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New Evidence on Tax-Aid Nexus

Empirical Investigation on Impact of Foreign Aid on Tax Revenue Mobilization in Africa

by

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Effective tax systems play a key role in self-sustained economic growth. Where foreign aid can provide much needed funds for less developed countries, it may also increase aid dependency if the country does not simultaneously improve its taxing capacity. This thesis is empirically investigating the relationship of foreign aid and tax revenue mobilization in a panel of 53 African countries during 1980-2018. The instrumental variable approach yields a positive short run effect for total ODA and taxes. This gives a positive outlook of taxing and development and reduces stress over fiduciary risks, moral hazard and aid dependency often attributed to foreign aid. Additionally, the thesis finds a negative association with taxes and technical assistance, i.e., professional services often included in aid that aim to improve the fiscal management of the aid funds. Consequently, aid donors should develop better ways to offer technical assistance that is better aligned with the objectives of the recipient governments. Concessional loans, often cited as a preferred aid modality due to lower fiduciary risks, do not show any statistically significant association with taxes.

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1 Introduction

1.1 Research Problem

Learning to tax is proposed to be one of the key determinants for self-sustained economic growth (Kaldor, 1963). Where foreign aid can provide a much needed “big push” for poor countries to start to climb the ladder of economic growth and development, it may also increase aid dependency. The central question in aid dependency is related to the fiscal response of the aid recipient governments. If inflows Official Development Assistance (ODA) are used to finance tax cuts instead of increasing investments and government spending, the issue of aid fungibility becomes pronounced. Aid-tax nexus has been extensively researched in recent decades, but the results have been inconclusive so far. The earliest empirical evidence is pointing out that grants have a substantial negative impact on tax revenues, whereas concessional ODA loans have a positive one (Gupta, Clements, Pivovarsky & Tiongson, 2003). This has led to policy implications emphasizing grants over loans as a preferred aid modality. However, this might be misleading as the results from cross-country studies are highly contested. As shown in the thesis, much of the controversy is stemming from models that are sensitive to specifications, unable to overcome the endogeneity issues, use poor data and imprecise measures aid and tax revenues. Later studies have established a positive medium and long run relationship between aid and tax revenues (Clist & Morrissey; 2011; Mavrotas & Ouattara, 2007; Tagem, 2017).

Building efficient and legitimate taxing systems is a path dependent process. The fiscal response to aid is theorized to be a trade-off between political costs of taxing and political costs of aid, namely aid dependency and decreased autonomy (Tagem, 2017). An efficient tax system entails a social contract between taxpayers and governments, where taxpayers expect to receive public services for the taxes levied (Fjeldstad, 2013). Therefore, if the government chooses to respond to aid by maximizing its utility in the first period and financing tax cuts instead of increasing public spending the social contract around taxes weakens. Consequently, the tax levying institutions are considered less legitimate, and taxes turn out to be harder to justify. Vice versa, if the government continues to collect tax revenues and uses aid to finance public services, the social contract around taxes strengthens. In other words, fiscal response to aid may exhibit a positive or a negative feedback loop in long run. Africa has experienced strong growth in tax revenues per GDP in the last two decades. This has happened simultaneously with a decrease in foreign aid per GDP. Despite the mixed results in some of the literature, most of the evidence finds a positive long run relationship with aid and taxes (Clist & Morrissey; 2011; Mavrotas & Ouattara, 2007; Tagem, 2017). This thesis provides

new evidence on aid having also a positive contemporaneous effect on tax revenues. This indeed seems to suggest that African countries have on average embarked on the aforementioned positive path.

Despite extensive literature on tax-aid nexus, many of the studies exhibit some deficiencies in model specification, treatment of endogeneity and poor data. Endogeneity issue is pronounced with aid, since aid is usually allocated *ceteris paribus* more to countries that are poorer and consequently have weaker taxing systems. Thus, causal relationship is difficult to establish. The thesis is using a 2SLS instrumental variable approach to estimate the causal relationship between aid and taxes using a panel of 53 African countries over a time period 1980-2018. Regarding poor data, this thesis is using a new dataset Government Revenue Database (GRD) by UNU-WIDER, which allows for disaggregation of government revenues to non-resource tax revenues that exclude social contributions and grants. Using total government revenue as an outcome variable would bias the coefficients and overestimate the fungibility of aid. That is because non-resource tax revenues are the revenues that are expected to react on aid. Moreover, the surveyed studies have not sufficiently addressed the issue of on and off budget aid. Bilateral aid by OECD's Development Assistance Committee's (DAC) consists of three parts: grants, concessional loans and technical assistance. Technical assistance is so-called off budget aid and is therefore by definition non-fungible. The literature seems to have a gap regarding technical assistance. If we are concerned about fiscal response though increasing or decreasing tax revenues, only on budget aid should be considered. The thesis is investigating technical assistance in two ways. Firstly, it constructs new variables of ODA and grants that are void of technical assistance. Secondly, it investigates independently what is the impact of technical assistance to tax revenue mobilization since the aim of technical assistance is to provide professional services to help in fiscal management of aid fund. The results show that technical assistance has a negative impact on tax revenues in short run. Technical assistance has been criticized for being strongly donor driven and costly hence, weakening the recipient governments' commitment to aid programmes and inability to align objectives with those of the recipients' (Leiderer, 2012).

1.2 Aim and Scope

The aim of the thesis is to provide new empirical evidence on tax-aid relationship. It is independently investigating the impact of total ODA, grants, concessional loans and technical assistance on tax revenues in Africa during 1980-2018. Where the literature on the topic is extensive, the results are somewhat mixed. This confusion is largely stemming from limitations in econometric modelling. Firstly, good data on government revenues in developing countