \frac{1}{\sum_j \sqrt{gdp_{it} - gdp_{jt}}} ; \\ \text{GDP: } \frac{1}{GDP_{jt}} / \frac{1}{\sum_j GDP_{jt}} \\ \text{Preferential Trade Agreement: } \left\{ \begin{array}{l} \frac{GDP_{jt}}{\sum_{t \in SR_{kt}} GDP_{jt}} \text{ if } j \in SR_{kt}, j \neq i \\ 0 \text{ if } j \notin SR_{kt}, j \neq i \end{array} \right\}; \\ \text{Trade Openness: } \frac{\sum_s TO_{jt-s}}{\sum_j \sum_s TO_{jt-s}}, s = 3,4,5, \text{ and } j \neq i \end{array} \right.$$

$\alpha_{0i}$  is the country fixed effect and if  $|\alpha| < 1$  there is a Nash equilibrium in the model.

- ***A Priori Expectation Of The Coefficients' Signs***

<b><i>Variables</i></b>	<b><i>Expected signs</i></b>
The slope coefficient ( $\alpha$ )	Positive
$GDP_{PC_{it}}$ ( $\beta_0$ )	Positive
$FDI_{it}$ ( $\beta_1$ )	Negative
$TO_{it}$ ( $\beta_2$ )	Negative

$EF_{it} (\beta_3)$	Negative
$I_{it} (\beta_4)$	Negative
$Agri(\beta_5)$	Negative
$G_{it} (\beta_6)$	Negative
$i_{it}(\beta_7)$	Positive
$L_{it} (\beta_8)$	Positive
$IQ_{it} (\beta_9)$	Positive
$Pop_{it} (\beta_{10})$	Positive
$Lang_{ijt}(\beta_{11})$	Negative
$Pdens_{it}(\beta_{12})$	Positive
$Pwom_{it}(\beta_{13})$	Positive
$Dist_{it}(\beta_{14})$	Negative
$Area_{it}(\beta_{15})$	Negative

To assess the impact of horizontal tax competition on macroeconomic performance, the previous model needs to undergo an empirical specification.

Several techniques help determine the macroeconomic performance of countries. This thesis builds on the Normalized Economic Performance Index (NEPI) developed by Medrano-B and Teixeira (2013). The index is based on the Kaldorian magic square of macroeconomic performance and has helped analyze some countries' performance (see Firme and Teixeira, 2014; Saavedra-Rivano and Teixeira, 2017; and Addi, 2020).

Medrano-B and Teixeira (2013) considered the four Kaldorian variables. Namely, GDP rate ( $\gamma$ ); trade balance ( $\tau$ ); inflation ( $\phi$ ); and unemployment ( $\zeta$ ). These variables are framed within their maximum and minimum values. Furthermore, following the wonderland configuration, unreachable macroeconomic goals are included in the model.

Indeed, the initial magic square had some flaws such as the non-uniformity of the figure and the arbitrary of the variables. Thus, while the growth rate was comprised between a scale going from 0 to 10, the trade balance was between -2 to 4. For the inflation rate, the interval was 10 to 0 and finally, the unemployment rate was comprised between 12 and

0. All these values are expressed in percentage. In addition, according to some economic laws such as Okun law and Phillips curve, some objectives were correlated.

To circumvent these flaws, Medrano-B and Teixeira (2013) developed a new quadrangle by normalizing the initial one in a unit area. This quadrangle has been designed as the “Magic Hypercube”. In addition, they computed an index of economic welfare: the Normalized Economic Performance Index (NEPI).

Then, to compute the NEPI for Sub-Saharan Africa, the following intervals are considered for a period going from 2005 to 2019.

$$[-36.3 \leq \gamma \leq 20.7]; [-65 \leq \tau \leq 24]; [255.29 \geq \varphi \geq -72.72]; [30.78 \geq \zeta \geq 0.31] \quad (5)$$

To consider the wonderland configuration, the maximum and minimum verified values are taken:

$$[-37 \leq \gamma \leq 21]; [-66 \leq \tau \leq 25]; [256 \geq \varphi \geq -73]; [31 \geq \zeta \geq 0] \quad (6)$$

Then to normalize the variables the following transformation is considered:

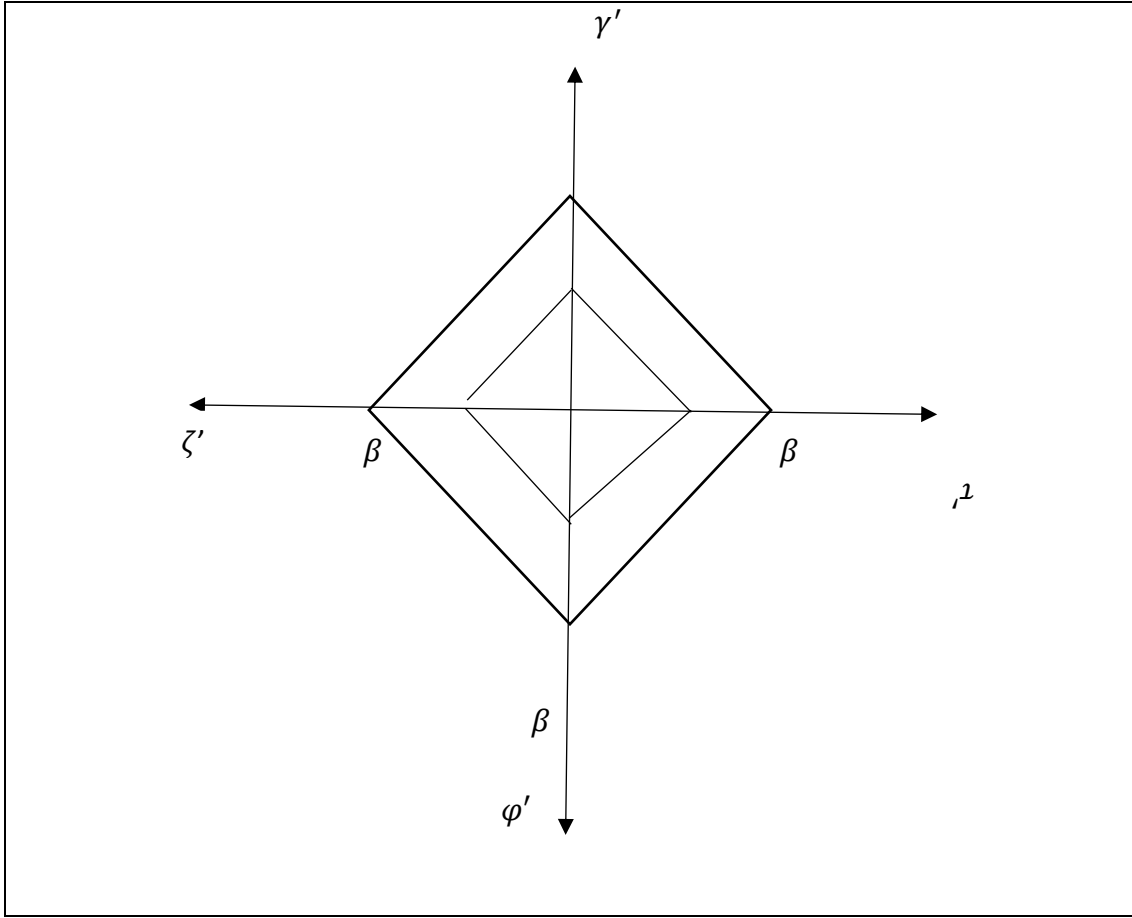
$$[0 \leq \gamma' \leq \beta]; [0 \leq \tau' \leq \beta]; [0 \geq \varphi' \geq \beta]; [0 \geq \zeta' \geq \beta] \quad (7)$$

The new variables (primed) represent performance in the related objective. Then, high primed values mean good performance in the relative objective. For example, a high value of  $\zeta'$  means good performance in reducing unemployment.

As a result, the formulas are:

$$\left\{ \begin{array}{l} \gamma' = \frac{\beta}{58}(\gamma + 37) \\ \tau' = \frac{\beta}{91}(\tau + 66) \\ \varphi' = \frac{\beta}{329}(256 - \varphi) \\ \zeta' = \frac{\beta}{31}(31 - \zeta) \end{array} \right\}$$

Considering primed variables, a *Modified Magical Square* can be drawn.



**Figure 5:** The Modified Magic Square

Following the wonderland approach,  $A'_w$  represents a wonderland, which is a utopian situation. For Medrano-B and Teixeira (2013),  $A'_w = 4(\beta^2/2) = 1$ ; thus,  $\beta = \frac{\sqrt{2}}{2}$ .

$$A' = \frac{1}{2}(\gamma'\tau' + \tau'\varphi' + \varphi'\zeta' + \zeta'\gamma'); \text{ with } 0 \leq A' \leq 1 \quad (8)$$

To get the NEPI, we just have to replace the primed variables with their real values.

Thus, high values of the index correspond to high performances while values converging to 0 suggest low performances.

To examine the effect of horizontal tax competition on macroeconomic performance in sub-Saharan Africa, the following equation is written:

$$\begin{aligned} A'_{it} = & \alpha_{0i} + \alpha A_{ijt} + \beta_1 FDI_{it} + \beta_2 TO_{it} + \beta_3 EF_{it} + \beta_4 I_{it} + \beta_5 Agri_{it} + \beta_6 G_{it} + \beta_7 L_{it} \\ & + \beta_8 IQ_{it} + \beta_9 Pop_{it} + \beta_{10} Lang_{ijt} + \beta_{11} Pdens_{it} + \beta_{12} Percwom_{it} \\ & + \beta_{13} Dist_{ijt} + \beta_{14} Area_{it} \\ & + \vartheta \end{aligned} \quad (9)$$

With  $A'_{it}$  the Normalized Economic Performance Index. It is important to notice that GDP\_PPP and inflation have been removed from the left side of this equation since GDP and inflation are used to construct the index (right side of the equation).

The configuration of the equation (4) and (9) commanded us to adopt a least square dummy variable (LSDV) approach of fixed effects for estimation. This method helps capture both country-specific and pair characteristics. Ignoring these effects when they exist would lead to biased estimations (see Inançlı and Addi, 2019).

- ***A Priori Expectations Of The Signs***

<b><i>Variables</i></b>	<b><i>Expected signs</i></b>
The slope coefficient ( $\alpha$ )	Positive
$FDI_{it}$ ( $\beta_1$ )	Positive
$TO_{it}$ ( $\beta_2$ )	Positive
$EF_{it}$ ( $\beta_3$ )	Positive
$I_{it}$ ( $\beta_4$ )	Positive
$Agri(\beta_5)$	Positive
$G_{it}$ ( $\beta_6$ )	Positive
$L_{it}$ ( $\beta_8$ )	Positive
$IQ_{it}$ ( $\beta_9$ )	Positive
$Pop_{it}$ ( $\beta_{10}$ )	Positive
$Lang_{ijt}(\beta_{11})$	Negative
$Pdens_{it}(\beta_{12})$	Positive
$Pwom_{it}(\beta_{13})$	Positive
$Dist_{it}(\beta_{14})$	Negative
$Area_{it}(\beta_{15})$	Negative



## Vertical Tax Competition And Macroeconomic Performance In Sub-Saharan African Countries: Methodology

To analyze the vertical tax competition in sub-Saharan Africa, a new variable is considered:  $VR_{it}$  which is an index of the vertical tax relationship with the central government.

$$VR_{it} = \frac{TR_{it}}{TR_{it} + Transfer_{it}} \quad (10)$$

With  $TR_{it}$  representing tax revenue collected by a province  $i$  during period  $t$ ; and  $Transfer_{it}$  represents any kind of transfer by the central government to a province  $i$  during period  $t$ . The transfer could be in kind of subvention; grants; or aid (Xing and Zhang, 2017). VR is a measure of tax autonomy a province has. The high VR is for a province, the large its tax effort is. In other words, if the central government were to give larger fiscal autonomy to municipalities, they would work harder to collect taxes (Xing and Zhang, 2017).

To analyze the presence of vertical tax competition, the following equation is employed:

$$TR_{it} = \alpha + \beta VR_{it} + \vartheta \quad (11)$$

In the case of the existence of vertical tax competition, its effect on macroeconomic performance in sub-Saharan Africa should be determined. Hence, the following equation is written:

$$A'_{it} = \alpha + \beta VR_{it} + \vartheta \quad (12)$$

- ***A Priori Expectations Of The Signs***

<i>Coefficients</i>	<i>Expected signs</i>
$\alpha$	Positive
$VR_{it} (\beta)$	Positive

## 2.4. Official Development Assistance And Macroeconomic Performance

### 2.2.1. Model Specification

Based on Mankiw et al. (1992), this evaluates the effects of ODA on economic performance. The initial model is a Cobb-Douglas production function. One of the advantages of working with a Cobb-Douglas function is its ability to handle several inputs simultaneously. Besides, with Cobb-Douglas (CD) function, econometric problems such as heteroscedasticity; multicollinearity; and serial correlation can be easily handled. Murthy (2002) went even further by claiming that aggregate technology can be well represented in CD function.

By including human capital in the model, the following equation is written:

$$Y = (AL)^{\alpha} K^{\beta} H^{\theta} \quad (13)$$

To analyze the effect of foreign aid, let us include ODA in the equation.

$$Y = (AL)^{\alpha} K^{\beta} H^{\theta} ODA^{\delta} \quad (14)$$

### Empirical Model

To analyze the effect of the financial market on economic growth, Luqman et al. (2013) based their studies on the following equation:

$$\ln Y_t = \beta_0 + \beta_1 \ln X_t + \beta_2 \ln(A_y)_t + \beta_3 \ln(A_y * FD)_t + \varepsilon_t \quad (15)$$

With  $Y$  being the real GDP;  $(A_y * FD)$  an interactive term of financial development and foreign aid;  $A_y$  aid to GDP ratio;  $X$  includes capital formation; human capital; and financial development.

Based on the aforementioned equation, we developed a panel model to evaluate the effect of aid on macroeconomic performance. Hence, the following equation is written:

$$\begin{aligned} A'_{it} = & \alpha_{0i} + \alpha_1 ODA_{it} + \beta_1 FDI_{it} + \beta_2 TO_{it} + \beta_3 EF_{it} + \beta_4 I_{it} + \beta_5 Agri_{it} + \beta_6 G_{it} \\ & + \beta_7 L_{it} + \beta_8 IQ_{it} + \beta_9 Pop_{it} + \beta_{10} Pdens_{it} + \beta_{11} Percwom_{it} \\ & + \beta_{12} Area_{it} \\ & + \vartheta \end{aligned} \quad (16)$$

## Estimation Technique

To obtain robust results, choosing an appropriate estimation technique is important. Then, to estimate the equation (16), the study relied on both static and dynamic panel techniques. The importance of panel estimation techniques lies in the fact that it allows combining different cross-sections and time data, and gives more consistent and robust results. Under the static panel, the Hausman specification test helps decide which one among the fixed effect and the random effect is suitable for the analysis. Since there is a possible endogeneity presence between institutions, economic freedom index, and growth, dynamic panel estimation techniques are considered as well. Under the dynamic panel technique, the Generalized Method of Moment (GMM) estimator is employed. Being an extension of instrumental variable methodology, the GMM estimation has the advantage to tackle endogeneity, but also to correct for possible serial correlation. Studies that focused on GMM estimation to fix endogeneity encompass Nawaz et al., (2014); (P. Siyakiya, 2017); and, Nirola and Sahu (2019).

It is worth highlighting that, because the studied period is not long enough (from 2005 to 2019), there is no need to run stationarity tests.

## Econometric Model Specification

Static and dynamic panels are specified in this sub-section.

### *Static Panel Specification*

The static panel estimation considers robust fixed effect panel and random effect panel.

### *Fixed Effect Panel Specification*

To apply the fixed effect model, equation (16) should be specified as follows:

$$\begin{aligned} A'_{it} = & \pi_i + \alpha ODA_{it} + \beta_1 FDI_{it} + \beta_2 TO_{it} + \beta_3 EF_{it} + \beta_4 I_{it} + \beta_5 Agri_{it} + \beta_6 G_{it} + \beta_7 L_{it} \\ & + \beta_8 IQ_{it} + \beta_9 Pop_{it} + \beta_{10} Pdens_{it} + \beta_{11} Percwom_{it} + \beta_{12} Area_{it} \\ & + \varepsilon_{it} \quad (17) \end{aligned}$$

With  $\pi_i = \alpha_i + Z'_i \alpha$  i.e contains intercept and vector of fixed and unobserved confounders.

### **Random Effect Panel Specification**

To apply the random effect model, equation (16) should be specified as follows:

$$\begin{aligned} A'_{it} = & \alpha_0 + \alpha ODA_{it} + \beta_1 FDI_{it} + \beta_2 TO_{it} + \beta_3 EF_{it} + \beta_4 I_{it} + \beta_5 Agri_{it} + \beta_6 G_{it} + \beta_7 L_{it} \\ & + \beta_8 IQ_{it} + \beta_9 Pop_{it} + \beta_{10} Pdens_{it} + \beta_{11} Percwom_{it} + \beta_{12} Area_{it} + \mu_i \\ & + \varepsilon_{it} \quad (18) \end{aligned}$$

With  $\mu$  being a group-specific random element that accounts for the deviation of each cross-sectional component from the average intercept.

### **Dynamic Panel Model Specification**

To run the GMM estimator, a lag of  $A'_{it}$  is included in equation (18) as an independent variable. Then the following equation is written:

$$\begin{aligned} LogA'_{it} = & \alpha_0 LogA'_{i-1,t} + \alpha_1 LogODA_{it} + \beta_1 LogFDI_{it} + \beta_2 LogTO_{it} + \beta_3 LogEF_{it} \\ & + \beta_4 LogI_{it} + \beta_5 LogAgri_{it} + \beta_6 LogG_{it} + \beta_7 LogL_{it} + \beta_8 LogIQ_{it} \\ & + \beta_9 LogPop_{it} + \beta_{10} LogPdens_{it} + \beta_{11} LogPercwom_{it} \\ & + \beta_{12} LogArea_{it} + \varepsilon_{it} \quad (19) \end{aligned}$$

With  $LogA'_{i-1,t}$  a lag of  $LogA'_{it}$  and  $\varepsilon_{it}$  the error terms.

### **Data**

Data used for the analysis go from 2005 to 2019 for 42 African countries. 13 of these countries belong to east Africa; 8 are from central Africa; 16 belong to west Africa, and 5 are from southern Africa. Indeed sub-Saharan Africa has more than 42 countries but due to the lack of complete data, some countries were removed from the analysis. See Table 2 of the Appendix for more information about sub-Saharan countries.

The following table describes data and gives information about their sources.

**Table 3.** Data Description And Source

<b>Variable</b>	<b>Description</b>	<b>Source</b>
$r_{it}$	Tax rate	WRLD
$dist_{ij}$	Distance between capital cities of countries i and j	(Mayer & Zignago, 2011)
$Cont_{ij}$	Contiguity between countries i and j	(Mayer & Zignago, 2011)
$GDPPC_{it}$	GDP per capita, PPP	WDI
$FDI_{it}$	Foreign Direct Investment as a proportion of GDP	UNCTADstat
$TO_{it}$	Trade Openness	WDI
$EF_{it}$	Economic Freedom	THF
$I_{it}$	Investment	WDI
$Agri$	Informal sector (Agriculture share of GDP)	WDI
$G_{it}$	Government general consumption as a percentage of GDP	WDI
$i_{it}$	Consumer price annual inflation	WDI
$L_{it}$	Labour force	WDI
$IQ_{it}$	Institutional Quality	WGI
$Wom_{it}$	Percentage of women in the parliament	WDI
$Pop_{it}$	Total population	WDI
$Lang_{ijt}$	Official Language	(Mayer & Zignago, 2011)
$Pdens_{it}$	Population density	WDI and UNSD for the year 2019
$Area_{it}$	Total area	CEPII distance database
$\gamma$	GDP percentage change at constant prices	WEO
$\tau$	The current balance as GDP percentage	WEO
$\phi$	The average price level for the consumer	WEO
$\zeta$	Unemployment rate	WDI
$ODA_{it}$	Net ODA received in current USD	WDI

Note: WRLD -World Revenue Longitudinal Data

WDI- World Development Indicator

WGI- Worldwide Governance Indicator

UNCTADstat- United Nation Conference on Trade and Development-Statistics

THF- The Heritage Foundation

UNSD- United Nations Statistics Division

CEPII- Centre d'Etudes Prospectives et d'Informations Internationales

WEO- World Economic Outlook Database (IMF)

Data are analyzed under Stata and Eviews.

## **CHAPTER 3: TAX COMPETITION, OFFICIAL DEVELOPMENT ASSISTANCE, AND MACROECONOMIC PERFORMANCE: RESULTS, DISCUSSION AND POLICY RECOMMENDATIONS**

The analytical framework, the estimation technique, the econometric model specification, and the data used for the analysis were presented in the previous chapter. The present chapter presents the results and gives policy recommendations.

Following the hypotheses of the study, this chapter has two sections. One regarding tax competition and macroeconomic performance and another focusing on the impact of aid on macroeconomic performance in sub-Saharan Africa.

### **3.1. Tax Competition And Macroeconomic Performance In Sub-Saharan African Countries: Results, Discussions And Policy Recommendations**

This section presents results for both horizontal and vertical tax competition and macroeconomic performance in sub-Saharan Africa. However, transfer pricing results are also presented.

#### **3.1.1. Horizontal Tax Competition**

##### **Descriptive Statistics**

This study considers 42 countries broken down as follows: 13 belong to east Africa; 8 to central Africa; 16 are from West Africa; and the remaining 5 belong to southern Africa. A simple descriptive analysis of the data (see Table 4 and 5) shows that countries of southern Africa have an average GDP per capita (with parity of purchasing power) higher than any other sub-region. They are followed by countries of central Africa; then comes east Africa; and finally West Africa. This ranking is the same when regions are ranged according to their average tax rate: southern Africa comes first, followed by central; east; and finally West Africa. Trade openness comparisons reveal that southern Africa is ranked first followed by central Africa, West Africa, and then east Africa. Table 4 also shows that regions with tax rates are generally the more open.

**Table 4.** Comparative analysis

Rank	Region	GDP, PPP (\$)	Tax rate (%)	Rank	Region	Openness (%)
1	Southern Africa	9227.15	30.36	1	Southern Africa	1.00
2	Central Africa	7751.77	16.04	2	Central Africa	0.83
3	East Africa	3046.12	12.94	3	West Africa	0.71
4	West Africa	2613.92	11.72	4	East Africa	0.59

Then, one can conclude that:

- Regions with high income contribute the most to tax revenue. This is in line with studies such as Auriol and Warlters (2005).
- Rich regions are more or less open than other regions;
- Regions with higher tax revenue are more open than regions with lower tax rates. This finding is quite consistent with Addison and Levin (2012).

On a country basis, the top five countries with higher GDP per capita (with parity of purchase power) are Equatorial Guinea; Mauritius; Gabon; Botswana; and South Africa in this order. As for the top five countries with low GDP per capita, there are Mozambique; Malawi; Central African Republic; D. R. Congo; and Burundi.

Countries that tax revenue contributes the most to GDP are Lesotho; Congo; Angola; Namibia; and South Africa. While countries that tax revenue contributes the less are the Central African Republic; Comoros; Nigeria; Guinea-Bissau; and Chad.

**Table 5.** Comparative analysis

Rank	Country	GDP, PPP (\$)	Rank	Country	Tax rate (%)
1	Equatorial Guinea	29831.32	1	Lesotho	43.50
2	Mauritius	17353.12	2	Congo	39.99
3	Gabon	14926.10	3	Angola	32.35
4	Botswana	14666.22	4	Namibia	29.88
5	South Africa	11954.15	5	South Africa	27.40
38	Mozambique	1061.07	38	Guinea-Bissau	7.10
39	Malawi	989.49	39	Central African Rep.	7.07
40	Central African Rep.	876.99	40	Comoros	6.99
41	D.R. Congo	773.82	41	Nigeria	6.98
42	Burundi	706.110	42	Chad	6.26



**Table 6.** Descriptive statistics

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std.Dev</b>	<b>Min</b>	<b>Max</b>
Tax rate (%)	630	15.1454	9.03504	1.90847	54.0817
Foreign direct investment (\$)	630	9.5E+20	1.4E+22	6.74281	3.0E+23
GDP_PPP (\$)	630	4513.63	5793.30	518.840	38407.8
Openness (%)	630	0.73762	0.34646	0.20722	3.11354
Economic freedom (\$)	630	54.4565	7.56822	21.4	77
Investment (\$)	630	23.3823	8.96457	1.52517	53.9879
Government expenditure (%GDP)	630	14.5005	6.24019	2.04712	41.8879
Agriculture (% GDP)	630	22.0898	14.2150	0.89269	66.0327
Inflation (%)	630	6.94435	13.6866	-72.729	255.292
Labor	630	8007552	1.1E+07	147532	5.9E+07
Institutional quality	629	-0.6183	0.575121	-1.69807	0.853919
Population	630	2.E+07	3.0E+07	463032	2.0E+08
Percentage of women in parliament	630	18.8754	12.0263	0	63.75
Population density	630	98.4496	129.168	2.3543	625.452
Area (Km2)	630	501314.	516710.	1862	2345410

Table 6 gives summary statistics of variables. Then, for an average population of 208 million inhabitants, only around 18% of the seat in parliament are for women.

It is worth highlighting that the standard deviation for the total population is greater than its average value. This might be explained by the extreme values taken by countries. Indeed, the minimum is 463,032 inhabitants (Cabo Verde in 2005) and the maximum is 200,563,599 inhabitants (Nigeria in 2019).

The average tax rate in sub-Saharan Africa from 2005 to 2019 is 15.14% meaning that 15% of GDP in the region comes from tax collection. Private investment represents 23.38% of GDP; the informal sector contributes 22.08% of GDP. The lowest value was attributed to Equatorial Guinea in 2008 (0.892696) and the highest to Liberia in 2005 (66.03273).

The overall economic freedom index is 54.45% with its lowest value of 21.4% (Zimbabwe in 2010) and its highest is 77% (Mauritius in 2012). Let us recall that the index is comprised between 0 and 100. The more values are closed to 100, the better economic freedom is. Then, one can conclude a presence of economic freedom in sub-Saharan Africa during 2005-2019. Besides, the overall inflation rate is around 6.94%.

Meanwhile, the institutional quality index gives an overall score of -0.61 representing then a poor quality of institutions in the region. Indeed, the index is ranged between -2.5 and 2.5. In sub-Saharan Africa, the highest value of the index is obtained in 2015 by Mauritius (0.85) and the lowest by the Central African Republic (-1.69) in 2014.

The correlation matrix (Table 7) shows a high correlation between the total population and labor force (0.9795). Worded differently, the table shows that total population and labor are highly correlated. Other correlations are detected: Agriculture (informal sector) and tax rate (about -57%); agriculture and GDP\_PPP (-59%); and agriculture and government expenses (about 38%).

Table 8 shows the correlation matrix between independent variables. Thus, by taking off the dependent variable from the analysis, the correlation between variables does not change very much. For instance, the labor variable and the total population are still highly correlated (-0.91).

**Table 7.** Correlation Matrix

	<i>Rt</i>	<i>fdi</i>	<i>gdpppp</i>	<i>open</i>	<i>freedom</i>	<i>agri</i>	<i>inv</i>	<i>g</i>	<i>inf</i>	<i>labor</i>	<i>iq</i>	<i>poptot</i>	<i>percwom</i>	<i>density</i>	<i>area</i>
<i>rt</i>	1														
<i>fdi</i>	0.288	1													
<i>gdpppp</i>	0.1937	-0.0236	1												
<i>open</i>	0.5277	0.2046	0.2944	1											
<i>freedom</i>	0.0889	-0.0275	0.2755	-0.0677	1										
<i>agri</i>	-0.5733	-0.0827	-0.5963	-0.281	-0.251	1									
<i>inv</i>	0.2162	0.0088	0.1601	0.2839	0.1878	-0.2442	1								
<i>g</i>	0.6405	0.1777	0.1174	0.3856	0.091	-0.3866	0.1567	1							
<i>inf</i>	-0.0393	-0.0017	-0.075	-0.006	-0.1046	0.0222	-0.0559	-0.0646	1						
<i>labor</i>	-0.185	-0.0428	-0.1515	-0.3276	-0.0026	0.1083	0.0775	-0.2829	0.1447	1					
<i>iq</i>	0.3601	0.0219	0.2863	0.1279	0.767	-0.3931	0.2651	0.3305	-0.1052	-0.1786	1				
<i>poptot</i>	-0.1898	-0.04	-0.1266	-0.3162	0.0014	0.0818	0.0344	-0.2895	0.1301	0.9795	-0.1892	1			
<i>percwom</i>	0.1988	-0.0296	-0.0161	-0.1266	0.1411	-0.1579	0.2092	0.2884	0.0524	0.1248	0.2087	0.0542	1		
<i>density</i>	-0.114	-0.0243	0.0629	-0.167	0.3151	0.0303	-0.1969	-0.0421	-0.0273	-0.0207	0.2435	-0.005	0.1783	1	
<i>area</i>	-0.0463	-0.0517	-0.124	-0.14	-0.1199	0.0411	0.2225	-0.174	0.0911	0.5155	-0.2158	0.4939	0.0439	-0.4184	1

<i>e(V)</i>	<i>fdi</i>	<i>gdpppp</i>	<i>open</i>	<i>freedom</i>	<i>inv</i>	<i>agri</i>	<i>g</i>	<i>labor</i>	<i>inf</i>	<i>iq</i>	<i>poptot</i>	<i>percwom</i>	<i>density</i>	<i>area</i>	<i>_cons</i>
<i>fdi</i>	1														
<i>gdpppp</i>	0.0378	1													
<i>open</i>	-0.1416	-0.0304	1												
<i>freedom</i>	-0.0637	-0.1844	-0.0251	1											
<i>inv</i>	0.0766	-0.1594	-0.2929	0.0519	1										
<i>agri</i>	0.0609	0.2448	-0.2283	-0.0057	0.0799	1									
<i>g</i>	0.0162	0.1781	-0.0722	0.0714	-0.1268	0.2388	1								
<i>labor</i>	-0.0592	-0.0464	0.1757	0.0776	-0.0827	-0.0873	0.0367	1							
<i>inf</i>	-0.0058	0.0296	0.0202	-0.0785	0.0091	-0.0157	0.0933	0.0138	1						
<i>iq</i>	-0.0115	-0.0393	0.1455	-0.2907	-0.1511	0.1186	-0.0231	0.0504	0.0516	1					
<i>poptot</i>	0.0398	0.0283	-0.0887	-0.0892	0.0314	0.0895	0.0064	-0.9125	-0.002	0.0147	1				
<i>percwom</i>	0.0777	0.023	0.0968	-0.0309	-0.0107	0.0179	-0.1848	-0.2983	-0.0327	-0.0873	0.2198	1			
<i>density</i>	0.0184	0.0043	-0.0554	-0.2115	0.0678	0.0672	-0.0596	-0.0428	0.0317	-0.0717	-0.0805	-0.1387	1		
<i>area</i>	0.0223	0.0793	-0.0445	-0.068	-0.0185	0.0357	0.0013	-0.1547	-0.0026	0.028	-0.0277	0.0191	0.4078	1	
<i>_cons</i>	0.0203	-0.0658	-0.0409	-0.7597	-0.1504	-0.2888	-0.2855	-0.0272	0.0211	0.3817	0.0579	-0.0873	-0.0933	-0.2581	1

## Estimation Results and Discussion

This study aims to analyze horizontal tax competition as contributing to macroeconomic performance in sub-Saharan Africa. Then, it is important to first ask the following question: *is there any evidence of horizontal tax competition in sub-Saharan Africa?*

Let us recall the equation of horizontal tax competition.

$$\begin{aligned}
 r_{it} = & \alpha_{0i} + \alpha A_{ijt} + \beta_0 GDP_{PCit} + \beta_1 FDI_{it} + \beta_2 TO_{it} + \beta_3 EF_{it} + \beta_4 I_{it} + \beta_5 Agri_{it} \\
 & + \beta_6 G_{it} + \beta_7 i_{it} + \beta_8 L_{it} + \beta_9 IQ_{it} + \beta_{10} Pop_{it} + \beta_{11} Lang_{ijt} \\
 & + \beta_{12} Pdens_{it} + \beta_{13} Percwom_{it} + \beta_{14} Dist_{ijt} + \beta_{15} Area_{it} \\
 & + \vartheta \qquad \qquad \qquad (1)
 \end{aligned}$$

With  $A_{ijt} = \sum_{i \neq j} z_{ij} r_{jt}$

$$z_{ij} = \left\{ \begin{array}{l} \text{Contiguity matrix: 1 if countries share same borders and 0 otherwise;} \\ \text{Geographical distance: } \frac{1}{d_{ij}} / \sum_j \frac{1}{d_{ij}} ; \\ \text{GDP per capita: } \frac{1}{\sqrt{gdp_{it} - gdp_{jt}}} / \sum_j \sqrt{\frac{1}{gdp_{it} - gdp_{jt}}} ; \\ \text{GDP: } \frac{1}{GDP_{jt}} / \sum_j \frac{1}{GDP_{jt}} \\ \text{Preferential Trade Agreement: } \left\{ \begin{array}{l} \frac{GDP_{jt}}{\sum_{t \in SR_{kt}} GDP_{jt}} \text{ if } j \in SR_{kt}, j \neq i \\ 0 \text{ if } j \notin SR_{kt}, j \neq i \end{array} \right\}; \\ \text{Trade Openness: } \frac{\sum_s TO_{jt-s}}{\sum_j \sum_s TO_{jt-s}}, s = 3,4,5, \text{ and } j \neq i \end{array} \right.$$

The configuration of the equation (1) commanded us to adopt a least square dummy variable (LSDV) approach of fixed effects for estimation. This method helps capture both country-specific and pair characteristics. Ignoring these effects when they exist would lead to biased estimations (see Inançlı and Addi, 2019).

This study takes into account the two first considerations of  $z_{ij}$ . Then, for  $z_{ij} = \frac{1}{d_{ij}} / \sum_j \frac{1}{d_{ij}}$ ,

the coefficient of  $A_{ijt}$  is found to be negative (see Table 9). Meaning that there is no evidence of tax competition in sub-Saharan Africa. This can be compared to the result obtained by Xing and Zhang (2017) which showed a positive sign of the variable.

On the other hand, the equation is estimated by considering a contiguity matrix.

Then the result shows evidence of tax competition in sub-Saharan Africa. Indeed, following table 9,  $\alpha = 0.03$ , relatively smaller than the result obtained by Xing and Zhang (2017) and Edmark and Ågren (2008) in their studies on China and Sweden respectively.

Variables such as foreign direct investment; economic freedom; investment; agriculture (informal sector); labor; and distance are found to be negatively and significantly affecting tax revenue while trade openness; government expenditure; inflation; institutional quality; population; language; density; percentage of women in parliament; and area are positively and significantly affecting tax revenue. Only GDP\_PPP is non-significant.

More specifically, a one-unit increase of foreign direct investment; economic freedom index; investment; and agriculture (informal sector) has a likely effect on reducing tax revenue by 0.0006; 0.1244; 0.0997; and 0.1342 respectively, all things being equal. Unlikely, a one-unit increase of trade openness; government expenditure; inflation; institutional quality index; percentage of women in parliament has a likely effect on stimulating tax revenue by 0.0472; 0.5790; 0.0418; 0.0297; and 0.0744 respectively, all things being equal. The results also show that sharing a common official language with a partner country increases horizontal tax competition; having a large population, vast territory, or high population density stimulates tax competition. The results reveal that the more countries are distant from each other; the least horizontal tax competition is among them.

**Table 9.** Evidence of horizontal tax competition in sub-Saharan Africa for  $A_{ij} =$

$$\frac{1}{d_{ij}} / \sum_j \frac{1}{d_{ij}}$$

<b>Dependent Variable: RT</b>				
<b>Method: Panel Least Squares</b>				
<b>Variables</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
Constant	0.3228	0.010812	29.86122	0.0000
A	-0.1107	0.032347	-3.42327	0.0006
Log(GDP_PPP)	0.0024	0.000689	3.428394	0.0006
Foreign Direct Investment	0.0003	0.000112	2.500397	0.0124
Trade Openness	0.0648	0.000865	74.91235	0.0000
Economic Freedom	-0.3632	0.008497	-42.7474	0.0000
Investment	-0.2354	0.005209	-45.1809	0.0000
Agriculture	-0.2910	0.003713	-78.3721	0.0000
Government expenditure	0.6898	0.008942	77.14652	0.0000
Inflation	0.2230	0.004346	51.32015	0.0000
Log(L)	-0.0172	0.002423	-7.10565	0.0000
Institutional Quality	0.0258	0.001012	25.50045	0.0000
Log(Pop)	-0.0050	0.00326	-1.54858	0.1215
Language	0.0008	0.000645	1.28801	0.1978
Log(dens)	0.0144	0.002232	6.439862	0.0000
Percentage of women in parliament	0.0650	0.003858	16.85449	0.0000
Log(Distance)	-0.0012	0.000409	-2.91505	0.0036
Log(Area)	0.0216	0.002249	9.597691	0.0000
Observations	25200			
R-squared	0.7044	Mean dependent var		0.152434
Adjusted R-squared	0.7042	S.D. dependent var		0.091174
S.E. of regression	0.0496	Akaike info criterion		-3.16934
Sum squared resid	61.9269	Schwarz criterion		-3.16353
Log-likelihood	39951.66	Hannan-Quinn criteria.		-3.16746
F-statistic	3529.303	Durbin-Watson stat		0.285906
Prob(F-statistic)	0.0000			

**Table 10.** Evidence of horizontal tax competition in sub-Saharan Africa for  $A_{ij}$  being a contiguity matrix

**Dependent Variable: RT**

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Constant	0.1408*	0.0073	19.2100	0.0000
A	0.0315*	0.0009	33.5895	0.0000
Log(GDP_PPP)	0.0005	0.0005	1.0333	0.3015
Foreign Direct Investment	-0.0006*	0.0001	-8.3309	0.0000
Trade Openness	0.0472*	0.0006	81.1567	0.0000
Economic Freedom	-0.1244*	0.0057	-21.6734	0.0000
Investment	-0.0997*	0.0038	-26.3093	0.0000
Agriculture	-0.1342*	0.0028	-47.5200	0.0000
Government expenditure	0.5790*	0.0061	94.8017	0.0000
Inflation	0.0418*	0.0029	14.2633	0.0000
Log(L)	-0.0324*	0.0016	-19.8618	0.0000
Institutional Quality	0.0297*	0.0007	42.6376	0.0000
Log(Pop)	0.0241*	0.0022	10.9766	0.0000
Language	0.0008**	0.0004	1.7464	0.0807
Log(dens)	0.0061*	0.0015	4.0327	0.0001
Percentage of women in parliament	0.0744*	0.0028	26.3633	0.0000
Log(Distance)	-0.0005**	0.0003	-1.8940	0.0582
Log(Area)	0.0060*	0.0015	3.9357	0.0001
Observations:	25200			
Robust Statistics				
R-squared	0.4589	Adjusted R-squared	0.4585	
Rw-squared	0.7987	Adjust Rw-squared	0.7987	
Akaike info criterion	28398.3500	Schwarz criterion	28555.3600	
Deviance	32.4930	Scale	0.0338	
Rn-squared statistic	86987.2000	Prob(Rn-squared stat.)	0.0000	
Non-robust Statistics				
Mean dependent var	0.1524	S.D. dependent var	0.0912	

\* p<0.01, \*\* p<0.1



Now that there is evidence of horizontal tax competition in Africa, it is important to analyze its effects on macroeconomic performance.

Let us remind that macroeconomic performance is examined in this study according to the Normalized Economic Performance Index (NEPI) developed by Medrano-B and Teixeira (2013). Thus, the following equation helps determine the effect of horizontal tax competition on macroeconomic performance in sub-Saharan Africa.

$$\begin{aligned}
 A'_{it} = & \alpha_{0i} + \alpha A_{ijt} + \beta_1 FDI_{it} + \beta_2 TO_{it} + \beta_3 EF_{it} + \beta_4 I_{it} + \beta_5 Agri_{it} + \beta_6 G_{it} + \beta_7 L_{it} \\
 & + \beta_8 IQ_{it} + \beta_9 Pop_{it} + \beta_{10} Lang_{ijt} + \beta_{11} Pdens_{it} + \beta_{12} Percwom_{it} \\
 & + \beta_{13} Dist_{ijt} + \beta_{14} Area_{it} \\
 & + \vartheta \qquad \qquad \qquad (2)
 \end{aligned}$$

With  $A'_{it}$  the Normalized Economic Performance Index.

Table 11 below gives the estimation result.

**Table 11.** Macroeconomic performance and horizontal tax competition

**Dependent Variable: A'**

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>z-Statistic</b>	<b>Prob.</b>
Constant	0.51*	0.01	43.24	0.00
A	-0.07*	0.00	-44.03	0.00
Foreign Direct Investment	0.00*	0.00	-15.79	0.00
Trade Openness	-0.05*	0.00	-58.40	0.00
Economic Freedom	0.08*	0.01	15.65	0.00
Investment	0.11*	0.01	24.44	0.00
Agriculture	0.09*	0.00	17.88	0.00
Government expenditure	-0.30*	0.01	-34.79	0.00
Log(L)	0.15*	0.00	57.70	0.00
Institutional Quality	-0.04*	0.00	-39.43	0.00
Log(Pop)	-0.12*	0.00	-34.89	0.00
Language	0.00*	0.00	3.66	0.00
Log(dens)	-0.01*	0.00	-5.29	0.00
Percentage of women in parliament	-0.12*	0.00	-25.32	0.00
Log(Distance)	0.00*	0.00	-2.76	0.01
Log(Area)	-0.02*	0.00	-6.44	0.00
Included observations:	25200			
Robust Statistics				
R-squared	0.4405	Adjusted R-squared	0.4401	
Rw-squared	0.6641	Adjust Rw-squared	0.6641	
Akaike info criterion	25313.11	Schwarz criterion	25467.37	
Deviance	68.4531	Scale	0.0520	
Rn-squared statistic	39377.74	Prob(Rn-squared stat.)	0.0000	
Non-robust Statistics				
Mean dependent var	0.523815	S.D. dependent var	0.0916	
S.E. of regression	0.062408	Sum squared resid	98.0782	

\* p<0.01

All variables are significant at 1 percent. Result reveals that horizontal tax competition negatively affects economic performance in the region. Indeed, any increase in the level of tax competition is likely to lead to a decrease of macroeconomic performance index in sub-Saharan Africa of 0.07 unit, all things being equal. Though this is very small in magnitude, there is evidence of a negative effect of horizontal tax competition on economic performance in sub-Saharan Africa. This is against the a priori expectations of the study.

Foreign direct investment; common language; and distance between countries are found to have no impact on macroeconomic performance in sub-Saharan Africa. Indeed, their coefficients are null. Worded differently, any increase in FDI will not have any effect on economic performance. This is against Mullen et al. (2005) who recommended policymakers give special attention to FDI as a guide to economic performance. More recently, Sirag and Ali (2018) show that FDI leads to economic performance via financial institutions.

As for trade openness, the result reveals a small but negative impact on macroeconomic performance. In other words, trade openness contributes to reducing macroeconomic performance in sub-Saharan Africa. To the best of our knowledge, there is no study of the effects of trade openness on macroeconomic performance. Generally, studies analyze the effect of trade openness on growth. This is the case of Jahangir and Nirob (2020); Nduka et al. (2013); and Silajdzic and Mehic (2018).

Economic freedom; investment; and Agriculture are positively related to the index. It can be said then: any improvement made in economic freedom; investment level; and agriculture (informal sector), is likely to enhance macroeconomic performance in the region. Following Aysan et al. (2009), investment decisions depend on a good investment environment. In another word, combined with economic freedom, investment is more likely to grow. This emphasized the important place given by the New Institutional Economics to economic freedom (See Altman, 2008).

Being a growing sector in Africa, a large number of the labor force comes from the informal sector (Mathurin and Chalout, 2019). Then, regulating that sector might further improve the economic performance.

Meanwhile, government expenses; institutional quality; percentage of women in the parliament; and countries' total area negatively affect macroeconomic performance in sub-Saharan Africa. Increasing government expenses lead to weakening economic performance in the region. Government should then step back from the economy and promote further liberal policies. Also, having a large area is found to negatively impact economic performance. Having a large area makes it difficult to reach performance in the region.

To sum up, this section investigates evidence of horizontal tax competition in sub-Saharan Africa. The results reveal the existence of horizontal tax competition in the region. Worded differently, sub-Saharan African countries compete with each other by lowering their tax rates to attract investment, depriving countries of an important source of financing. The immediate consequence of this competition is the negative effect on macroeconomic performance. Indeed, following the results, horizontal tax competition is likely to reduce macroeconomic performance in sub-Saharan Africa during 2005-2019.

### ***3.1.2. Vertical Tax Competition***

This sub-section aims to analyze the effect of vertical tax competition on macroeconomic performance in Sub-Saharan Africa.

Contrary to horizontal tax competition, vertical tax competition considers both central and local government interactions. Due to the difficulty in getting suitable data in the field, only the case of Tanzania will be analyzed in this study.

Located in East Africa and bordering the Indian Ocean, Tanzania is a neighboring country of Kenya and Uganda to the north, Rwanda; Burundi; and the Democratic Republic of Congo to the west, and Zambia; Malawi and Mozambique to the south. Just like several African countries, Tanzania has enormous natural resource potentiality such as gold; diamond; tanzanite; and natural gas. Agriculture plays an important role in the Tanzanian economy.<sup>16</sup>

With its diverse fauna deemed to contain around 20% of species of Africa's mammal population, its famous marine and national parks (such as Serengeti national park or

---

<sup>16</sup> <https://www.ke.tzembassy.go.tz/tanzania/natural-resources-and-mining-in-tanzania>

Ngorongoro conservation area), its beautiful islands, and its multicultural environment, Tanzania is one of the best touristic destinations in Africa<sup>17</sup>.

Since July 2020, Tanzania has upgraded from a low-income country to a lower-middle-income country<sup>18</sup>. It is worth highlighting that, the recent Covid-19 crisis has negatively affected virtually all Tanzanian sectors, except gold export. Indeed the country has experienced a dramatic decline in its growth moving from 5.8% in 2019 to an estimated rate of 2.0% in 2020<sup>19</sup>. However, despite this decline, Statistica (2021), ranked Tanzania 3<sup>rd</sup> largest economy in East Africa and 6<sup>th</sup> in sub-Saharan Africa during 2020.

Regardless of the potentialities of Tanzania, it is worth recalling that this country has been chosen for the analysis solely due to the availability of data.

Hence the following equation is used to examine vertical tax competition in Tanzania. All the variables are expressed in their natural logarithm to avoid inconsistent estimations.

$$TE_{it} = \alpha + \beta VR_{it} + \vartheta \quad (3)$$

$TE$  is the local government tax effort. Tax effort can be calculated following different approaches. This study adopts the approach of Kim (2007) which divides the local tax revenue by GDP of the region.

$$TE = \frac{\text{Local tax revenue}}{\text{Local GDP}}$$

$VR_{it}$  is an index of the vertical tax relationship with the central government.

$$VR_{it} = \frac{TR_{it}}{TR_{it} + Transfer_{it}}$$

With  $TR_{it}$  representing tax revenue collected by a province  $i$  during period  $t$ ; and  $Transfer_{it}$  represents any kind of transfer by the central government to a province  $i$  during period  $t$ . The transfer could be in kind of subvention; grants; or aid (Xing and Zhang, 2017).  $VR$  is a measure of tax autonomy a province has. The high  $VR$  is for a province, the large its tax effort is. In other words, if the central government were to give

---

<sup>17</sup> <https://www.aworldtotravel.com/best-places-to-visit-in-africa/>

<sup>18</sup> <https://www.worldbank.org/en/country/tanzania/overview>

<sup>19</sup> <https://www.worldbank.org/en/country/tanzania/overview>

larger fiscal autonomy to municipalities, they would work harder to collect taxes (Xing and Zhang, 2017).

In the case of the existence of vertical tax competition, its effect on macroeconomic performance in sub-Saharan Africa should be determined following the below equation:

$$A'_t = \alpha + \beta VR_{it} + \vartheta \quad (4)$$

$A'_t$  represents macroeconomic performance index of Tanzania during year  $t$ . The following table represents the 22 different regions considered for the study. Data for transfer (grants) were obtained in bulk for local governments from the IMF database<sup>20</sup>. To get grants received by every region, we adopted a simplified approach consisting in distributing grants to regions regarding their population level. This technique could reduce the importance of our study but due to the lack of data, this is the only way we have to get an estimation of transfer received by local governments in Tanzania. Furthermore, the lack of data reluctantly forces us to consider only the year 2015 for vertical tax competition in sub-Saharan Africa in general and particularly in Tanzania.

### 3.1.2.1 Descriptive Analysis

**Table 12.** Regional tax revenue and grant (in Tanzanian Shillings)

	<b>Region</b>	<b>Tax revenue</b>	<b>Population</b>	<b>Grant per region</b>
1	Arusha	266841.3061	1694310	1.03138E+11
2	Coast	19056.97784	1098668	66879558000
3	Dar es salam	5038436.002	4364541	2.65684E+11
4	Dodoma	29850.99449	2083588	1.26835E+11
5	Iringa	39861.93059	941238	57296272771
6	Kagera	30226.03026	2458023	1.49628E+11
7	Kigoma	8815.390141	2127930	1.29534E+11
8	Kilimanjaro	112024.2433	1640087	99837524749
9	Lindi	5778.648117	864652	52634229434
10	Mara	74870.65488	1743830	1.06153E+11
11	Mbeya	75279.47427	1708548	1.04005E+11
12	Morogoro	44248.64688	2218492	1.35047E+11

<sup>20</sup> <https://data.imf.org/regular.aspx?key=60991462>

13	Mtwara	48335.82698	1270854	77361089794
14	Mwanza	117269.8132	2772509	1.68772E+11
15	Ruvuma	7748.677433	1004539	61149614181
16	Shinyanga	22036.95152	1376891	83815912991
17	Singida	4942.94015	1370637	83435211308
18	Tabora	16898.96481	2291623	1.39499E+11
19	Tanga	99316.3427	2045205	1.24498E+11
20	Rukwa	8067.505935	1004539	61149614181
21	Manyara	9423.447881	1425131	86752441476
22	Zanzibar	143936.3969	1303569	79352560138
<b>Source</b>	TAR	TAR	NBS	IMF

TAR: Tanzania Revenue Authority;

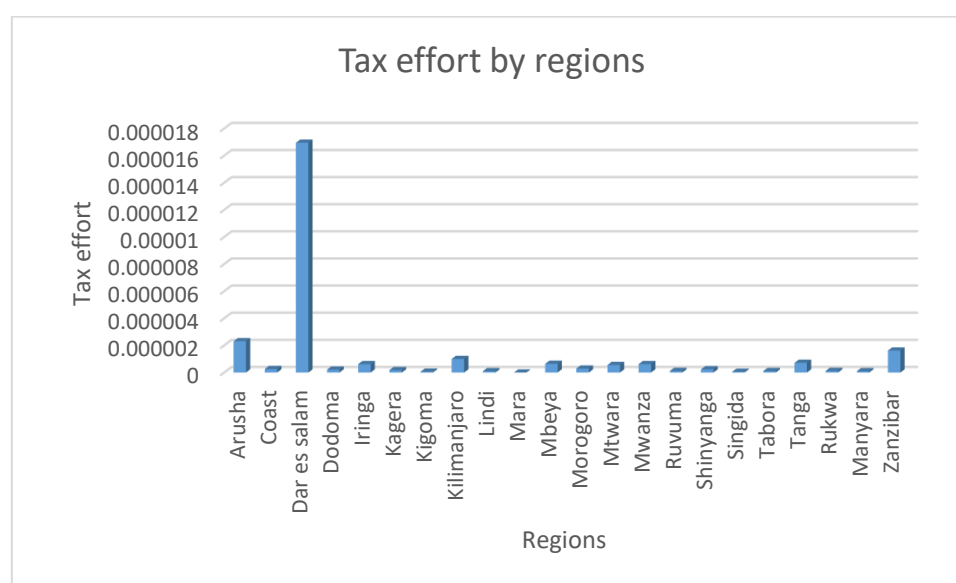
IMF: International Monetary Fund;

and NBS: National Bureau of Statistics Tanzania

**Table 13.** Tax effort by regions

Region	Tax effort
Dar es salam	1.70E-05
Arusha	2.31E-06
Zanzibar	1.62E-06
Kilimanjaro	1.00E-06
Tanga	7.13E-07
Mbeya	6.47E-07
Iringa	6.22E-07
Mwanza	6.21E-07
Mtwara	5.58E-07
Morogoro	2.93E-07
Coast	2.55E-07
Shinyanga	2.35E-07
Dodoma	2.10E-07
Kagera	1.81E-07

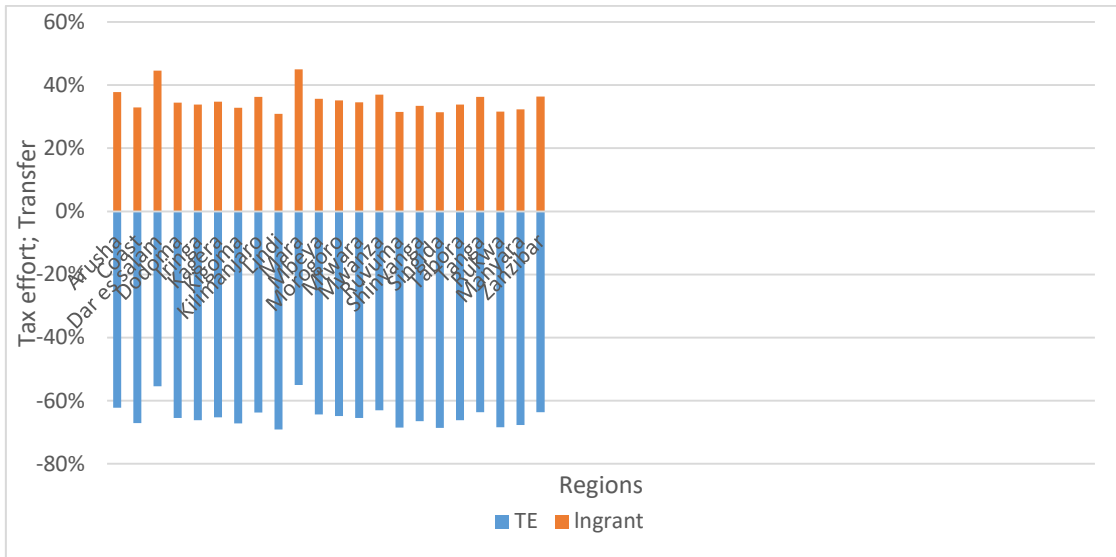
Rukwa	1.18E-07
Ruvuma	1.13E-07
Tabora	1.08E-07
Lindi	9.81E-08
Manyara	9.71E-08
Kigoma	6.08E-08
Singida	5.30E-08
Mara	7.30E-16



**Figure 6:** Tax effort by regions

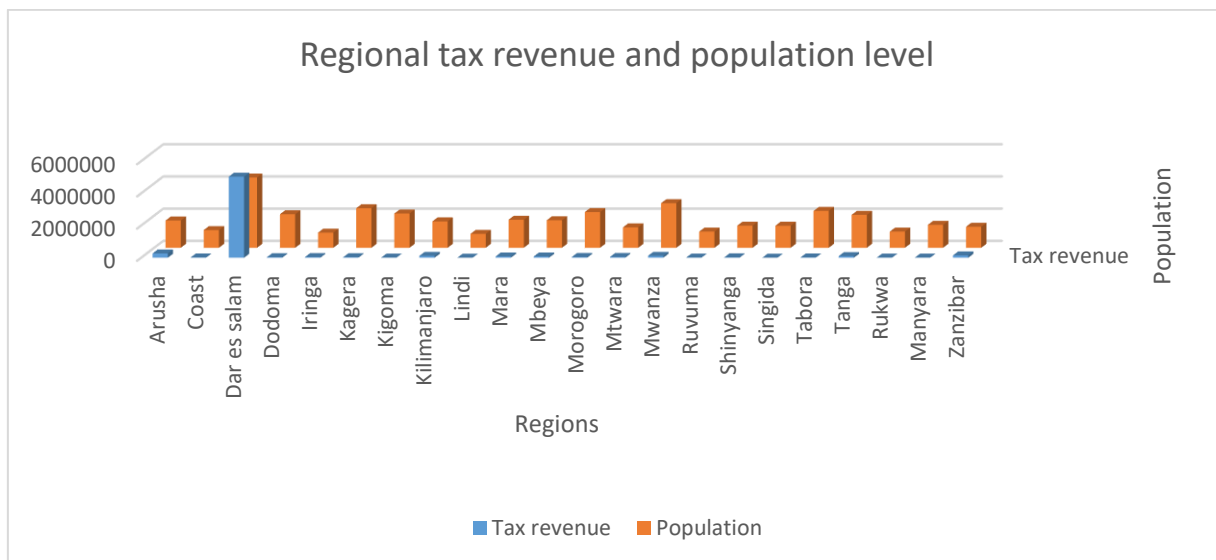
Table 13 and figure 6 show tax effort by region. Thus, it can be noticed that Darussalam exerts more effort in collecting taxes than any other Tanzanian region, followed by Arusha and Zanzibar. Mara has the lowest tax effort in Tanzania. It is then natural to think that regions with low tax efforts would receive more transfers from the central government. The case of Chinese provincial tax collection constitutes an example. Indeed, to further receive a fiscal transfer from the central government, Chinese local governments reduce their tax effort (see Xing and Zhang, 2017).





**Figure 7: Tax effort and transfer**

From the above histogram, it can be concluded that transfer exerts downward pressure on regional tax effort. In another word, the more a region collects taxes, the least it receives a transfer from the central government. This result is confirmed by Nicholson-crotty (2008) for the case of the U.S.



**Figure 8: Regional tax revenue and population-level**

Figure 8 is a histogram for tax collected and population level of local governments in Tanzania during 2015. Being the economic capital city of Tanzania, Darussalam is the most populated and contributes the most to tax collection in the country. Thus, it is natural

to consider that Darussalam would receive less transfer than any other region in the country.

### Estimation

This part aims to analyze the effect of vertical tax competition on the macroeconomic performance of Tanzania. For that reason, the estimation will be conducted following two steps. First of all, evidence of vertical tax competition among jurisdictions should be given before evaluating the impact of that competition on macroeconomic performance.

**Table 14.** Estimation result

VARIABLES	Ln(TE)
Ln(VR)	1.172***
	(0.059)
Constant	-1.420
	(0.875)
Observations	22
R-squared	0.921
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

VR is found to be positively significant at 1% to the local tax effort. This indicates that fiscal decentralization has positive effects on local tax collection. Worded differently, fiscal decentralization helps local governments collect more taxes in Tanzania. Thus, there is evidence of vertical tax competition in Tanzania for the year 2015. This result is in line with Xing and Zhang (2017) who demonstrated vertical tax competition evidence in China.

Now that vertical competition is found to be existing, the next step is to evaluate its impact on the macroeconomic performance of the regions.

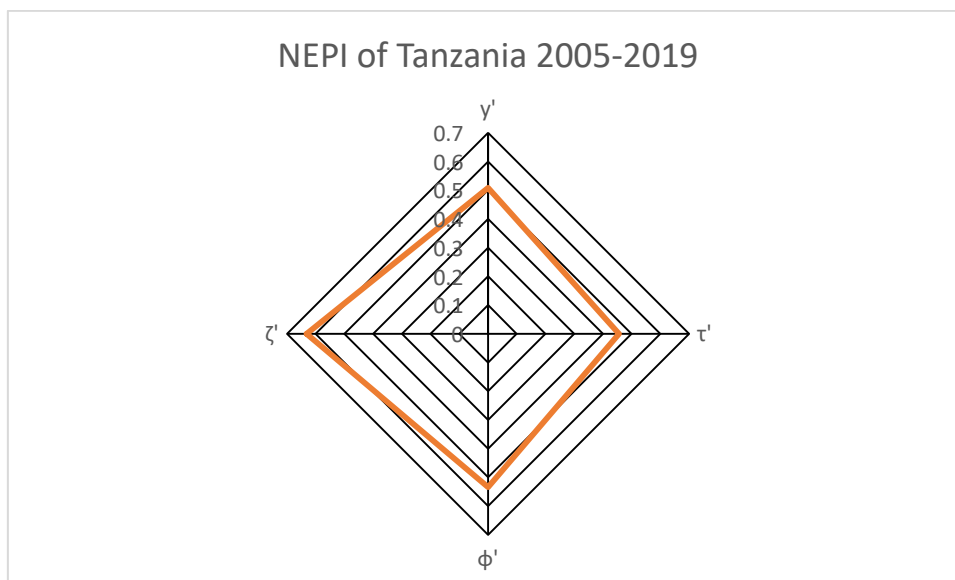
Figures 7 and 8 give the nature and the evolution of the NEPI in Tanzania from 2005 to 2019.

Figure 7 shows that during the given period 2005-2019, Tanzania has mastered improving the four Kaldorian objectives (growth, external balance, unemployment, and inflation)

but especially, the country has mastered reducing unemployment; and fighting against inflation.

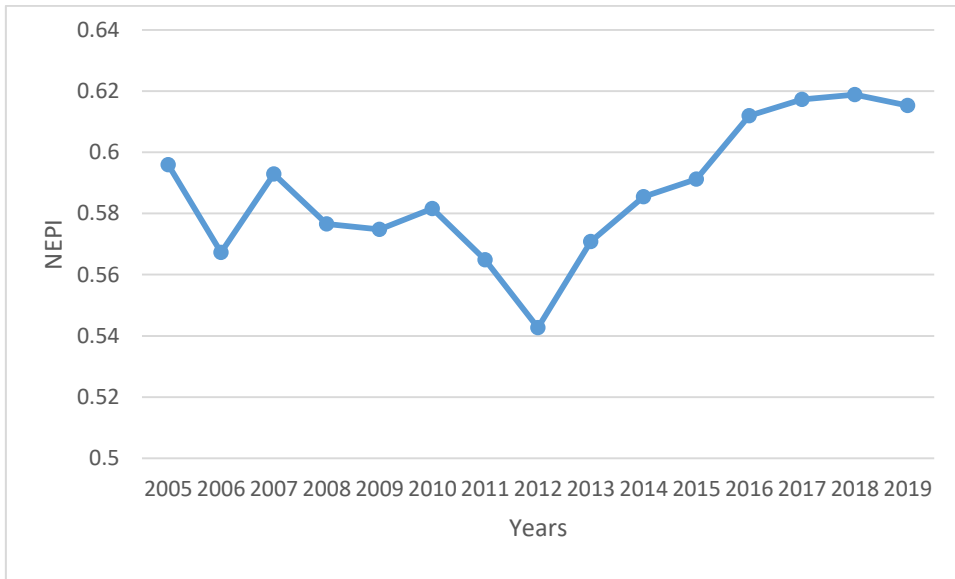
Figure 8 shows that the macroeconomic performance index went through different stages (up and down) until 2012 when the country experienced its lowest level. Afterward, the figure shows a growing trend until 2018. However, in 2019, Tanzania has experienced a low performance. This might be explained by the advent of the Covid-19 which has negatively affected several main sectors in the country.

Figures 5 and 6 are in line with the World Bank report which upgraded Tanzania from a low-income country to a lower-middle-income country in 2020<sup>21</sup>.



**Figure 9:** NEPI of Tanzania from 2005 to 2019

<sup>21</sup> <https://www.worldbank.org/en/country/tanzania/overview>



**Figure 10:** NEPI evolution from 2005 to 2019

Since there is a lack of regional data, this section will lie on the following assumption: wealthiest provinces attract more workers (more populated), produce and export more, and suffer the most from inflation. Worded differently, the wealthiest regions have better macroeconomic performance. Therefore, to get regional macroeconomic performance indices, this study distributes the Tanzanian macroeconomic performance index of 2015 to its 22 considered regions, following their contribution to national revenue of that year 2015.

**Table 15.** Estimation result

VARIABLES	Ln(A)
Ln(VR)	-1.202***
	(0.027)
Constant	-21.308***
	(0.100)
Observations	22
R-squared	0.990
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

The above table reveals that vertical tax competition negatively and significantly affects local macroeconomic performance in Tanzania for the studied period 2015. Then, for every 1% increase in tax autonomy (VR), the local macroeconomic performance index is likely to decrease by about 1.102%, *ceteris paribus*. This indicates that vertical tax competition harms local performance in Tanzania.

*In fine*, this study reveals that tax autonomy (VR) in Tanzanian regions led to tax effort and unfortunately weak performance during the year 2015. A possible explanation might be given by Flowers (1988) who is considered as the pioneer in vertical tax competition studies. The author demonstrates the inefficiency of a such model in which both central and local governments maximize their interest.

This conclusion should not be generalized to entire sub-Saharan Africa. It merely concerns Tanzania during 2015 since getting African local government data constitutes a great challenge.

### **Discussion And Policy Recommendation**

Results reveal that both the horizontal and the vertical tax competitions have negative effects on the macroeconomic performance in SSA.

Tax competition described here has some characteristics of monopolistic competition such as many countries and investors are involved but competition is imperfect because of differences in products (countries have different potentialities and capacities) and geographical location (some countries like Cameroon or Tanzania have access to the ocean, while others like Rwanda and Chad have not); knowledge is widely spread among members but is imperfect; countries are price makers (in this case, the price is tax burden). It is worth noting that in the short run, monopolistic competition is characterized by superprofit whereas, in the long run, the profit tends to zero. Then, this thesis recommends **adopting innovative tax policy strategies such as further “product differentiation”**.

This study shows a negative impact of tax competition on macroeconomic performance in sub-Saharan Africa. It should be noted that the macroeconomic performance index in this context is not the final output in our monopolistic competition, rather the index encompasses several variables (economic growth; inflation rate; unemployment rate; and external balance). Low tax revenues would compromise public missions such as building

infrastructures and delivering public services. In addition, developing countries collect less tax on average (10-15% of GDP) than developed countries (30-40% of GDP)<sup>22</sup>. An estimation of USD 40 to 80 billion is lost by Africa every year due to tax evasion (See The Africa Initiative, 2019). Hence, this may explain the negative nexus between tax competition and macroeconomic performance in sub-Saharan Africa.

Another possible explanation is countries are in a monopolistic long-run equilibrium. To remain in the short run, where the profit is higher, countries need to adopt innovative policy strategies such as **rewarding both tax collector agents and taxpayers and shaming non-payers**. Indeed, following Khan et al. (2016), offering large amounts of money to tax collectors help improve tax collection in the Pakistan Punjab region by 9 to 13 points over 2010-2014, with gains exceeding incentives cost. Increasing transparency regarding taxpayers is effective as well. The case of Bangladesh is a good example. Indeed, an experiment has been conducted in the country consisting in sending information about taxpayers to randomly selected firms. As a result, the volume of tax collection has considerably increased the following year of the experiment<sup>23</sup>.

However, another interpretation of that negative relationship might be explained by **corruption; embezzlement of public funds; or poor governance**. The Corruption Perceptions Index (CPI) ranked SSA as the lowest region during 2019 with an average score of 32 out of 100 (Transparency International, 2020). Knowing that the average global score is 43 (Duri, 2020), it can say that corruption is highly affecting SSA. For a better picture of the situation, figure 11 of the appendix shows how corrupted the countries are, with 0 denoting the most corrupt and 100 the least. Then, Seychelles; Botswana; and Cabo Verde scored respectively 66; 61; and 58, representing the least corrupted countries in 2019, whereas Equatorial Guinea; South Sudan; and Sudan, respectively scoring 16; 12; and 9 represent the most corrupted countries in the region. This has caused huge damage to African economies, and alongside embezzlement and fraud, constitute economic crimes that need to be severely condemned. Following the Africa Initiative report of 2019 (The Africa Initiative, 2019), \$50 to \$80 billion each year is diverted away from legal financial flows in Africa. In addition, 44% of Africa's financial wealth is offshore. This represents €17 billion in tax revenue losses. Hopefully,

---

<sup>22</sup> <https://www.theigc.org/impact/innovative-tax-policies/>

<sup>23</sup> <https://www.theigc.org/impact/innovative-tax-policies/>

actions are seriously taken by governments, and institutions such as the African Union to fight against these economic crimes. The annual publication of the “*tax transparency in Africa*” represents an excellent example of global tax transparency and exchange of information to fight these crimes such as corruption, tax evasion, and fraud. Other measures taken by government consist in jailing people involved in such crimes. Yet, these all these measures seem to be insufficient since the continent is still suffering from such crimes even during the Corona outbreak<sup>24</sup> .

This study recommends policymakers to further efforts in fighting against corruption, fraud, tax evasion, and profit shifting and fraud by **improving transparency and exchange information**; in fighting against embezzlement by **taking much more severe sanctions against officials who are involved in**; and by **improving governance**.

The last part of this chapter analyses the effects of ODA on macroeconomic performance in sub-Saharan Africa.

## 2.5. Official Development Assistance And Macroeconomic Performance In Sub-Saharan African Countries: Results, Discussions And Policy Recommendations

This section aims to analyze aid as a contributing element of macroeconomic performance in sub-Saharan Africa.

For this model, the period goes from 2005 to 2019. A simple histogram observation shows that some variables such as aid and trade openness are skewed to the right; hence, after a log transformation, it can be noticed that histograms are more or less symmetric (see figure 12 to 15 of the appendix). Then, to avoid having inconsistent estimations, all variables are transformed into their log form.

Hence,

$$\begin{aligned}
 \text{Log}A'_{it} = & \alpha_{0i} + \alpha_1 \text{Log}ODA_{it} + \beta_1 \text{Log}FDI_{it} + \beta_2 \text{Log}TO_{it} + \beta_3 \text{Log}EF_{it} + \beta_4 \text{Log}I_{it} \\
 & + \beta_5 \text{Log}Agri_{it} + \beta_6 \text{Log}G_{it} + \beta_7 \text{Log}L_{it} + \beta_8 \text{Log}IQ_{it} + \beta_9 \text{Log}Pop_{it} \\
 & + \beta_{10} \text{Log}Pdents_{it} + \beta_{11} \text{Log}Percwom_{it} + \beta_{12} \text{Log}Area_{it} \\
 & + \vartheta \tag{5}
 \end{aligned}$$

<sup>24</sup> <https://www.ft.com/content/617187c2-ab0b-4cf9-bdca-0aa246548745>

With Log representing natural logarithm.

Before applying any test on the model, statistical properties are checked.

### Descriptive statistics

**Table 16.** Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
A'	630	0.525755	0.091268	0.196212	0.723537
FDI	630	4.463463	6.680765	-6.09626	56.78201
TO	630	0.735711	0.347417	0.207225	3.113541
Freedom	630	0.543912	0.076158	0.214	0.77
I	630	0.233753	0.089622	0.015252	0.53988
Agri	630	0.221425	0.142652	0.008927	0.660327
G	630	0.144703	0.062379	0.020471	0.41888
IQ	630	-0.62168	0.574488	-1.69807	0.853919
ODA	630	8.71E+08	1.01E+09	520000	1.14E+10
Percwom	630	0.18813	0.120567	0.30303	0.6375
LPoptot	630	15.99855	1.401053	13.04555	19.11863
LDensity	630	3.873398	1.298819	0.856268	6.438475
LArea	630	12.16505	1.83643	7.529406	14.66797



**Table 17.** Comparative analysis

<b>Rank</b>	<b>Country</b>	<b>Average ODA</b>	<b>Rank</b>	<b>Country</b>	<b>Average A'</b>
1	Ethiopia	\$3, 505, 000,000.00	1	Kenya	0.6157
2	Nigeria	\$3, 241, 000,000.00	2	Rwanda	0.6151
3	D.R. Congo	\$2, 595, 000,000.00	3	Ethiopia	0.6080
4	Tanzania	\$2, 538, 000,000.00	4	Benin	0.6035
5	Kenya	\$2, 119, 000,000.00	5	Chad	0.5965
6	Mozambique	\$1, 874, 000,000.00	6	Uganda	0.5961
7	Uganda	\$1, 710, 000,000.00	7	Nigeria	0.5953
8	Ghana	\$1, 370, 000,000.00	8	Guinea-Bissau	0.5925
9	Mali	\$1, 179, 000,000.00	9	Niger	0.5912
10	Zambia	\$1, 059, 000,000.00	10	Ivory Coast	0.5906

**Table 18.** Comparative analysis

<b>Rank</b>	<b>Country</b>	<b>Average ODA</b>	<b>Rank</b>	<b>Country</b>	<b>Average A'</b>
33	Cape Verde	\$187, 700,000.00	33	Gambia	0.4854
34	Lesotho	\$159, 900,000.00	34	Mauritania	0.4719
35	Botswana	\$146, 410,000.00	35	Cape Verde	0.4706
36	Gambia	\$132, 000,000.00	36	Congo	0.4650
37	Guinea-Bissau	\$194, 000,000.00	37	Botswana	0.4502
38	Eswatini	\$89, 968,667.00	38	Gabon	0.4285
39	Mauritius	\$86, 099,333.00	39	Namibia	0.3720
40	Gabon	\$80, 017,332.00	40	Eswatini	0.3392
41	Comoros	\$62, 132,666.78	41	Lesotho	0.3272

42	Equatorial Guinea	\$25, 394,000.00	42	South Africa	0.3046
----	----------------------	------------------	----	--------------	--------

Tables 17 and 18 show descriptive comparisons for some countries of the study. Indeed, table 17 ranges the top 10 aid recipient and their score obtained in the macroeconomic index, both on average; while table 18 gives the same information for the bottom 10. Thus, Ethiopia is the most aid recipient country on average during 2005-2019 and has the third-best score of macroeconomic performance during the same period. Likewise, Nigeria and Kenya are respectively ranged as the second and the fifth recipient countries while their scores for the index of performance are 0.59 and 0.61 (seventh and first respectively) respectively.

Equatorial Guinea is on average the least aid recipient country during 2005-2019 and is not registered among the top 10 countries with high macroeconomic performance. For South Africa, table 18 shows that it has the lowest score of macroeconomic performance and is not included among the top 10 aid recipient countries. In the same line, Rwanda is presented as having the second-best performance index by table 17 and is not present among countries receiving neither the most nor the least aid during 2005-2019. The relationship between aid and performance needs more investigation.

## **Diagnostic Tests And Regression Analysis**

### **Diagnostic Tests**

Before running any test, a diagnostic test of the model needs to be done. Thus multicollinearity; autocorrelation; heteroscedasticity; and cross dependency test results are presented below<sup>25</sup>:

### **Multicollinearity Test**

Multicollinearity test is run to avoid biased estimations due to a correlation between independent variables.

---

<sup>25</sup> T being less than 30 years, there is no need to run unit root test

From the correlation matrix presented under Table 19 (see Appendix), it can be seen that except for 6 variables, there is no strong correlation between independent variables. Indeed, the Institutional quality index and economic freedom index are highly correlated (72%). Similarly, the labor and the total population variables are highly correlated as well (99%). Also, a high correlation is seen between aid and the labor of about 84% on the one hand, and on the other hand between aid and the total population of 84% as well. Apart from these remarks, no other score upper than 60% is seen. Therefore, it can be said that there is multicollinearity in the model. Nonetheless, to be sure about the presence of multicollinearity in the model, we computed the variance inflation factor (VIF). Table 15 presents the results. As it can be observed, the total population and labor largely exceed 10. Consequently, we conclude that our model suffers from multicollinearity.

**Table 20.** Variance inflation factor

	VIF	1/VIF
Inpoptot	103.888	.01
Inlabor	98.015	.01
Inoda	5.208	.192
Inabsiq	3.349	.299
Infreedom	2.457	.407
Inagri	2.157	.464
Inopen	2.129	.47
Ing	1.613	.62
Infdi1	1.527	.655
Ininv	1.52	.658
Inpercwom	1.477	.677
Indensity	1.256	.796
Mean VIF	18.716	.

### **Autocorrelation Test**

Another test worthy to be run is the autocorrelation test. This test shows if error terms are correlated to avoid biased estimations.

Following Table 21 (see Appendix), our model suffers from the first-order autocorrelation.

### Heteroscedasticity Test

To verify if error terms are normally distributed to avoid biased estimations, a heteroscedasticity test should be run.

The hypotheses of the test are:

H0: There is no heteroscedasticity; Ha: There is heteroscedasticity

**Table 22.** Heteroscedasticity test

Likelihood-ratio test	LR chi2(104)= 590.07
(Assumption: homo nested in hetero)	Prob > chi2 =
0.0000	

From the above table, it can be seen that H0 should be rejected. Therefore we can conclude that our model suffers from heteroscedasticity.

### Cross-Section Dependency Test

Based on Pesaran (2015), we run the Common Correlated Effects estimator (CCE) to determine if the residuals are weakly cross-sectional dependent.

Following the result of the test given below, residuals are strongly cross-sectional dependent.

**Table 23.** Pesaran (2015) test for weak cross-sectional dependence.

Pesaran (2015) test for weak cross-sectional dependence.	
H0: errors are weakly cross-sectional dependent.	
CD	= -1.259
p-value = 0.208	

To sum up, our model suffers from multicollinearity, autocorrelation, heteroscedasticity, and cross-sectional dependence. Therefore, the simple OLS technique of estimation is not

appropriate; rather fixed and random effects under certain conditions and the panel-corrected standard error (PCSE) can be estimated (see Hoechle, 2007).

### Regression Analysis

In this part, both static and dynamic estimations are considered.

#### Static Panel Estimation

Static estimation encompasses estimations such as pooled OLS, fixed effect, random effect, the feasible generalized least square, and panel-corrected standard errors. However, due to the nature of our model ( $N > T$ ), the feasible generalized least square is not appropriate (see Hoechle, 2007).

#### Pooled Ordinary Least Square estimation

**Table 24.** Pooled OLS

InA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Inoda	-.007	.01	-0.70	.485	-.027	.013	
Infdi	-.049	.02	-2.37	.018	-.089	-.008	**
Inopen	-.062	.02	-3.09	.002	-.101	-.022	***
Infreedom	.037	.061	0.60	.55	-.084	.157	
Ininv	.116	.017	6.76	0	.082	.15	***
Inagri	.065	.009	7.01	0	.047	.084	***
Ing	-.144	.018	-8.04	0	-.179	-.109	***
Inlabor	.311	.04	7.69	0	.232	.391	***
Iniq	-.13	.039	-3.35	.001	-.206	-.054	***
Inpoptot	-.306	.043	-7.12	0	-.39	-.221	***
Indensity	.02	.005	4.01	0	.01	.03	***
Inpercwom	-.034	.012	-2.99	.003	-.057	-.012	***
Constant	-.245	.169	-1.45	.147	-.576	.086	
Mean dependent var	-0.662		SD dependent var		0.201		
R-squared	0.474		Number of obs		630.000		
F-test	46.266		Prob > F		0.000		
Akaike crit. (AIC)	-613.116		Bayesian crit. (BIC)		-555.322		

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

From the above table, it can be seen that the majority of our independent variables are significant at 1% and 5%. However, our principal independent variable (aid), non-significant but negatively related to macroeconomic performance. Among the variable found to be significant, investment; agriculture; labor; and population density are positively associated with macroeconomic performance. Therefore, investing in these variables would help improve economic performance in sub-Saharan Africa. Unlikely, variables such as aid; foreign direct investment; trade openness; institutional quality; total population; and percentage of women in parliament are negatively associated with macroeconomic performance.

However, following the diagnostic tests run above, we concluded that OLS is not appropriate for this model. Hence, the aforementioned results of pooled OLS are not considered.

### Robust Fixed Effect

Running a robust fixed effect helps overcome two of the problems we encountered while running the diagnostic test. These problems are autocorrelation and heteroscedasticity (see Hoechle, 2007).

**Table 25.** Robust fixed effect results

lnA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lnoda	.018	.009	1.93	.061	-.001	.037	*
lnfdi1	-.066	.025	-2.62	.012	-.117	-.015	**
lnopen	.031	.035	0.88	.384	-.04	.101	
lnfreedom	-.175	.102	-1.71	.094	-.38	.031	*
lninv	-.022	.026	-0.83	.414	-.075	.031	
lnagri	-.111	.051	-2.15	.037	-.215	-.007	**
lng	-.049	.057	-0.86	.392	-.165	.066	
lnlabor	-.133	.263	-0.51	.616	-.665	.399	
lnabsiq	.145	.107	1.36	.182	-.071	.362	

Inpoptot	-3.53	7.753	-0.46	.651	-19.188	12.128	
Indensity	3.497	7.791	0.45	.656	-12.238	19.231	
Inpercwom	-.011	.044	-0.26	.8	-.1	.077	
Constant	43.518	93.777	0.46	.645	-145.868	232.905	
Mean dependent var	-0.662		SD dependent var		0.201		
R-squared	0.122		Number of obs		630.000		
F-test	2.983		Prob > F		0.005		
Akaike crit. (AIC)	-1115.666		Bayesian crit. (BIC)		-1057.872		
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

In this case, only four variables are significant: aid (positive and significant at 1%); foreign direct investment (negative and significant at 5%); economic freedom index (negative and significant at 1%); and agriculture (negative and significant at 5%). It can be noticed that the majority of variables significant and non-significant are negatively related to macroeconomic performance.

### Robust Random Effect

Like the robust fixed effect, the robust random effect would fix multicollinearity and heteroscedasticity (see Hoechle, 2007).

**Table 26.** Robust random effect results

InA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lnoda	.022	.01	2.16	.031	.002	.043	**
lnfdi1	-.072	.032	-2.24	.025	-.134	-.009	**
lnopen	-.006	.035	-0.18	.855	-.074	.061	
lnfreedom	-.147	.082	-1.78	.075	-.308	.015	*
lninv	.013	.027	0.48	.634	-.04	.066	
lnagri	.017	.033	0.51	.613	-.048	.082	
lng	-.072	.068	-1.07	.285	-.205	.06	
lnlabor	.114	.15	0.76	.446	-.179	.407	
lnabsiq	.021	.077	0.27	.787	-.13	.171	

Inpoptot	-.108	.158	-0.68	.495	-.418	.202	
Indensity	.011	.012	0.89	.374	-.013	.034	
Inpercwom	-.054	.031	-1.76	.079	-.114	.006	*
Constant	-1.273	.486	-2.62	.009	-2.225	-.322	***
Mean dependent var	-0.662		SD dependent var		0.201		
Overall r-squared	0.349		Number of obs		630.000		
Chi-square	23.207		Prob > chi2		0.026		
R-squared within	0.045		R-squared between		0.475		
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

Like for the fixed effect, four independent variables are significant: aid is significant at 5% and positively affects macroeconomic performance; foreign direct investment is significant at 5% and negatively affects economic performance; economic freedom index is found to be significant at 1% and negatively related to macroeconomic performance, and finally, percentage of women in a parliament is negatively associated with macroeconomic performance and significant at 10%.

### Panel-Corrected Standard Errors: Results, Discussions, and Policy

#### Recommendations

Our model is a micro-panel ( $N > T$ ) and suffers from several problems such as autocorrelation; heteroscedasticity; and cross-dependency. According to Hoechle (2007), the appropriate estimation technique for a such model is the Panel-Corrected Standard Errors (PCSE).

It is worth recalling that one of the objectives of this study is to analyze the contribution of aid in macroeconomic performance in sub-Saharan Africa. Thus, the results presented in the following table may help break down better that contribution.

**Table 27.** Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

InA	Coef.	St.Err.	t-value	p-value	[95% Conf Interval]	Sig
Inoda	.011	.014	0.83	.409	-.016 .039	
Infdi	-.05	.026	-1.94	.053	-.102 .001	*



lnopen	-.06	.035	-1.74	.082	-.128	.008	*
lnfreedom	-.077	.18	-0.43	.67	-.429	.276	
lninv	.074	.04	1.86	.063	-.004	.152	*
lnagri	.045	.018	2.56	.01	.011	.08	**
lng	-.084	.042	-2.02	.043	-.166	-.003	**
lnlabor	.224	.065	3.46	.001	.097	.351	***
lniq	-.083	.071	-1.18	.239	-.222	.055	
lnpoptot	-.221	.07	-3.17	.002	-.358	-.085	***
lndensity	.022	.009	2.48	.013	.005	.04	**
lnpercwom	-.045	.016	-2.76	.006	-.077	-.013	***
Constant	-.762	.314	-2.43	.015	-1.377	-.147	**
Mean dependent var	-0.662		SD dependent var		0.201		
R-squared	0.341		Number of obs		630.000		
Chi-square	149.682		Prob > chi2		0.000		
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

From Table 27, foreign aid is found to have an insignificant positive effect on macroeconomic performance in sub-Saharan Africa. This indicates that although aid has the potential to positively affect the economic performance in the region, its current level is not sufficient enough to spur macroeconomic performance in sub-Saharan African countries. This is in contrast with the modern theory of development which considers aid as a factor of production per se. More accurately, this finding is against studies such as Chenery and Strout (1966) Papanek (1973); Mosley et al. (1987); Chaudhuri (1978); Levy (1987); Newlyn (1990); Roemer (1989); Adam and O'Connell (1999); Davenport (1970) and more recently Pham and Pham (2020). These studies, using empirical techniques demonstrate the positive effect of aid on the economy.

Foreign direct investment; trade openness; g; total population; percentage of women in parliament are found to have a significant negative effect on macroeconomic performance in sub-Saharan Africa whilst investment; agriculture; labor; and population density are significant and positively related to macroeconomic performance in the studied region.

Indeed, from the above table, it can be seen that *foreign direct investment* is significant at 10%. Then, for every 1% increase in foreign direct investment, the macroeconomic

performance index decreases by about 0.05%. Besides, for every 20% increase in foreign direct investment, the macroeconomic performance index decreases by about 0.90%. Thus, this indicates that in sub-Saharan Africa, an increase in foreign investment volume is not useful for stimulating better macroeconomic performance. We then conclude that improving foreign direct investment is harmful to economic performance in sub-Saharan Africa. This finding can be explained by the irregularities of foreign direct investment in the region (see figures 6 and 7 in the appendix). Indeed, this can destabilize a country's economic development and complicate the application of economic policy instruments (Vissak and Roolaht, 2005). Besides, being a cost-oriented investment, foreign direct investment inflows are sensible to cost factors variation. Hence, a sudden increase in labor costs in one country may result in a redraw of FDI from that particular country. This may cause an increase in macroeconomic indicators such as unemployment; production; export; and inflation. In short a deterioration of macroeconomic performance. Nonetheless, receiving more or less FDI is not beneficial or harmful per se. The effectiveness of FDI depends on government policies on how to manage the inflows received. Thus, **governments should adopt appropriate policies that can attract and absorb foreign direct investments such as reducing labor cost; improving infrastructure quality; governance; reducing corruption. In short, by improving the political and economic environment, sub-Saharan Africa can attract and absorb more foreign direct investment inflows.**

Likewise, *trade openness* is found to be negatively significant at 10%. Each 1% increase in trade openness is likely related to a decrease of the index of macroeconomic performance by about 0.06%. Then, for every 10% increase in trade openness, the index is likely to decrease by 0.57%. This finding points out the negative effect of trade openness on macroeconomic performance in sub-Saharan Africa. This is in contrast to that of Semancikova (2016) and Siyakiya (2017) but quite similar to that of Pigka-Balanika (2013). Indeed, this result may be explained by the existence of natural trade barriers, export mainly depending on natural resources, poor transport infrastructures to the distant large market in the sub-Saharan African region.

However, the recent establishment of the African Continental Free Trade Area (AfCFTA) is a source of hope for the future of trade and consequently of better economic performance in the region. Then, to completely benefit from that, **governments**

**should create conditions for better integration such as building better transport infrastructure. They should also promote import-substitution industrialization policies (see Inançli and Addi, 2019) for the case of the Economic Community of Central African States) to improve macroeconomic performance in sub-Saharan Africa.**

*The total population* negatively affects macroeconomic performance and is significant at 1%. For every 1% increase in the total population level, the macroeconomic performance index decreases by about 0.22%. In addition, for every 20% increase in total population level, the macroeconomic performance index decreases by about 3.93%. This finding points out that a large population is not a source of economic performance in sub-Saharan Africa. Indeed, sub-Saharan Africa is home to low-income countries. Increasing the population rate in this context may slow development (Peterson, 2017). Contrariwise, By considering 30 countries among the most populated in the world, Sibe et al. (2016) reveal a positive relationship between population growth and economic growth. Hocktsen and Furuoka (2005) for Asian economies found mixed results. Indeed, they found a bidirectional Granger causality between population and economic growth for Japan; Korea; and Thailand, a unidirectional Granger causality from population to economic growth for China; Singapore; and the Philippines. Finally, for Taiwan and Indonesia, results show no evidence of Granger causality between population and economic growth. Then since the results find the total population harming macroeconomic performance, this study recommends governments of sub-Saharan Africa **promote familial planning and advisory centers by training and monitoring cadres in the field. Methods such as task sharing in a couple, and contraception uptakes may help limit childbearing. This may enhance the macroeconomic performance in the region.**

As for the *percentage of women in parliament*, table 27 reveals a negative and significant at 1% effect on macroeconomic performance. More precisely, each 1% increase in that percentage leads to a decrease of about 0.045% in macroeconomic performance in sub-Saharan Africa. Furthermore, for every 40% rise in the percentage of women in parliament, the macroeconomic performance index decreases by about 1.5%. This indicates that the presence of women in politics does not help economic performance. This is against women empowering theories and more especially against studies such as Baskaran et al. (2018) and Bhalotra (2018) which in the case of India, found female

legislators to likely be less criminal and corrupt, and less vulnerable to political opportunism than male legislators. In short, they found that in constituencies led by women, there is better economic performance. However, Bhalotra (2018) points out that in the short to medium term, female legislators are less effective than men legislators. Therefore, many more years might be required for women to influence positively macroeconomic performance in sub-Saharan Africa.

*Investment* is positively significant at 10%. Every 1% increase in investment volume is followed by about 0.074% increase in macroeconomic performance index in sub-Saharan Africa. Worded differently, for every 20% increase in investment volume the macroeconomic performance index does increase by about 1.35% all things being the same. Then, it can be said that private investment positively and significantly contributes to macroeconomic performance in sub-Saharan Africa. This finding is in line with the economic theory and quite similar to studies such as Khan and Reinhart (1990); Makuyana and Odhiambo (2019); and Ari and Koc (2020) for the case of the U.S. These studies demonstrate the positive effect of private investment on economic growth. As for policy recommendations, the present study calls for **a substantial amount of specific policies for the promotion of private investment in sub-Saharan Africa such as tax exemption; subvention to start-up companies; construction of better public infrastructures (roads and hospitals); governance improvement (fighting against corruption).** In short, this study recommends government of sub-Saharan Africa improve conditions that might help attract private investment in the region.

*The agriculture sector* is found to be positively significant at 5%. For a better understanding, let us recall that the agriculture variable depicts agriculture, forestry, and fishing value-added share of GDP. This measures the size of the informal sector in the country. Thus, following the finding, each increase of 1% in the informal sector leads to an increase of about 0.045% in the economic performance index in sub-Saharan Africa. In another word, for every 30% increase in the informal sector in the region, the macroeconomic performance index increases by around 1.18%. This tells us that the informal sector in sub-Saharan Africa contributes positively to macroeconomic performance. This result is in line with the teachings of the forerunners of economics: such as the physiocrats and Adam Smith. Besides, though less broad than our study, Martin (2019) and Sertoğlu et al. (2017) examined the effect of agriculture, not on

macroeconomic performance in general, but economic growth. Their results show the importance of focusing on agriculture.

With the discovery of oil, several countries in sub-Saharan Africa have diverted away from agriculture to crude oil (Nigeria; Ghana; and the Democratic Republic of Congo). Crude is a finite resource and has volatile prices. Then, **governments of the region need to rely on agriculture, which, according to the aforementioned result, positively and significantly affects macroeconomic performance in the region. They should further diversify their economies to avoid external shocks.**

*Labor and population density* are found to be positively significant at 1% and 5% respectively. For every 1% increase in labor and population density, macroeconomic performance increases by about 0.224% and 0.022% respectively. Worded differently, with each 10% increase in labor and population density, the index of macroeconomic performance increases by about 2.15% and 0.20% respectively in the region. Then, we can say that labor and population density positively contribute to macroeconomic performance in sub-Saharan Africa. This is in line with the economic theory and with studies such as Zulu and Mattondo (2015) and Yegorov (2015). The latter shows the importance of population density on harvesting societies (i.e. societies depending on agriculture and natural resources). In previous work, Yegorov (2009) determines an optimum level of population density compatible with economic growth. Studies regarding population density also include Tiffen (1995).

Following Borat et al. (2015) and Golub et al. (2015) who suggest market regulations are impediments to employment in sub-Saharan Africa; and Abdychev et al. (2018), this thesis recommends the followings:

- **Increase the level of the minimum wage to encourage labor factor;**
- **Focus on creating new jobs rather than only protecting existing jobs;**
- **Facilitate access to finance;**
- **Build good infrastructures;**
- **Seriously fight against corruption and land use;**
- **Strengthen public-private partnership;**
- **Develop an education system consistent with the labor market;**

- **Boost regional trade integration (the AfCFTA is a great example of trade integration).**

Following the pre-estimation tests, this study is suitable for a GMM estimation.

### **Dynamic Panel Estimation**

Another method to fix heteroscedasticity and autocorrelation within the panel is to run dynamic panel estimation. The method considered by this thesis is the Generalized Method of Moments (GMM). Indeed, apart from heteroscedasticity and autocorrelation, GMM is suitable among others for situations where independent variables are not strictly exogenous; where N is greater than T; and where there is an arbitrary distribution of fixed effects.

The literature recognizes 2 main GMM estimators: difference GMM and system GMM.

Proposed by Arellano and Bond (1991), difference GMM corrects endogeneity by transforming all regressors via differencing and in that process, removes the fixed effect. However, this technique has a weakness: it subtracts the previous from the contemporaneous ones, thereby magnifying gaps in the unbalanced panel. Worded differently, in the case of an unbalanced panel, applying a system GMM may weaken the results.

As for system GMM, it is proposed by Arellano and Bover (1995) and Blundell and Bond (1998) but unlike difference GMM, corrects endogeneity by introducing more instruments to dramatically improve efficiency. This method transforms the instruments to make them uncorrelated with the fixed effects. Also, system GMM builds a system of 2 equations: an original equation and a transformed one. Another originality of the system GMM is that this technique remedies the flaw of difference GMM abovementioned by using orthogonal deviations. This helps minimize data loss since it subtracts the average of all future available observations of a variable.

Let us recall that for the GMM technique, a lag of the dependent variable has been created and included in the equation as follow:

$$\begin{aligned}
\text{Log}A'_{it} = & \alpha_0 \text{Log}A'_{i-1,t} + \alpha_1 \text{Log}ODA_{it} + \beta_1 \text{Log}FDI_{it} + \beta_2 \text{Log}TO_{it} + \beta_3 \text{Log}EF_{it} \\
& + \beta_4 \text{Log}I_{it} + \beta_5 \text{Log}Agri_{it} + \beta_6 \text{Log}IQ_{it} + \beta_7 \text{Log}Pop_{it} \\
& + \beta_8 \text{Log}Pdens_{it} + \beta_9 \text{Log}Percwom_{it} + \beta_{10} \text{Log}Area_{it} + \varepsilon_{it} \quad (6)
\end{aligned}$$

With  $\text{Log}A'_{i-1,t}$  a lag of  $\text{Log}A'_{it}$  and  $\varepsilon_{it}$  the error terms. The equation considers 7 instruments. The number of instruments is considered sufficient if the Arrelano-Bond test for AR(1) is significant and for AR(2) not significant.

**Table 28.** Difference and system GMM estimation results

	<b>Dif. GMM</b>	<b>Dif. GMM</b>	<b>Sys. GMM</b>	<b>Sys. GMM</b>
<b>VARIABLES</b>	One-step	Two-step	One-step	Two-step
<b>lnA_1</b>	0.246*** (0.067)	0.234*** (0.031)	0.360*** (0.081)	0.395*** (0.031)
<b>lnoda</b>	0.018 (0.014)	0.014 (0.010)	-0.063* (0.036)	-0.040** (0.020)
<b>lnfdi</b>	-0.068** (0.027)	-0.068*** (0.010)	-0.025 (0.024)	-0.042*** (0.012)
<b>lnopen</b>	-0.026 (0.045)	-0.006 (0.023)	-0.028 (0.039)	0.005 (0.034)
<b>lnfreedom</b>	-0.197 (0.137)	-0.174*** (0.060)	-0.091 (0.392)	-0.130 (0.128)
<b>lninv</b>	0.023 (0.030)	0.039** (0.017)	0.057 (0.037)	0.082*** (0.023)
<b>lnagri</b>	-0.292*** (0.055)	-0.177*** (0.043)	0.054 (0.040)	0.072*** (0.020)
<b>lnabsiq</b>	0.196 (0.574)	0.245 (0.183)	0.106 (0.316)	0.128 (0.113)
<b>lnpoptot</b>	78.698 (69.983)	24.588 (64.004)	0.109** (0.044)	0.048 (0.032)
<b>lndensity</b>	-78.883 (69.957)	-24.698 (64.008)	-0.015 (0.053)	0.022 (0.028)
<b>lnpercwom</b>	-0.071 (0.111)	-0.071 (0.052)	-0.149* (0.090)	-0.071* (0.042)
<b>Constant</b>			-1.023 (0.651)	-0.385 (0.394)
Arellano-Bond test for AR(1) in first differences. Prob>z	0.000	0.014	0.000	0.014
Arellano-Bond test for AR(2) in first differences. Prob>z	0.958	0.608	0.887	0.844
Hansen test. Prob>chi2		0.206		0.213
Observations	546	546	588	588
Number of code	42	42	42	42
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 28 presents the results of the two variants of GMM (difference and system). Both one-step and two-step estimations are run. It can be noticed that aid positively affects macroeconomic performance under the difference GMM while the opposite is seen under system GMM. However, the variable is found to be non-significant under difference GMM whilst the system GMM reveals a significance of 10% and 5% (one-step and two-step respectively).



Six variables are significant under system GMM two-step; 4 under system GMM one-step and difference GMM two-step; and 3 are significant under difference one-step.

Since Arrelano-Bond tests for AR (1) in first difference are all significant while for AR(2) are not, it can be said that there is no second-order serial correlation. Hansen's tests are not significant. Thus, the study has a good instrument set.

The study retains as instruments the following variables:

Internal instrument:  $LogA'_{i-1,t}$ ;

External instruments:  $LogODA_{it}$ ;  $LogFDI_{it}$ ;  $LogTO_{it}$ ;  $LogEF_{it}$ ;  $LogI_{it}$ ; and  $LogAgri_{it}$ .

To decide between difference and system GMM, Bond's (2002) rule of thumb is applied. The decision is taken accordingly to the following three steps:

- Step 1: The autoregressive model should be initially estimated by pooled OLS and fixed effects approach
- Step 2: The pooled effect estimate for  $\alpha_0$  (coefficient of the lag of the dependent variable) should be considered an upper-bound estimate, whilst the corresponding fixed effect estimate should be considered a lower-bound estimate.
- Step 3: If the difference GMM estimate obtained is close to or below the fixed effect estimate, the former estimate is downward biased because of weak instrumentation. Then, the system GMM estimator is preferred.

Table 26 provides estimated values of  $\alpha_0$  following pooled OLS; fixed effect; and difference GMM (one-step and two-step) estimation techniques.

**Table 29.** Estimated values of  $\alpha_0$

Estimators	Coefficient
Pooled OLS	0.730
Fixed Effect	0.308
One-step diff. GMM	0.245
Two-step diff. GMM	0.234
One-step sys. GMM	0.360
Two-step sys. GMM	0.394

According to Bond (2002), if under GMM estimation the coefficients of the lag dependent variable are lower than the ones of fixed effect, then difference GMM is more appropriate. Otherwise, the system is more appropriate.

Table 29, gathers estimate coefficients of  $LogA'_{i-1,t}$  ( $\alpha_0$ ) obtained under pooled OLS; fixed effects; difference and system GMM. Since  $\alpha_0$  gotten from GMM estimations are more or less higher than the one of fixed effect, or closer to the one of pooled effect, system GMM is then preferable for this study (see Bond, 2002).

Then table 30 recapitulates system GMM estimations for one-step and two-step.

**Table 30.** System GMM estimation results

<b>VARIABLES</b>	<b>One-step</b>	<b>Two-step</b>
<b>lnA_1</b>	0.360***	0.395***
	(0.081)	(0.031)
<b>Lnoda</b>	-0.063*	-0.040**
	(0.036)	(0.020)
<b>lnfdi</b>	-0.025	-0.042***
	(0.024)	(0.012)
<b>lnopen</b>	-0.028	0.005
	(0.039)	(0.034)
<b>lnfreedom</b>	-0.091	-0.130
	(0.392)	(0.128)
<b>lninv</b>	0.057	0.082***
	(0.037)	(0.023)
<b>lnagri</b>	0.054	0.072***
	(0.040)	(0.020)
<b>lnabsiq</b>	0.106	0.128
	(0.316)	(0.113)
<b>lnpoptot</b>	0.109**	0.048
	(0.044)	(0.032)
<b>lndensity</b>	-0.015	0.022
	(0.053)	(0.028)

<b>Inpercwom</b>	-0.149*	-0.071*
	(0.090)	(0.042)
<b>Constant</b>	-1.023	-0.385
	(0.651)	(0.394)
Arellano-Bond test for AR(1) in first differences. Prob>z	0.000	0.025
Arellano-Bond test for AR(2) in first differences. Prob>z	0.650	0.824
Hansen test. Prob>chi2		0.665
Observations	588	588
Number of code	42	42
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

As it can be seen from the previous table, *the lagged form of the macroeconomic performance index* is found to positively and significantly affect the dependent variable, by both one-step and two-step estimations. More precisely, each 10% increase in the macroeconomic performance index in year T-1, is most likely to rise the macroeconomic performance index of year T by about 0.3% in sub-Saharan Africa, *ceteris paribus*. Besides, for every 10% increase in the previous year's macroeconomic performance, the current performance increases by about 3.85 %, all things being the same. Then the macroeconomic performance for the previous term plays a role of memory for the next term.

*Foreign aid* negatively affects the macroeconomic performance in the region. Indeed, every 1% increase in foreign aid leads to a decrease of about 0.06% (following one-step GMM) and 0.04% (following two-step GMM) of the macroeconomic performance in the region. Likewise, for every 20% increase in foreign aid flow to sub-Saharan Africa, the macroeconomic performance index is supposed to decrease by about 1.08% and 0.72% following one-step and two-step respectively. Hence, it can be said that aid harms Africa's development, even though the amplitude of that impact is relatively low. In another word, foreign is harming sub-Saharan Africa.

This result is against the one we found under static estimation. Indeed, following the PCSE test run under static estimation, foreign aid has an insignificant positive effect on macroeconomic performance in sub-Saharan Africa.

This finding is in the same line with Moyo (2009) and Anetor et al. (2020). Other studies such as Chenery and Strout (1966) Papanek (1973); Mosley et al. (1987); Chaudhuri (1978); Levy (1987); Newlyn (1990); Roemer (1989); Adam and O'Connell (1999); Davenport (1970) and more recently Pham and Pham (2020) using empirical techniques also demonstrate the positive effect of aid on the economy.

Then, following Moyo (2009) the solution consists **to foster entrepreneurship and market-oriented policies such as bond supplying to raise capital in non-traditional markets (due to challenges of traditional capital markets)**. Besides, African countries **need to attract more foreign direct investments by adopting better tax policies, to emphasize trade with partners such as China. Furthermore, to help African countries reduce poverty and strengthen growth, donor countries have to stop financing aid.**

This study also recommends governments of sub-Saharan Africa *develop a better accountability system that will be transparent and include all forms of aid received by all international agencies to guarantee aid is strictly used for development purposes only. Furthermore, to ensure a better impact of aid, governments should channel aid inflows to key sectors such as education, health, and infrastructure. In short, aid should be tailored to poverty reduction.*

*Foreign direct investment* is found to be negatively affecting macroeconomic performance in sub-Saharan Africa under the system GMM two-step. Indeed, for every 1% increase in foreign investment, macroeconomic performance is more likely to decrease by about 0.042, *ceteris paribus*. Likewise, every 10% increase in foreign direct investment is followed by a decrease of macroeconomic performance in the region by about 0.39%, all things being the same. A simple comparison of this result with the one gotten from the PCSE, it can be seen that under both techniques, foreign direct investment has a negative and significant effect on macroeconomic performance, and the amplitude of this effect is low. This result might be explained by the fact that sub-Saharan African countries may not have reached yet the minimum level of foreign investment volume,

necessary to stimulate macroeconomic performance. However, finding foreign direct investment having a negative effect is not unprecedented. Studies such as Herzer (2010) and Anetor et al. (2020) have found foreign aid to be negatively affecting the economy.

The policymakers should then **rethink their strategy regarding foreign direct investment. They should apply policies that will further attract foreign direct investment inflows to stimulate macroeconomic performance in the region.**

As for the *private investment*, it is only significant under the two-step at 1%. Hence, for each 1% increase in private investment, macroeconomic performance is likely to increase by about 0.082%, *ceteris paribus*. Thus, private investment positively affects macroeconomic performance in sub-Saharan Africa. This confirms the result found by PCSE and is in line with the economic theory. Furthermore, this finding is in line with studies such as Khan and Reinhart (1990); Makuyana and Odhiambo (2019); and Ari and Koc (2020) for the case of the U.S.

*The informal sector (agriculture)* is significant under two-step only. For every 1 % increase in the agriculture sector, macroeconomic performance increase by about 0.072% *ceteris paribus*. Then, it can be said that the informal sector positively contributes to economic performance in sub-Saharan Africa. This is in line with the result gotten under PCSE and quite similar to studies such as Martin (2019) and Sertoğlu et al. (2017).

This study finds the *total population* positively significant at 5% but only under one step. Hence, for every 20% increase in total population, macroeconomic performance increase by about 2% all thing being the same. This finding is against the one gotten with PCSE, but quite similar to studies such as Sibe et al. (2016); Hocktsen and Furuoka (2005); Thuku et al. (2013); and Furuoka (2010), however. These studies reveal the importance of population rise on economic growth. Although the increase of population is in general beneficial for economic growth, it is important not to confuse with the per capita economic growth, which reduces while population growth increases (see Klasen and Lawson, 2007).

Though total population positively influences economic performance in sub-Saharan Africa, this study recommends **a carefully planned population growth evolving with the economic growth. In addition, governments should ensure that the population must not grow higher than economic growth. This can ensure that the extra demand**

**for goods and services coming from population growth is met. In an economy characterized by a healthy and well-educated population, employment and productivity rates are high. This leads to a better macroeconomic performance index.**

As for the *percentage of women in parliament*, both one and two-step show a negative and significant effect on macroeconomic performance. Indeed, for every 1% increase in that percentage, macroeconomic performance is more likely to decrease by about 0.149% (one-step) and 0.071% (two-step), *ceteris paribus*. This indicates that the presence of women in politics does not help economic performance. This is in line with the result gotten from PCSE but against women empowering theories and more especially against studies such as Baskaran et al. (2018) and Bhalotra (2018) which for the case of India, found female legislators to likely be less criminal and corrupt, and less vulnerable to political opportunism than male legislators. In short, they found that in constituencies led by women, there is better economic performance. However, Bhalotra (2018) points out that in the short to medium term, female legislators are less effective than men legislators. Therefore, many more years might be required for women to influence positively macroeconomic performance in sub-Saharan Africa.

To sum up, this sub-section empirically analyses the effect of foreign aid on macroeconomic performance in sub-Saharan Africa. Thus, both static and dynamic estimation techniques are employed. Under static estimation, the main method was PSCE and under dynamic estimation, the GMM method was adopted. Roughly, just like Moyo (2009) and Anetor et al. (2020), this study finds that foreign aid negatively affects macroeconomic performance in sub-Saharan Africa. Foreign direct investment negatively influences macroeconomic performance while private investment is positively associated with the dependent variable under both PCSE and GMM techniques.

It is worth highlighting that one of the weaknesses of GMM techniques (corrected in PCSE) is that they do not account for cross-sectional dependency.

### **Conclusion Of The Chapter**

In conclusion, this thesis aims to analyze the effects of tax competition (both horizontal and vertical) on macroeconomic performance in SSA, on one hand, and the effects of

foreign aid on the macroeconomic performance in SSA on the other hand. Then, following the study's methodology, this chapter presents the results, their explanation regarding the theory, and policy recommendations. More precisely, the results reveal the existence of horizontal and vertical tax competitions. Worded differently, not only that sub-Saharan African countries compete with each other by lowering their tax rates to attract investment, depriving countries of an important source of financing, but in a case of a single country consideration (Tanzania for the year 2015), the central government and local jurisdictions, sharing the same tax base, compete with each other in collecting taxes. The consequence of these forms of competition is translated into a negative effect on macroeconomic performance in SSA. Indeed, following the results, horizontal tax competition is likely to reduce macroeconomic performance in sub-Saharan Africa during 2005-2019; and vertical tax competition negatively and significantly affects local macroeconomic performance in Tanzania for the studied period 2015. This can be explained by several reasons including the inefficiency of the vertical tax competition model (see Flowers, 1988); and the form of tax competition models similar to the "*monopolistic competition markets*". Therefore, we recommend policymakers to further efforts in fighting against corruption, fraud, tax evasion, and profit shifting by **improving transparency and exchange information**; in fighting against embezzlement by **taking much more severe sanctions against officials who are involved in**; and by **improving governance**.

Furthermore, as for the effect of foreign aid on macroeconomic performance, the results show a negative impact. Then, just like Moyo (2009) and Anetor et al. (2020) found before foreign aid harms SSA. Then **donors have to stop financing aid** which, rather than helping African recipient countries, encourages rampant corruption, and leads to slow economic growth and poverty (see Moyo, 2009). **Entrepreneurship and market-oriented policies such as bond supplying to raise capital in non-traditional markets (due to challenges of traditional capital markets) need to be promoted**. Besides, African countries **need to attract more foreign direct investments by adopting better tax policies, to emphasize trade with partners such as China**. Furthermore, to help African countries reduce poverty and strengthen growth, donor countries have to **stop financing aid**.

This study also recommends governments of sub-Saharan Africa *develop a better accountability system that will be transparent and include all forms of aid received by all international agencies to guarantee aid is strictly used for development purposes only. Furthermore, to ensure a better impact of aid, governments should channel aid inflows to key sectors such as education, health, and infrastructure. In short, aid should be tailored to poverty reduction.*



## CONCLUSION

We aimed to analyze tax competition (horizontal and vertical) and foreign aid as contributing elements to macroeconomic performance in sub-Saharan Africa. In this regard, three chapters are developed. The first one reviews the theoretical and the empirical literature focusing on tax competition and ODA, and their effects on macroeconomic performance; the second presents the methodology related to the impact of tax competition and ODA on macroeconomic performance in SSA; and then the last chapter presents the results, discussion, and policy recommendations.

Indeed, the first part of the first chapter reviews both theoretical and empirical literature on the nexus between tax competition and macroeconomic performance. Then, it appears that tax competition has two main forms: horizontal and vertical competitions.

Horizontal tax competition occurs when jurisdictions do compete with each other generally by reducing their tax rates; ending up in a race to the bottom (see Zodrow and Mieszkowski, 1986) or to a ride on a seesaw (Chirinko and Wilson, 2017). Hence, revision of tax rates in a region pushes other regions to alter theirs and creates instability of tax revenues, necessary to finance public goods. Most often, this situation ends in a non-optimal level of public goods in regions. The empirical verifications are done through statistics, econometrics, and spatial econometrics show the evidence of horizontal tax competition among regions and explain the economic performance of countries (see for instance Liu et al. 2018).

Meanwhile, alongside horizontal tax competition, there is vertical tax competition. This latter appears when in a federal system (or a decentralized State), and due to sharing the same tax bases, tax decisions of one jurisdiction affect tax revenues at another level. This kind of competition produces inefficiencies depending on whether governments are benevolent or not, and on whether the game is played following Nash or Stackelberg's strategies (Clingman and Clingman, 2009). Considered as pioneers in the field, Flowers (1988) and Johnson (1988) developed strong theoretical approaches to vertical tax competition. The authors highlighted evidence of tax competition among governments of different levels of competency, by integrating Cournot-Nash and Stackelberg's strategic game approaches, and by considering the fact that the government is benevolent or not. Empirical verifications made mostly with the help of econometric techniques show

evidence of vertical tax competition among different levels of government when the tax base is the same. Then, for better economic performance, recommendations suggest more autonomy to local governments (see for instance Xing and Zhang, 2018).

Besides, this sub-section introduces transfer-pricing practices in the analysis. Transfer price is the price paid by multinationals during their transactions with their affiliates located abroad. It appears that multinationals generally manipulate their prices to avoid paying taxes by shifting their profits to their affiliates in low-tax countries. To fight against these malpractices, OECD has developed the “arm’s length principle”. Introducing the transfer-pricing strategy in the study aims to investigate the impact of transfer pricing methods on tax competition, and therefore on economic performance. Worded differently, what could be the effect of transfer prices on the magnitude of tax competition, and consequently on macroeconomic performance?

Following the literature on profit shifting strategies, it appears that contrarily to traditional tax competition forms (horizontal and vertical), tax competition based on transfer pricing supposes that the competition exists only between the home (where the parent company is located) and the host (where the subsidiary is located) countries. Indeed, horizontal and vertical competition models supposed that the competition starts before the installation of foreign investment. Transfer price-based models assume tax competition to be set on corporate profits taxes and is therefore established after the installation of the subsidiary in the host country.

Studies on income shifting reveal that transfer-pricing manipulations affect tax revenues, GDP distribution across countries responsible for its creation, the level of firms’ location, and employment (see Harris et al., 1993). Thus, it is worthy to say that transfer pricing may affect macroeconomic performance.

The second part of this chapter gives information regarding the effect of aid on macroeconomic performance. First, an overview of aid in the African context shows that the sub-region has received so far billions and billions of dollars as foreign aid assistance. The allocation of aid is given either by bilateral donors such as the U.S., U.K., and Germany or by multilateral institutions such as IDA, EU, and the AfDB. Aid allocation is absorbed by sectors, the main of them are social sectors; economic sector; production sector; humanitarian sector; multi-sector; and general aid programs. Based on the

statistics given in this sub-section, one can say that aid has been positive to the macroeconomic performance of sub-Saharan Africa. However, it is worth noting that the bilateral allocation during the years following independence was far less than the multilateral allocation (ODA) mainly started during the 1970-1980s. Yet, African countries could not avoid the debt crisis of the 1980s. This could compromise the effectiveness of aid.

Then, studies regarding the matter are reviewed. It has emerged that both theoretical and empirical literature shows evidence of the negative effects of foreign aid on the economic performance of aid recipient countries. Considered as a weapon used to attract allies in the short term since the Cold War, for Friedman (1995) in the long term, it will almost surely retard economic development and help communism to spread. Some studies such as Lensink and White (2001); and Islam (2005) show that after a certain limit, aid becomes harmful for the recipient countries. One of the most virulent critics of aid comes from Moyo (2009). For her, aid is responsible for corruption, slow economic growth, and poverty in Africa. She then points out that unlike countries relying on aid, countries that do not depend on aid such as China, India, or even South Africa are economically successful.

Following the study's methodology, the last chapter presents the results, their explanation regarding the theory, and policy recommendations. More precisely, the results reveal the existence of horizontal and vertical tax competition. Worded differently, not only that sub-Saharan African countries compete with each other by lowering their tax rates to attract investment, depriving countries of an important source of financing, but in a case of a single country consideration (Tanzania for the year 2015), the central government and local jurisdictions, sharing the same tax base, compete with each other in collecting taxes. The consequence of these forms of competition is translated into a negative effect on macroeconomic performance in SSA. Indeed, following the results, horizontal tax competition is likely to reduce macroeconomic performance in sub-Saharan Africa during 2005-2019; and vertical tax competition negatively and significantly affects local macroeconomic performance in Tanzania for the studied period 2015. This can be explained by several reasons including the inefficiency of the vertical tax competition models (see Flowers, 1988); and the form of tax competition models similar to the "*monopolistic competition markets*". Therefore, we recommend policymakers to further

efforts in fighting against corruption, fraud, tax evasion, and profit shifting by **improving transparency and exchange information**; in fighting against embezzlement by **taking much more severe sanctions against officials who are involved in**; and by **improving governance**.

Furthermore, as for the effect of foreign aid on macroeconomic performance, the results show a negative impact. Then, just like Moyo (2009) and Anetor et al. (2020) found before, foreign aid harms SSA. Then **donors have to stop financing aid** which, rather than helping African recipient countries, encourages rampant corruption, and leads to slow economic growth and poverty (see Moyo, 2009). **Entrepreneurship and market-oriented policies such as bond supplying to raise capital in non-traditional markets (due to challenges of traditional capital markets) need to be promoted**. Besides, African countries **need to attract more foreign direct investments by adopting better tax policies, to emphasize trade with partners such as China**. Furthermore, to help African countries reduce poverty and strengthen growth, donor countries have to **stop financing aid**.

This study also recommends governments of sub-Saharan Africa develop a **better accountability system that will be transparent and include all forms of aid received by all international agencies to guarantee aid is strictly used for development purposes only**. Furthermore, to ensure a better impact of aid, governments should **channel aid inflows to key sectors such as education, health, and infrastructure**. In short, **aid should be tailored to poverty reduction**.

However, results regarding vertical tax competition should be taken with some reservations and should not be generalized to the entire region. Indeed, due to the difficulty in getting complete local governments' data in SSA, we could have as a case study Tanzania during the year 2015.

As a future contribution to research in this field, it would be interesting to analyze the joint effect of tax competition and foreign aid on macroeconomic performance in sub-Saharan Africa.

## REFERENCES

- Abdychev, A., Alonso, C., Alper, E., Desruelle, D., Kothari, S., Liu, Y., Perinet, M., Rehman, S., Schimmelpfennig, A., & Sharma, P. (2018). The Future of Work in Sub-Saharan Africa. In *Departmental Papers / Policy Papers* (Vol. 18, Issue 18). <https://doi.org/10.5089/9781484383094.087>
- Adam, C. S., & O'Connell, S. A. (1999). Aid, taxation, and development: Analytical perspectives on aid effectiveness in Sub-Saharan Africa. *The World Bank*.
- Addi, H. M. (2020). The Macroeconomic Performance of Turkey: An application of the Normalized Economic Performance Index (NEPI). In O. Akgül (Ed.) *Proceedings of Economics-Finance-Business. 5th International Student Symposium.*, (pp. 72-85).
- Addison, T., & Levin, J. (2012). *The determinants of tax revenue in sub-Saharan Africa*. <https://www.diva-portal.org/smash/get/diva2:570456/FULLTEXT01.pdf>
- Afawubo, K., & Mathey, S. (2017). The effectiveness of aid on savings and investment in Sub-Saharan Africa: do volatility and institutional quality matter? *Applied Economics*, 49(51), 5212–5230. <https://doi.org/10.1080/00036846.2017.1302066>
- Ali, A. M. ., & Isse, H. S. (2007). Foreign Aid and Free Trade and Their Effect on Income : A Panel Analysis. *The Journal of Developing Areas*, 41(1), 127–142.
- Ali, M., & Zeb, A. (2016). Foreign Aid : Origin , Evolution and its Effectiveness in Poverty Alleviation. *Dialogue (Pakistan)*, 11(1).
- Altman, M. (2008). How much economic freedom is necessary for economic growth? Theory and evidence. *Economics Bulletin*, 15, 1–20.
- Anetor, F. O., Esho, E., & Verhoef, G. (2020). The impact of foreign direct investment, foreign aid and trade on poverty reduction: Evidence from Sub-Saharan African countries. *Cogent Economics and Finance*, 8(1). <https://doi.org/10.1080/23322039.2020.1737347>
- Arazmuradov, A. (2016). The Impact Of Foreign Capital On Macroeconomic Performance In Central Asia. *Annals of Public and Cooperative Economics*, 87(2), 275–304.
- Arellano, M., & Bond, S. (1991). Employment Equations Some Tests of Specification for Panel Data : Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies*, 58(2), 277–297.
- Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51.
- Ari, I., & Koc, M. (2020). Economic Growth , Public and Private Investment : A Comparative Study of China and the United States. *Sustainability*, 12(2243). <https://doi.org/10.3390/su12062243>

- Auriol, E., & Warlters, M. (2005). Taxation base in developing countries. *Journal of Public Economics*, 89, 625–646. <https://doi.org/10.1016/j.jpubeco.2004.04.008>
- Aysan, A., Pang, G., & Véganonès-Varoudakis, M.-A. (2009). Uncertainty , economic reforms and private investment in the Middle East and North Africa Uncertainty , economic reforms and private investment in the Middle East and North Africa. *Applied Economics*, 41, 1379–1395. <https://doi.org/10.1080/00036840601019315>
- Azarnert, L., V. (2008). Foreign aid, Ferility and Human Capital Accumulation. *Economica*, 75(300), 766–781.
- Baskaran, T., Bhalotra, S. R., Min, B., & Uppal, Y. (2018). Women Legislators and Economic Performance. In *IZA Discussion Pappers* (Vol. 11596).
- Bénassy-Quéré, A., Gopalraja, N., & Trannoy, A. (2007). Tax competition and Public Input. *Economic Policy*, 22(50), 385–430.
- Besley, T. J., & Rosen, H. S. (1998). Vertical externalities in tax setting : evidence from gasoline and cigarettes. *Journal of Public Economics*, 70, 383–398.
- Bhalotra, S. R. (2018). *Are women politicians good for economic growth?* International Growth Centre. <https://www.theigc.org/blog/are-women-politicians-good-for-economic-growth/>
- Bhorat, H., Kanbur, R., & Stanwix, B. (2015). Minimum wages in sub-saharan Africa: A primer. *World Bank Research Observer*, 32(1), 21–74. <https://doi.org/10.1093/wbro/lkw007>
- Bicaba, Z., Brixiová, Z., & Ncube, M. (2017). Can Extreme Poverty in Sub-Saharan Africa be Eliminated by 2030 ? *Journal of African Development*, 19(2), 93–110.
- Bird, G., & Choi, Y. (2020). The effects of remittances , foreign direct investment , and foreign aid on economic growth : An empirical analysis. *Review of Development Economics*, 24(1), 1–30. <https://doi.org/10.1111/rode.12630>
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143.
- Boadway, R., & Keen, M. (1996). Efficiency and the Optimal Direction of Federal-State Transfers. *International Tax and Public Finance*, 3, 137–155.
- Bond, E. W., & Samuelson, L. (1986). Tax holidays as signals. *The American Economic Review*, 76(4), 820–826.
- Bond, S. R. (2002). Dynamic panel data models : a guide to micro data methods and practice. *Portuguese Economic Journal*, 1(February), 141–162.
- Brett, C., & Pinkse, J. (2000). The determinants of municipal tax rates in British Columbia. *Canadian Journal of Economics*, 33(3), 695–714. <https://doi.org/https://doi.org/10.1111/0008-4085.00037>

- Brueckner, J. K. (1983). Property value maximization and public sector efficiency. *Journal of Urban Economics*, 14(1), 1–15.
- Burge, G. S., & Rogers, C. L. (2018). Do State Sales Taxes Crowd Out Local Option Sales Taxes? *B.E. Journal of Economic Analysis and Policy*, 18(3), 1–9. <https://doi.org/10.1515/bejeap-2018-0003>
- Burnside, C., & Dollar, D. (2000). American Economic Association Aid , Policies , and Growth. *The American Conomic Review*, 90(4), 847–868.
- Cassette, A. (2007). *Concurrence fiscale, offre de biens et services publics et intégration européenne*. Université de Lille, 1.
- Chaudhuri, P. (1978). The Indian Economy: Poverty and Development. *Crosby Lockwood Staples*.
- Chauvet, L., & Guillaumont, P. (2003). Aid and Growth Revisited : Policy , Economic Vulnerability and Political Instability. *ABCDE*, 95.
- Chauvet, L., & Guillaumont, P. (2009). Aid, volatility, and growth again: When aid volatility matters and when it does not. *Review of Development Economics*, 13(3 SPEC. ISS.), 452–463. <https://doi.org/10.1111/j.1467-9361.2009.00501.x>
- Chenery, H. B., & Strout, A. M. (1966). American Economic Association Foreign Assistance and Economic Development. *American Economic Association Stable URL : Htpps://Www.Jstor.Org/Stable/1813524*, 56(4), 679–733.
- Chirinko, R. S., & Wilson, D. J. (2017). Tax competition among U.S. states: Racing to the bottom or riding on a seesaw? *Journal of Public Economics*, 155(August 2015), 147–163. <https://doi.org/10.1016/j.jpubeco.2017.10.001>
- Clingman, S., & Clingman, S. (2009). Vertical and Horizontal. In *The Grammar of Identity* (pp. 134–166). <https://doi.org/10.1093/acprof:oso/9780199278497.003.0005>
- Coates, D. (1993). Property tax competition in a repeated game. *Regional Science and Urban Economics*, 23(1), 111–119.
- Collier, P., & Dollar, D. (1999). Aid Allocation and Poverty Reduction Policy Research. *Working Paper 2041, Washington, DC: World Bank*.
- Collier, P., & Dollar, D. (2002). Aid allocation and poverty reduction. *European Economic Review*, 46, 1475–1500.
- Cools, M., & Emmanuel, C. (2007). Transfer pricing: the implications of fiscal compliance. In: C.S. Chapman, A.G. Hopwood, and M.D. Shields, Eds. *Handbook of Management Accounting Research*. Amsterdam: Elsevier, 573–585.
- Cristea, A. D., & Nguyen, D. X. (2016). Transfer Pricing by Multinational Firms: New Evidence from Foreign Firm Ownerships. *American Economic Journal: Economic Policy*, 8(3), 170–202.

- Da Costa Campos, R. H., Ferreira, R. T., & Kloeckner, R. (2015). Vertical tax competition in Brazil : Empirical evidence for ICMS and IPI in the period 1995 – 2009. *Economía*, *16*(1), 111–127. <https://doi.org/10.1016/j.econ.2015.03.004>
- Davenport, M. (1970). The Allocation of Foreign Aid: A Cross Section Study, with Special Reference to the Pearson Commission Report. *Bulletin of Economic Research*, *22*(1), 26–42. <https://doi.org/https://doi.org/10.1111/j.1467-8586.1970.tb00053.x>
- Davies, R. B., Martin, J., Parenti, M., & Toubal, F. (2018). Knocking On Tax Haven ' S Door : Multinational Firms And Transfer Pricing. *The Review of Economics and Statistics*, *100*(1), 120–134. <https://doi.org/10.1162/REST>
- Dhillon, A., Wooders, M., Zissimos, B. (2007). Tax competition reconsidered. *Journal of Public Economic Theory*, *9*(3), 391–423.
- Dijkstra, G. (2018). Aid and good governance : Examining aggregate unintended effects of aid. *Evaluation and Program Planning*, *68*(2018), 225–232. <https://doi.org/10.1016/j.evalprogplan.2017.09.004>
- Direction Générale des Impôts de France. (2006). *les Prix de Transfert, Guide à l'usage des PME*.
- Djankov, S., Montalvo, J. G., & Reynal-querol, M. (2008). The curse of aid. *Journal of Economic Growth*, *13*, 169–194. <https://doi.org/10.1007/s10887-008-9032-8>
- Dubois, E., Leprince, M., & Paty, S. (2007). The effects of politics on local tax setting: evidence from France. *Urban Studies*, *44*(8), 1603–1618.
- Durán-Cabré, J. M., Esteller-Moré, A., & Salvadori, L. (2015). Empirical evidence on horizontal competition in tax enforcement. *International Tax and Public Finance*, *22*(5), 834–860. <https://doi.org/10.1007/s10797-014-9333-0>
- Duri, J. (2020). Sub-Saharan Africa: Overview of corruption and anti-corruption. *U4 AntiCorruption Resource Centre-Transparency International*. <https://www.u4.no/publications/sub-saharan-africa-overview-of-corruption-and-anti-corruption>
- Dutta, N., Leeson, P. T., & Williamson, C. R. (2013). The Amplification Effect : Foreign Aid ' s Impact on Political Institutions. *Kyklos*, *66*(2), 208–228.
- Easterly, B. W., Levine, R., & Roodman, D. (2004). American Economic Association Aid , Policies , and Growth : Comment. *The American Economic Review*, *94*(3), 774–780.
- Edmark, K., & Ågren, H. (2008). Identifying strategic interactions in Swedish local income tax policies. *Journal of Urban Economics*, *63*, 849–857. <https://doi.org/10.1016/j.jue.2007.06.001>
- Egger, P., Koethenbueger, M., & Smart, M. (2010). Do fiscal transfers alleviate business tax competition? Evidence from Germany. *Journal of Public Economics*, *94*(3–4),



235–246. <https://doi.org/10.1016/j.jpubeo.2009.10.002>

- Ekpo, A. H. ., & Afangideh, U. J. . (2012). Official Development Assistance And Economic Performance In Nigeria, 1970-2010. *West African Journal of Monetary and Economic Integration*, 12(1), 128–152.
- Elitzur, R., & Mintz, J. (1996). Transfer pricing rules and corporate tax competition. *Journal of Public Economics*, 60, 401–422.
- Firme, V. de A. C., & Teixeira, J. R. (2014). Index of Macroeconomic Performance for a Subset of Countries : A Kaldorian Analysis from the Magic Square Approach Focusing on Brazilian Economy in the Period 1997-2012. *Panaeconomicus, Special Issue*, 527–542. <https://doi.org/DOI: 10.2298/PAN1405527F>
- Fischel, W. A. (1975). Fiscal and Environmental Considerations in the Location of Firms in Suburban Communities. *Fiscal Zoning And Land Use Controls*, Edited by Edwin Mills and Wallace Oates 119\_74. Lexington, MA: DC Heath.
- Flaen, A. (2017). The Role of Transfer Prices in Profit-Shifting by U . S . Multinational Firms : Evidence from the 2004 Homeland Investment Act. *Federal Reserve Board of Governors*.
- Flowers, M. R. (1988). Shared tax sources in a Leviathan model of federalism. *Public Finance Quarterly*, 16(1), 67–77.
- Friedman, M. (1995). Foreign economic aid: Means and objectives. In *Hoover Press*. (Issue 60).
- Furuoka, F. (2010). Is Population Growth Beneficial or Detrimental to Economic Development ? A New Evidence from Pakistan. *Journal of Population and Social Studies (JPSS)*, 18(2), 25–38.
- Golub, S. S., Chwe, H., & Golub, S. S. (2015). *Labor Market Regulations In Sub-Saharan Africa , With A Focus On Senegal Dpru Working Paper 201505 A DPRU Working Paper \* commissioned for the Labor Market Regulations In Sub-Saharan Africa , With A Focus On Senegal* (Issue December). [www.dpru.uct.ac.za](http://www.dpru.uct.ac.za).
- Grubert, H., & Mutti, J. (1991). Taxes , Tariffs and Transfer Pricing in Multinational Corporate Decision Making. *The Review of Economics and Statistics*, 73(2), 285–293.
- Guillaumont, P., & Chauvet, L. (2001). Aid and Performance: A Reassessment. *Journal of Development Studies*, 37(6), 66–92. <https://doi.org/10.1080/713601083>
- Hancock, G. (1989). Lords of Poverty: The free-wheeling lifestyles, power, prestige and corruption of the multi-billion dollar aid business. *London: Macmillan*.
- Hansen, H., & Tarp, F. (2001). Aid and growth regressions. *Journal of Development Economics*, 64, 547–570. <https://doi.org/10.1111/1467-8268.12135>

- Harris, D., Morck, R., Slemrod, J., & Yeung, B. (1993). *Income Shifting in U . S . Multinational Corporations* (Issue January).
- Hebous, S., & Johannesen, N. (2016). At Your Service! The Role of Tax Havens in International Trade with Services. *Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, 109, 1–24.
- Herzer, D. (2010). How does foreign direct investment really affect developing countries' growth? *IAI Discussion Papers*, 207.
- Hines, J. R. ., & Rice, E. M. . (1994). Fiscal Paradise : Foreign Tax Havens and American Business. *The Quarterly Journal of Economics*, 109(1), 149–182.
- Hocktsen, W., & Furuoka, F. (2005). The Relationship between Population and Economic Growth in Asian Economies. *Asian Economic Bulletin*, 22(3), 314–330.
- Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional dependence. *The Stata Journal*, 7(3), 281–312.
- Hoyt, W. H. (1991). Property taxation, Nash equilibrium, and market power. *Journal of Urban Economics*, 30(1), 123–131.
- Ighobor, K. (2018). *Africa Renewal: Closing Africa's wealth gap*.
- Inançlı, S., & Addi, H. M. (2019a). Trade Creation and Trade Diversion Effects in the Economic Community of Central African States. 31(3), 307–317. <https://doi.org/10.1111/1467-8268.12391>
- Inançlı, S., & Addi, H. M. (2019b). Trade Creation and Trade Diversion Effects in the Economic Community of Central African States. *African Development Review*, 31(3), 307–317. <https://doi.org/10.1111/1467-8268.12391>
- Islam, M. N. (2005). Regime changes , economic policies and the effect of aid on growth Regime Changes , Economic Policies and the Effect of Aid on Growth. *The Journal of Development Studies*, 41(8), 1467–1492. <https://doi.org/10.1080/00220380500187828>
- Jahangir, K., & Nirob, A. (2020). Causal Relationship between Trade Openness and Economic Growth : A Panel Data Analysis of Asian Countries. *International Journal of Economics and Financial Issues*, 10(1), 118–126. <https://doi.org/10.32479/ijefi.8657>
- Johnson, W. R. (1988). Income redistribution in a federal system. *American Economic Review*, 78(3), 570–573.
- Kaldor, N. (1971). Conflicts in National Economic Objectives. *Economic Journal*, 81(321), 1–16.
- Kalyvitis, S., & Vlachaki, I. (2012). European Journal of Political Economy When does more aid imply less democracy ? An empirical examination. *European Journal of*

- Political Economy*, 28(1), 132–146. <https://doi.org/10.1016/j.ejpoleco.2011.06.010>
- Karkalakos, S., & Kotsogiannis, C. (2007). A spatial analysis of provincial corporate income tax responses: Evidence from Canada. *Canadian Journal of Economics*, 40(3), 782–811. <https://doi.org/10.1111/j.1365-2966.2007.00431.x>
- Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). The Worldwide Governance Indicators : A Summary of Methodology, Data and Analytical Issues. *World Bank Policy Research, Working Pa.* [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1682130%0A](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1682130%0A)
- Keen, M. (2008). Tax competition. *The New Palgrave Dictionary of Economics*, Ed. Steven N. Durlauf and Lawrence E. Blume, Palgrave Macmillan.
- Keenleyside, H. L. (1966). International aid: a summary, with special reference to the programmes of the United Nations. *JH Heineman*, 37–38.
- Khan, A. Q., Khwaja, A. I., & Olken, B. A. (2016). Nber Working Paper Series Tax Farming Redux: Experimental Evidence On Performance Pay For Tax Collectors Tax Farming Redux: Experimental Evidence on Performance Pay for Tax Collectors. *The Quarterly Journal of Economics*, 131(1), 219–271. <http://goo.gl/1xifaf>
- Khan, M. A., & Ahmed, A. (2007). Pakistan Institute of Development Economics , Islamabad Foreign Aid — Blessing or Curse : Evidence from Pakistan Author ( s ): Muhammad Arshad Khan and Ayaz Ahmed Source : *2The Pakistan Development Review*, 46(3), 215–240.
- Khan, M. S., & Reinhart, C. M. (1990). Private Investment and Economic Growth in Developing Countries. *World Development*, 18(1), 19–27. [https://doi.org/10.1016/0305-750X\(90\)90100-C](https://doi.org/10.1016/0305-750X(90)90100-C)
- Kim, S. (2007). A more accurate measurement of tax effort A more accurate measurement of tax effort. *Applied Economics Letters*, 14(7), 539–453. <https://doi.org/10.1080/13504850500425345>
- Klasen, S., & Lawson, D. (2007). [www.econstor.eu](http://www.econstor.eu). *Diskussionsbeiträge*, 133.
- Klemm, A., & Liu, L. (2019). The Impact of Profit Shifting on Economic Activity and Tax Competition. *IMF Working Paper*.
- Konrad, K. A., & Schjelderup, G. (1999). Fortress building in global tax competition. *Journal of Urban Economics*, 46(1), 156–167. <https://doi.org/10.1006/juec.1998.2113>
- Krelove, R. (1993). The persistence and inefficiency of property tax finance of local public expenditures. *Journal of Public Economics*, 51(3), 415–435.
- Lee, J. W. (1995). Capital goods imports and long-run growth. *Journal of Development Economics*, 48(1), 91–110.

- Leibrecht, M., & Hochgatterer, C. (2012). Tax competition as a cause of falling corporate income tax rates: A survey of empirical literature. *Journal of Economic Surveys*, 26(4), 616–648. <https://doi.org/10.1111/j.1467-6419.2010.00656.x>
- Lensink, R., & White, H. (2001). Are There Negative Returns to Aid? *Journal of Development Studies*, 7(6), 42–65. <https://doi.org/10.1080/713601082>
- Leshoro, T. (2013). Foreign Aid and Economic growth in South Africa: An Empirical Analysis using Bounds Testing. *Journal of Economic and Financial Sciences*, 6(1), 55–66.
- Levy, V. (1987). Does Concessionary Aid Lead to Higher Investment Rates in Low-Income Countries? *The Review of Economics and Statistics*, 69(1), 152–156. <https://doi.org/10.2307/1937914>
- Liu, L., Schmidt-eisenlohr, T., & Guo, D. (2017). International Transfer Pricing and Tax Avoidance : Evidence from Linked Trade-Tax Statistics in the UK \*. *Proceedings. Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, 110, 1–31.
- Liu, Y., Lv, B., Tai, H., & Yang, C. (2018). Fiscal Incentives and Local Tax Competition: Evidence from China. *International Center for Public Policy: Working Paper 13-05, March*, 1–24.
- Luqman, M., Haq, M., & Lal, I. (2013). Foreign Aid and Macroeconomic Performance in Pakistan : Exploring the Role of Local Financial Sector Development. *Forman Journal of Economic Studies*, 9, 109–136.
- Lyons, J. (2014). *Foreign aid is hurting, not helping Sub-Saharan Africa*. Le Journal International.
- Makuyana, G., & Odhiambo, N. M. (2019). Public and private investment and economic growth in Malawi: an ARDL-bounds testing approach. *Economic Research-Ekonomska Istrazivanja*, 32(1), 673–689. <https://doi.org/10.1080/1331677X.2019.1578677>
- Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A Contribution To The Empirics Of. *The Quarterly Journal of Economics*, 107(2), 407–437. <https://doi.org/doi:10.2307/2118477>
- Manning, R. (2008). *Development co-operation report 2007*.
- Mansori, K. S. ., & Weichenrieder, A. J. . (2001a). Tax Competition and Transfer Pricing Disputes. *FinanzArchiv / Public Finance Analysis*, 58(1), 1–11.
- Mansori, K. S., & Weichenrieder, A. J. (2001b). Tax Competition and Transfer Pricing Disputes Author ( s ): Kashif S . Mansori and Alfons J . Weichenrieder Source : FinanzArchiv / Public Finance Analysis , Vol . 58 , No . 1 ( 2001 ), pp . 1-11 Published by : Mohr Siebeck GmbH & Co . KG Stable URL : htt. *FinanzArchiv / Public Finance Analysis*, 58(1), 1–11.

- Martin, W. (2019). Economic growth, convergence, and agricultural economics. *Agricultural Economics*, 50(7), 7–27. <https://doi.org/10.1111/agec.12528>
- Maruta, A. A., Banerjee, R., & Cavoli, T. (2019). Foreign aid , institutional quality and economic growth : Evidence from the developing world. *Economic Modelling*, November. <https://doi.org/10.1016/j.econmod.2019.11.008>
- Mathurin, T. N., & Chalout, H. H. (2019). Income Concentration , Market Size and Informal Sector in Africa. *International Journal of Innovation and Economic Development*, 5(1), 7–23. <https://doi.org/10.18775/ijied.1849-7551-7020.2015.51.2001>
- Matsumoto, M. (1998). A note on tax competition and public input provision. *Regional Science and Urban Economics*, 28(4), 465–473.
- May, T. (2006). Vague targets: The case of aid in South Africa. *Harvard International Review*, 28(2), 7.
- Mayer, T., & Zignago, S. (2011). Notes on CEPII ' s distances measures : The GeoDist database. *CEPII Working Paper*, 25.
- McKinlay, R. D., & Little, R. (1978). A foreign-policy model of the distribution of British bilateral aid, 1960–70. *British Journal of Political Science*, 8(3), 313–331.
- Medrano-B, R., & Teixeira, J. (2013). A Kaldorian Macroeconomic Index of economic welfare. *Revista de História Econômica & Economia Regional*, 8(14).
- Mintz, J., & Tulkens, H. (1986). *Commodity Tax Competition Between Of A Federation : Equilibrium And Member States Efficiency \* In federal countries where local governments possess the power to levy taxes of their own , it is generally the case that fiscal decisions by one government aff.* 29, 133–172.
- Mosley, P. (1987). Overseas aid: its defence and reform. *London: Wheatsheaf Books*.
- Mosley, Paul, Hudson, J., & Horrell, S. (1987). Aid , the Public Sector and the Market in Less Developed Countries. *The Economic Journal*, 97(387), 616–641. <https://doi.org/10.2307/2232927>
- Moyo, D. (2009). Why foreign aid is hurting Africa. *The Wall Street Journal*, 21, 1–2.
- Moyo, Dambisa. (2009). Why Foreign Aid Is Hurting Africa. *The Wall Street Journal*, 21(1–2), 1–5.
- Mullen, J. K., Ã, M. W., & Introduction, I. (2005). Foreign Direct Investment and Regional Economic Performance. *Kyklos*, 58(2), 265–282.
- Murad, A., & Zeb, A. (2016). Foreign Aid: Origin, Evolution and its Effectiveness in Poverty Alleviation. *Dialogue (Pakistan)*, 11(1).
- Murthy, K. V. B. (2002). Arguing A Case For The Cobb-Douglas Production Function. *Review of Commerce Studies*, 20–21(1), 75–91.

- Nawaz, S., Iqbal, N., & Khan, M. A. (2014). Pakistan Institute of Development Economics , Islamabad The Impact of Institutional Quality on Economic Growth : Panel Evidence Author ( s ): Saima Nawaz , Nasir Iqbal and Muhammad Arshad Khan Source : The Pakistan Development Review , Vol . 53 , No . 1 ( . *The Pakistan Development Review*, 53(1), 15–31.
- Nduka, E. K., Chukwu, J. O., & Ugbor, K. I. (2013). Trade Openness And Economic Growth : A Comparative Analysis Of The Pre And Post Structural Adjustment Programme ( Sap ) Periods In Nigeria. *Asian Journal Of Business And Economics*, 3(3), 1–12.
- Newlyn, W. (1990). Aid , the Public Sector and the Market in Less Developed Countries : A Note. *The Economic Journal*, 100(399), 220–223. <https://doi.org/10.2307/2233606>
- Nicholson-crotty, S. (2008). research articles Fiscal Federalism and Tax Effort in the U . S . States. *State Politics and Policy Quaterly*, 8(2), 109–126.
- Nirola, N., & Sahu, S. (2019). The interactive impact of government size and quality of institutions on economic growth- evidence from the states of India. *Heliyon*, 5(3), e01352. <https://doi.org/10.1016/j.heliyon.2019.e01352>
- Noiset, L. (1995). Pigou, Tiebout, property taxation, and the underprovision of local public goods: comment. *Journal of Urban Economics*, 38(3), 312–316.
- Oates, W. E. (1972). Fiscal Federalism. *New York: Harcourt Brace Jovanovich. Polity IV Dataset* <Http://Www.Bsos.Umd.Edu/Cidcm/Inscr/Polity>.
- Oates, W. E. (2001). A Reconsideration of Environment Federalism. *Washington, DC: Resources for the Future*, 1–35.
- OECD. (2013). *Action Plan on Base Erosion and Profit Shifting (Paris: OECD, 2013)*.
- OECD. (2019). *Development Aid at a Glance. Statistics by Region*. <http://www.oecd.org/dac/financing-sustainable-development/>
- Papanek, G. F. (1973). Aid , Foreign Private Investment , Savings , and Growth In Less Developed Countries. *Political Economy*, 81(1), 120–130. <https://doi.org/doi.org/10.1086/260009>
- Pesaran, M. H. (2015). Testing Weak Cross-Sectional Dependence in Large Panels Testing Weak Cross-Sectional Dependence in Large Panels. *Econometric Reviews*, 34(6–10), 1089–1117. <https://doi.org/10.1080/07474938.2014.956623>
- Peterson, E. W. F. (2017). The Role of Population in Economic Growth. *Sage Open*, 7(4), 2158244017736094. <https://doi.org/10.1177/2158244017736094>
- Pham, N., & Pham, T. K. C. (2020). Effects of foreign aid on the recipient country ’ s economic growth. *Journal of Mathematical Economics*, 86, 52–68. <https://doi.org/10.1016/j.jmateco.2019.11.004>

- Pigka-Balanika, V. (2013). *The Impact Of Trade Openness On Economic Evidence in Developing Countries*. Erasmus Universiteit Rotterdam.
- Podvieszko, A., Parfenova, L., & Pugachev, A. (2019). Tax Competitiveness of the New EU Member States. *Journal of Risk and Financial Management*, 12(1), 34. <https://doi.org/10.3390/jrfm12010034>
- Porhel, R. (2007). *The Economic Consequences of the Political Crisis* (Jérôme Laf). Institut français de recherche en Afrique.
- Quak, E. J. (2018). The Impact of International Tax Competition on Low and Middle-Income Countries. *Institute of Development Studies (IDS)*.
- Redoano, M. (2007). Fiscal interactions among European countries.: does the EU Matter? *CESifo Working Paper, 1952*.
- Richter, W. F., & Wellisch, D. (1996). The provision of local public goods and factors in the presence of firm and household mobility. *Journal of Public Economics*, 60(1), 73–93.
- Rist, G. (2002). *The History of Development: From Western Origins to Global Faith*. London and New York: Zed Books.
- Roemer, M. (1989). The Macroeconomics of Counterpart Revisited Funds. *World Development*, 17(6), 795–807. [https://doi.org/https://doi.org/10.1016/0305-750X\(89\)90003-X](https://doi.org/https://doi.org/10.1016/0305-750X(89)90003-X)
- Rostow, W., W. (1959). The Stages of Economic Growth. *Economic History Revue*, 12(1), 1–16.
- Saavedra-Rivano, N., & Teixeira, J. (2017). Magic Hypercube And Index Of Welfare And Sustainability. *Economia*, 18(1), 88–97.
- Sachs, J. (2005). *The End Of Poverty: Economic Possibilities For Our Time*. New York Times. Mcgraw-Hill.
- Salmon, P. (1987). Decentralisation As An Incentive. *Oxford Review of Economic Policy*, 3(2), 24–43.
- Seck, G. S., Hache, E., & Martin, R. (2019). (2019, January 15). "Afrique subsaharienne : le long chemin vers l'électrification. Le Point Afrique. [https://www.lepoint.fr/economie/afrique-subsaharienne-le-long-chemin-vers-l-electrification-15-01-2019-2285979\\_28.php](https://www.lepoint.fr/economie/afrique-subsaharienne-le-long-chemin-vers-l-electrification-15-01-2019-2285979_28.php)
- Semancikova, J. (2016). Trade, trade openness and Macroeconomic Performance. *Procedia-Social Behavioral Sciences*, 220, 407–416. <https://doi.org/10.1016/j.sbspro.2016.05.515>
- Sertoğlu, K., Ugural, S., & Bekun, F. V. (2017). The Contribution of Agricultural Sector on Economic Growth of Nigeria. *International Journal of Economics and Finance*,

7(1), 547–552.

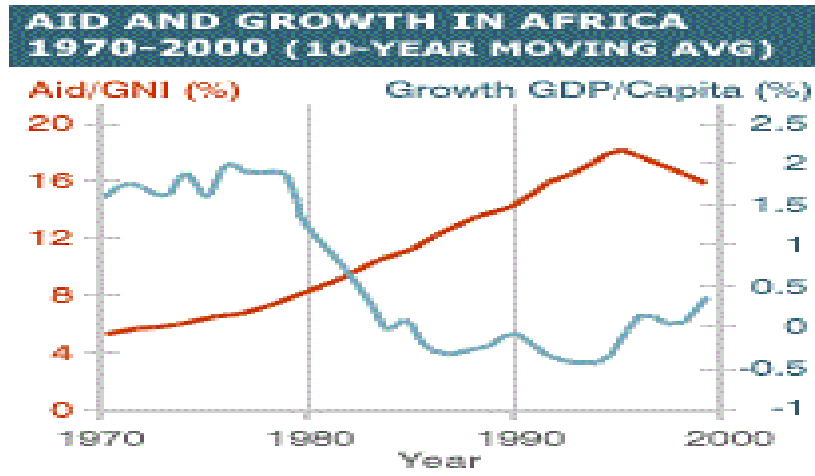
- Sethi, N., Bhujabal, P., Das, A., & Sucharita, S. (2019). Foreign aid and growth nexus : Empirical evidence from India and Sri Lanka. *Economic Analysis and Policy*, 64, 1–12. <https://doi.org/10.1016/j.eap.2019.07.002>
- Sibe, P., Chiatchoua, C., & Megne, N. (2016). The Long Run Relationship between Population Growth and Economic Growth : a Panel Data Analysis of 30 of the most Populated Countries of the World. *Analisis Economico*, XXXI(77), 2005–2218.
- Silajdzic, S., & Mehic, E. (2018). Trade Openness and Economic Growth : Empirical Evidence from Transition Economies. *Trade and Global Market, IntechOpen*. <https://doi.org/10.5772/intechopen.75812>
- Sinn, H.-W. (1997). The selection principle and market failure in systems competition. *Journal of Public Economics*, 66(2), 247–274.
- Sirag, A., & Ali, H. S. (2018). Financial development , FDI and economic growth : evidence from Sudan. *International Journal of Social Economics*, 45(8), 1236–1249. <https://doi.org/10.1108/IJSE-10-2017-0476>
- Siyakiya, P. (2017). The Impact of Institutional Quality on Economic Performance: An Empirical Study of European Union 28 and Prospective Member Countries. *World Journal of Applied Economics*, 3(2), 3–24. <https://doi.org/10.22440/wjae.3.2.1>
- Siyakiya, Puruweti hhz. (2017). Can trade openness stimulate output performance ? A case of selected African countries. *Journal of International and Global Economics Studies*, 10(2), 55–67.
- Statistica. (2021). *GDP of African countries 2020, by country Published by Simona Varrella , Feb 18, 2021 Nigeria's GDP amounted to 443 billion U.S. dollars in 2020 and records the highest gross domestic product in Africa. Egypt's GDP was worth 362 billion U.S. dollars and r.* <https://www.statista.com/statistics/1120999/gdp-of-african-countries-by-country/>
- Talpoş, I., & Crâşneac, A. O. (2010). The effects of tax competition". *Theoretical and Applied Economics*, XVII, 8(549), 39–52.
- Tannenwald, R. (1999). Tax Competition. *The Encyclopaedia of Tax Policy, Washington: The Urban Institute*, 367–371.
- The Africa Initiative. (2019). Tax Transparency in Africa 2020. In *The Africa Initiative*.
- Thuku, G. K., Paul, G., & Almadi, O. (2013). The impact of population change on economic growth in Kenya. *International Journal of Economics and Management Sciences*, 2(6), 43–60.
- Tiebout, C. (1956). A pure theory of local expenditures. *Journal of Political Economy*, 64(5), 416–424.



- Tiffen, M. (1995). Population Density , Economic Growth and Societies in Transition : Boserup Reconsidered in a Kenyan Case study. *Development and Change*, 26, 31–66.
- Transparency International. (2020). *CPI 2019: Sub-Saharan Africa*.
- Turnovsky, S., J. (2011). The accumulation of human capital and income inequality in a two-sector economy. *Journal of Human Capital*, 5(4), 418–452.
- UNECA. (1998). *Official Devejopment Assistance to Africa : Lessons from Country Case Studies* (Issue July).
- Vicard, V. (2015). Profit Shifting Through Transfer Pricing: Evidence From French Firm Level Trade Data. *Banque de France, Working Pa*(555).
- Vissak, T., & Roolaht, T. (2005). The Negative Impact of Foreign Direct Investment on the Estonian Economy The Negative Impact of Foreign. *Problems of Economic Transition*, 48(2), 43–66. <https://doi.org/10.1080/10611991.2003.11049974>
- Vrijburg, H., & de Mooij, R. A. (2016). Tax rates as strategic substitutes. *International Tax and Public Finance*, 23(1), 2–24.
- Weightman, G. (2007). The Industrial Revolutionaries: the Creation of the Modern World, 1776-1914. *Atlantic*.
- White, M. J. (1975). Firm location in a zoned metropolitan area. *Fiscal Zoning and Land Use Controls* (ES Mills and WE Oates, Eds.).
- Wildasin, D. E. (1986). Urban public finance. *Harwood, New York*.
- Wildasin, D. E. (1987). Theoretical analysis of local public economics. *Handbook of Regional and Urban Economics, Elsevier*, 2, 1131–1178.
- Williams, V. (2015). Foreign Aid. In *Encyclopædia Britannica*. <https://www.britannica.com/topic/foreign-aid>
- Wilson, J. D. (1986). A theory of interregional tax competition. *Journal of Urban Economics*, 19(3), 296–315.
- Wilson, J. D. (1999). Theories of tax competition. *National Tax Journal*, 269–304.
- Wilson, J. D., & Wildasin, D. E. (2004). Capital tax competition: bane or boon. *Journal of Public Economics*, 88(6), 1065–1091.
- Wilson, John Douglas, & Janeba, E. (2005). Decentralization and international tax competition. *Journal of Public Economics*, 89(7), 1211–1229. <https://doi.org/10.1016/j.jpubeco.2004.08.005>
- World Bank Group. (2016). *Commodity Markets Outlook, January*. World Bank, Washington, DC. License: Creative Commons Attribution CC BY 3.0 IGO.

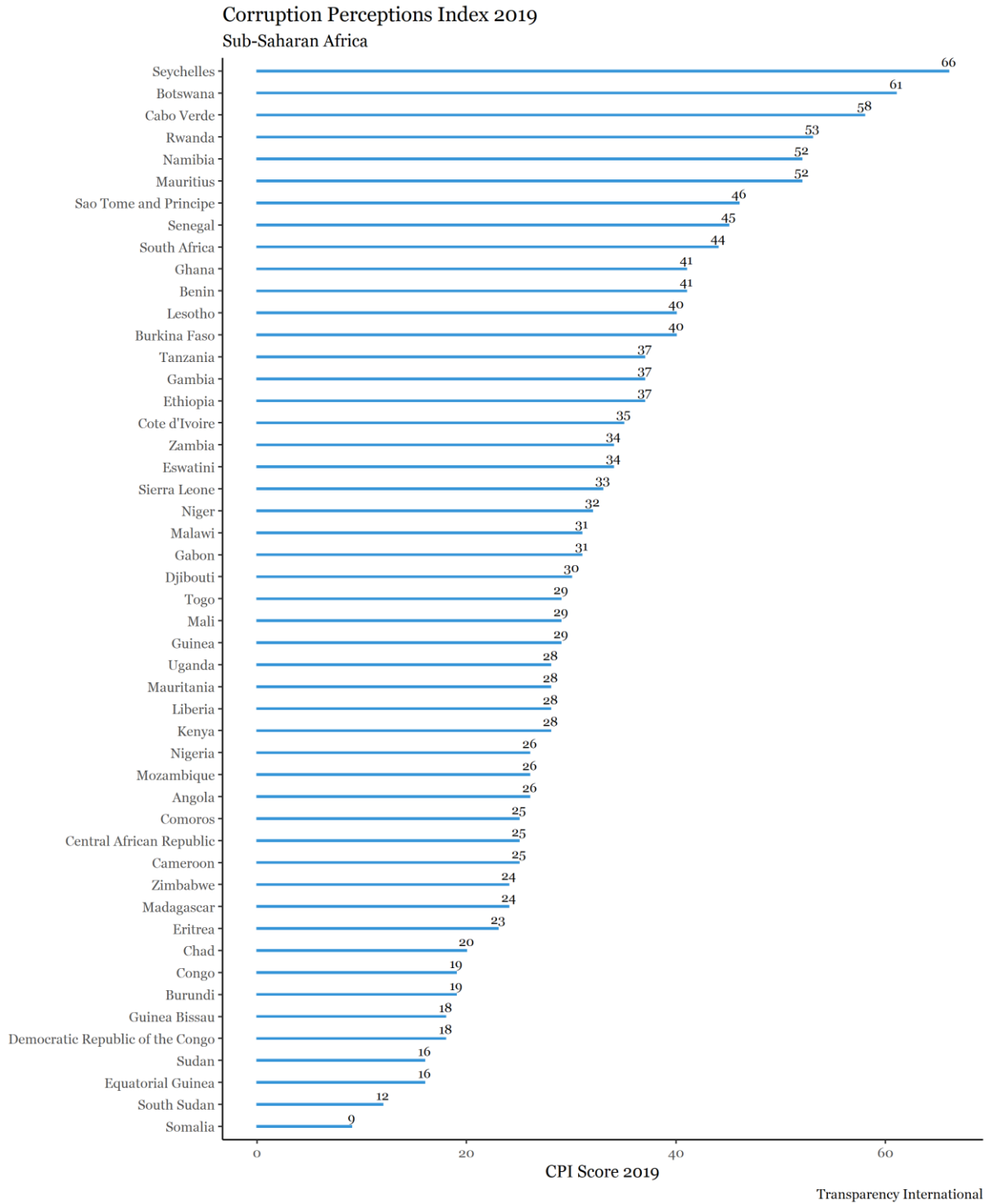
- World Travel and Tourism Council. (2018). *Economic Impact 2018, Sub-Saharan Africa*.
- Wu, Y., & Hendrick, R. (2009). Horizontal and vertical tax competition in Florida local governments. *Public Finance Review*, 37(3), 289–311. <https://doi.org/10.1177/1091142109332054>
- Xing, W., & Zhang, Q. (2017). The effects of vertical and horizontal incentives on local tax efforts: evidence from China. *Applied Economics*, 50(11), 1222–1237. <https://doi.org/10.1080/00036846.2017.1355546>
- Yegorov, Y. (2009). Socio-economic influences of population density. *Chinese Business Review*, 8(7), 1–12.
- Yegorov, Y. (2015). Economic Role of Population Density. In E. R. S. A. (ERSA) (Ed.), *55th Congress of the European Regional Science Association: "World Renaissance: Changing roles for people and places."* <https://scholarship.law.cornell.edu/sajpd/vol2/iss1/6>
- Zodrow, G. R., & Mieszkowski, P. (1986). Pigou, Tiebout, property taxation, and the underprovision of local public goods. *Journal of Urban Economics*, 19(3), 356–370.
- Zulu, J. J., & Mattondo, B. (2015). The Impact of Labour Productivity on Economic Growth: The Case of Mauritius and South Africa. *Southern African Journal of Policy and Development*, 2(1). <https://scholarship.law.cornell.edu/sajpd/vol2/iss1/6>

## APPENDIX



**Figure 1:** Aid and growth in Africa

**Source :** Erixon, F. (2005b) "Why Aid Doesn't Work?" BBC News



**Figure 11:** Corruption perceptions Index 2019

**Table 1.** Variables description

<b>Variable</b>	<b>Definition</b>	<b>Source</b>
<b>Voice accountability (VA)</b>	Voice and Accountability captures perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and free media.	The Worldwide Governance Indicator (WGI)
<b>Political stability and absence of violence (PS)</b>	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism	The Worldwide Governance Indicator (WGI)
<b>Government effectiveness (GE)</b>	Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	The Worldwide Governance Indicator (WGI)
<b>Regulatory quality (RQ)</b>	Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	The Worldwide Governance Indicator (WGI)
<b>Rule of law (RL)</b>	Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence	The Worldwide Governance Indicator (WGI)
<b>Control of Corruption (CC)</b>	Control of Corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	The Worldwide Governance Indicator (WGI)

**Source:** World Governance Indicator

**Table 2.** Sub-Saharan African countries

<b>Sub-region</b>	<b>Country</b>	<b>Capital city</b>	<b>Currency</b>
<b>East Africa</b>	Burundi	Bujumbura	Burundian franc
	Comoros	Moroni	Comorian franc
	Djibouti**	Djibouti	Djiboutian franc
	Eritrea**	Asmara	Eritrea Nakfa
	Ethiopia	Addis-Abeba	Birr
	Kenya	Nairobi	Kenyan shilling
	Madagascar	Antananarivo	Ariary
	Malawi	Lilongwe	Malawian Kwacha
	Mauritius	Port Louis	Mauritian Rupee
	Mayotte**	Mamoudzou	Euro
	Mozambique	Maputo	Metical
	Reunion**	Saint-Denis	Euro
	Rwanda	Kigali	Rwandan franc
	Seychelles**	Victoria	Seychellois Rupee
	Somalia**	Mogadiscio	Somali shilling
	South Sudan**	Juba	South Sudanese pound
	Sudan**	Khartoum	Sudanese pound
	Tanzania	Dodoma	Tanzanian shilling
	Uganda	Kampala	Ugandan shilling
	Zambia	Lusaka	Zambian kwacha
Zimbabwe	Harare	Zimbabwean dollar	
	Angola	Luanda	Angolan kwanza
	Cameroon	Yaounde	Franc CFA (XAF)

<b>Sub-region</b>	<b>Country</b>	<b>Capital city</b>	<b>Currency</b>
<b>Central Africa</b>	Central African Rep.	Bangui	Franc CFA (XAF)
	Chad	N'djamena	Franc CFA (XAF)
	D.R.Congo	Kinshasa	Congolese franc
	Congo	Brazzaville	Franc CFA (XAF)
	Equatorial Guinea	Malabo	Franc CFA (XAF)
	Gabon	Libreville	Franc CFA (XAF)
	Sao Tome and Prin.**	Sao Tome	Dobra
<b>West Africa</b>	Benin	Cotonou	Franc CFA (XOF)
	Burkina Faso	Ouagadougou	Franc CFA (XOF)
	Cape Verde	Praia	Cape Verdean Escudo
	Ivory Coast	Yamoussoukro	Franc CFA (XOF)
	The Gambia	Banjul	Dalasi
	Ghana	Accra	Cedi
	Guinea	Conakry	Guinean franc
	Guinea-Bissau	Bissau	Franc CFA (XOF)
	Liberia	Monrovia	Liberian dollar
	Mauritania	Nouakchott	Mauritanian Ouguiya
	Niger	Niamey	Franc CFA (XOF)
	Nigeria	Abuja	Naira
	Saint Helena**	Jamestown	Saint Helena pound
	Senegal	Dakar	Franc CFA (XOF)

<b>Sub-region</b>	<b>Country</b>	<b>Capital city</b>	<b>Currency</b>
	Sierra Leone	Freetown	Leone
	Togo	Lome	Franc CFA (XOF)
<b>Southern Africa</b>	Botswana	Gaborone	Botswana Pula
	Eswatini	Mbabane	Lilangeni
	Lesotho	Maseru	Loti
	Namibia	Windhoek	Namibian dollar
	South Africa	Pretoria	Rand

Note: \*\*denotes countries that are removed from the analysis due to lack of complete data



**Table 19.** Matrix of correlations

<b>Variables</b>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
<b>(1) lnA</b>	1.000												
<b>(2) lnoda</b>	0.311	1.000											
<b>(3) lnfdi</b>	-0.106	0.029	1.000										
<b>(4) lnopen</b>	-0.382	-0.381	0.429	1.000									
<b>(5) lnfreedo</b>	-0.127	0.012	-0.055	-0.059	1.000								
<b>(6) lninv</b>	-0.050	0.094	0.352	0.280	0.273	1.000							
<b>(7) lnagri</b>	0.498	0.470	-0.002	-0.470	-0.171	-0.249	1.000						
<b>(8) lng</b>	-0.486	-0.218	0.046	0.341	0.159	0.167	-0.368	1.000					
<b>(9) lnlabor</b>	0.338	0.842	-0.086	-0.395	-0.056	0.048	0.324	-0.248	1.000				
<b>(10) ln(iq)</b>	-0.315	-0.047	0.052	0.132	0.727	0.313	-0.337	0.405	-0.192	1.000			
<b>(11) lnpoptot</b>	0.333	0.844	-0.095	-0.417	-0.056	0.048	0.336	-0.278	0.994	-0.211	1.000		
<b>(12) lndensit</b>	0.236	0.098	-0.220	-0.307	0.117	-0.233	0.235	-0.085	0.080	0.099	0.070	1.000	
<b>(13) lnpercw</b>	-0.141	0.231	0.047	-0.029	0.118	0.221	-0.137	0.336	0.255	0.231	0.222	0.043	1.000

Source: Author

**Table 21.** Serial correlation test

Wooldridge test for autocorrelation in panel data			
H0:	no	first-order	autocorrelation
F(	1,	41) =	11.567
Prob	> F =		0.0015

**Source :** Author

**Table 31.** Cross-sectional time-series FGLS regression

lnA	Coef.	St.Err.	t- value	p- value	[95% Conf	Interval]	Sig
lnoda	.002	.005	0.43	.669	-.008	.012	
lnfdi1	-.06	.011	-5.53	0	-.082	-.039	***
lnopen	-.039	.008	-4.94	0	-.054	-.024	***
lnfreedom	-.004	.036	-0.12	.906	-.074	.065	
lninv	-.027	.009	-2.94	.003	-.045	-.009	***
lnagri	.032	.005	6.11	0	.022	.042	***
lng	-.027	.01	-2.74	.006	-.047	-.008	***
lnlabor	.16	.018	8.85	0	.124	.195	***
lnabsiq	-.069	.02	-3.52	0	-.107	-.03	***
lnpoptot	-.145	.02	-7.23	0	-.184	-.106	***
Indensity	.025	.003	9.87	0	.02	.03	***
lnpercwom	-.007	.005	-1.38	.167	-.017	.003	
Constant	-.719	.095	-7.58	0	-.905	-.533	***
Mean dependent var	-0.662		SD dependent var		0.201		
Number of obs	630.000		Chi-square		936.638		
Prob > chi2	0.000		Akaike crit. (AIC)		-1119.185		

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

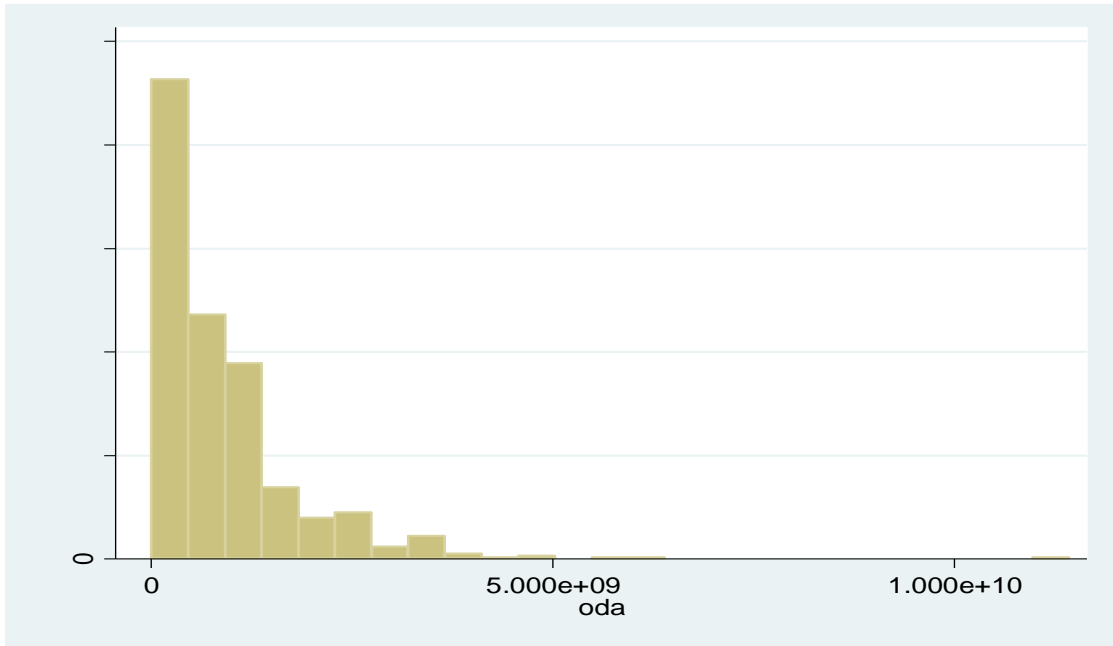
**Source :** Author

**Table 32.** Cross-sectional time-series FGLS regression

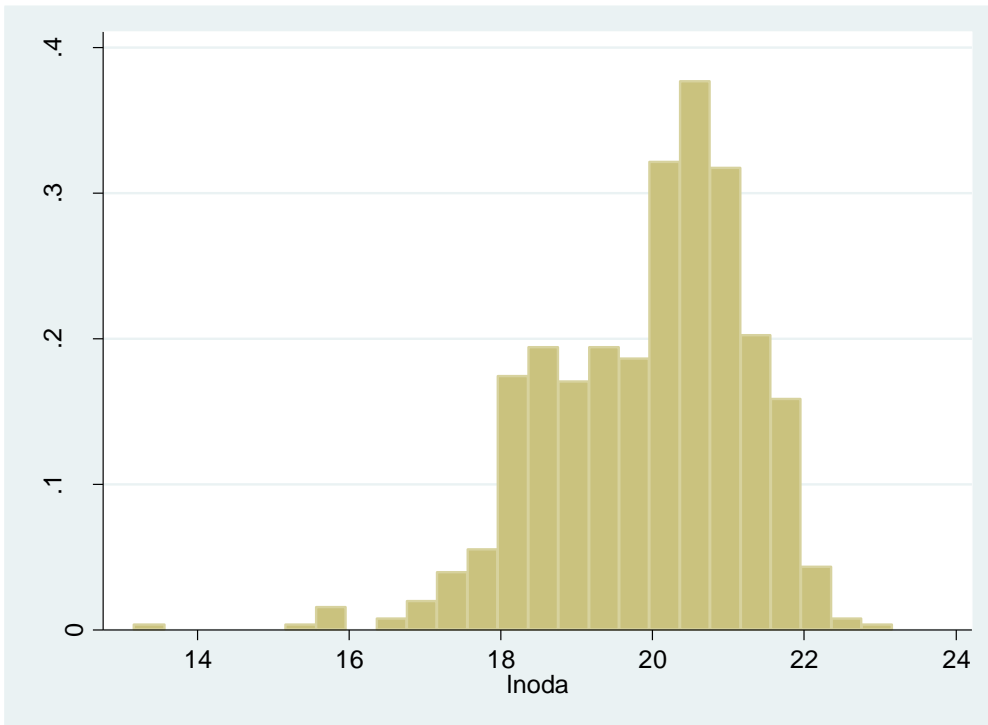
lnA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lnoda	-.007	.01	-0.71	.48	-.027	.013	
lnfdi1	-.049	.02	-2.40	.016	-.088	-.009	**
lnopen	-.062	.02	-3.12	.002	-.1	-.023	***
lnfreedom	.037	.061	0.60	.546	-.082	.156	
lninv	.116	.017	6.83	0	.083	.149	***
lnagri	.065	.009	7.09	0	.047	.083	***
lng	-.144	.018	-8.13	0	-.179	-.109	***
lnlabor	.311	.04	7.77	0	.233	.39	***
lnabsiq	-.13	.038	-3.38	.001	-.205	-.055	***
lnpoptot	-.306	.042	-7.19	0	-.389	-.222	***
Indensity	.02	.005	4.05	0	.01	.03	***
lnpercwom	-.034	.011	-3.02	.002	-.057	-.012	***
Constant	-.245	.167	-1.47	.142	-.572	.082	
Mean dependent var	-0.662		SD dependent var		0.201		
Number of obs	630.000		Chi-square		566.892		
Prob > chi2	0.930		Akaike crit. (AIC)		-611.116		

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

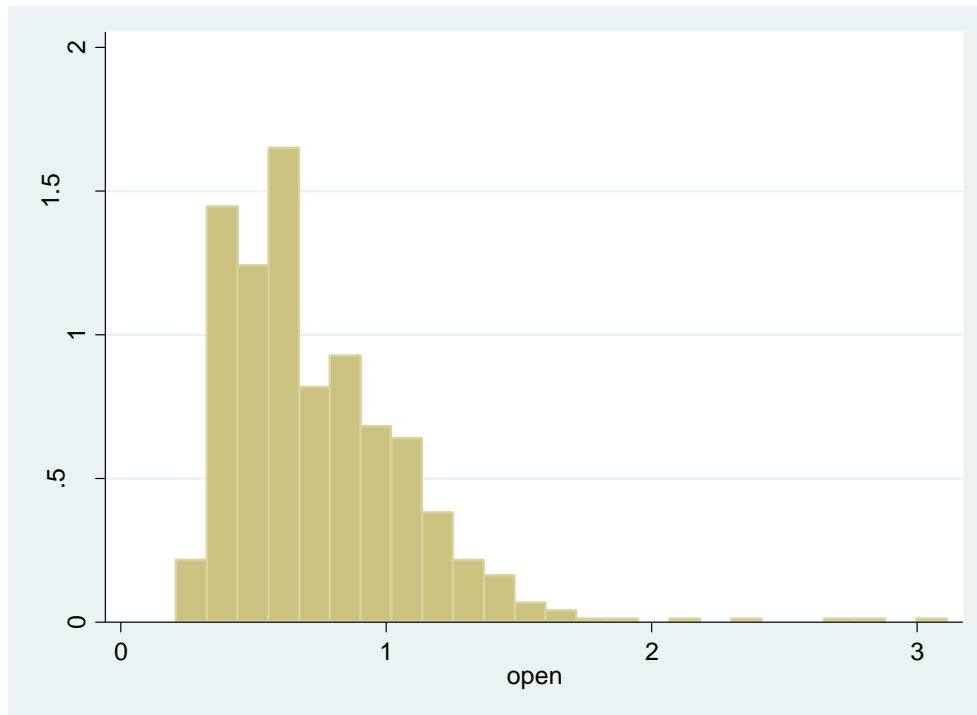
**Source :** Author



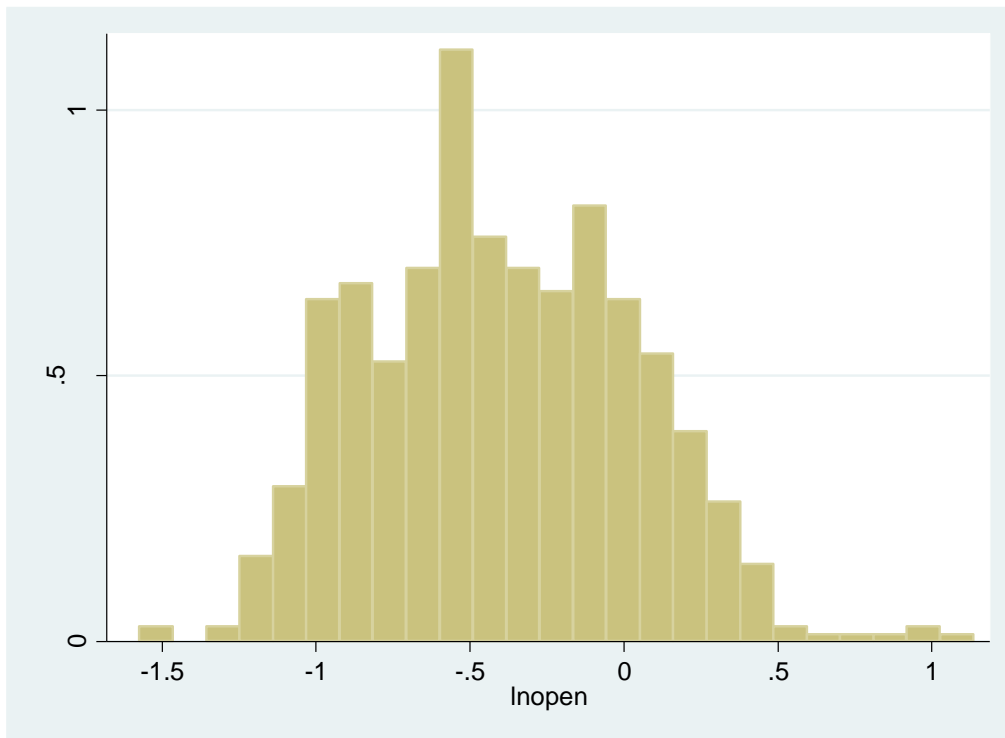
**Figure 12: Histogram of ODA**



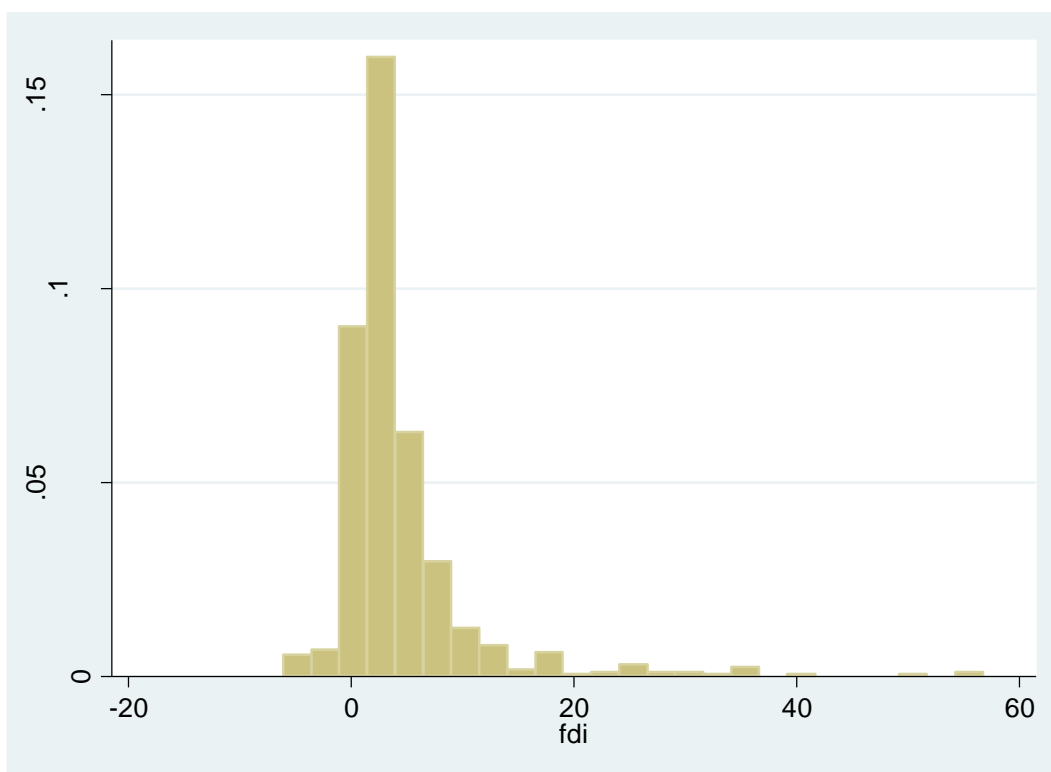
**Figure 13:** Histogram of log (ODA)



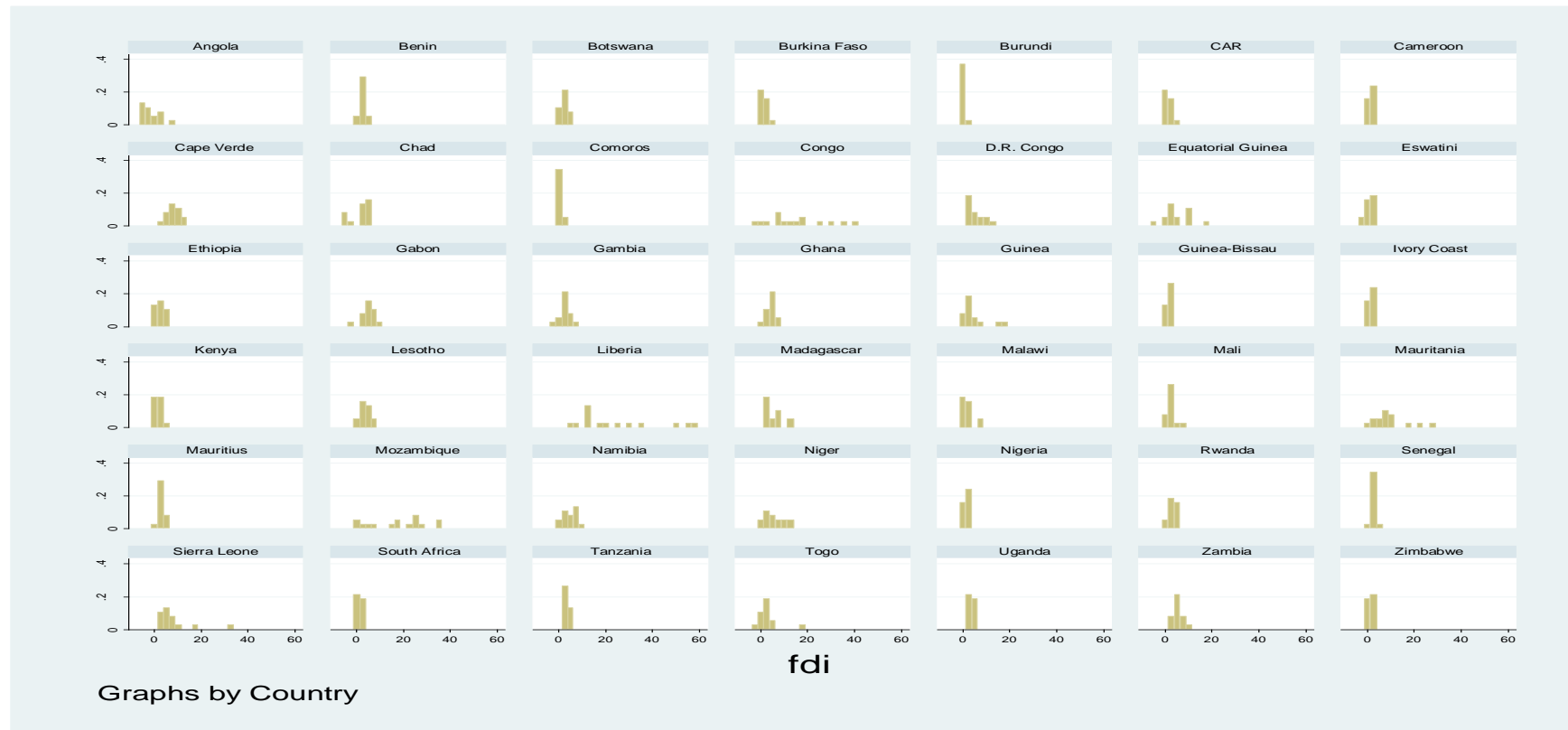
**Figure 14:** Histogram of trade openness



**Figure 15:** Histogram of log (trade openness)



**Figure 16:** Foreign direct investment inflows to sub-Saharan Africa



**Figure 17:** Foreign direct investment inflows to sub-Saharan Africa



## CURRICULUM VITAE

<b>Name Surname: Haman Mahamat Addi</b>	
<b>Eğitim Bilgileri</b>	
<b>Lisans</b>	
<b>University</b>	The University of Yaoundé II-Cameroon
<b>Faculty</b>	Faculty of Economics and Management
<b>Department</b>	Economics and Management
<b>Yüksek Lisans</b>	
<b>University</b>	The University of Yaoundé II-Cameroon
<b>Faculty</b>	Economics and Management
<b>Department</b>	Economics
<b>Program</b>	Applied Economics, Mathematical Economics and Econometrics
<b>Makale ve Bildiriler</b>	
<p>1. “Macroeconomic Performance Indices on the Central African Economic and Monetary Community (CEMAC) Country Members” In Y. Bayar (Ed.) “<i>Proceedings of 11<sup>th</sup> SCF International Conference on “The Economic and Social Impacts of Population Aging”</i>” (pp. 27-35). Bandirma, Turkey.</p>	
<p>2. “The Macroeconomic Performance of Turkey: An application of the Normalized Economic Performance Index (NEPI)” In O. Akgül (Ed.) <i>Proceedings of Economics-Finance-Business. 5<sup>th</sup> International Student Symposium</i> (pp. 72-85). Edirne, Turkey: Trakya University. <a href="http://www.internationalstudentsymposium.com/dosya/2019-sempozyum-bildiriler-3.pdf">http://www.internationalstudentsymposium.com/dosya/2019-sempozyum-bildiriler-3.pdf</a></p>	
<p>3. “Trade Creation and Trade Diversion Effects in the Economic Community of Central African States (ECCAS)”, <i>African Development Review</i>, Vol. 31, No. 3, 2019, 307–317.</p>	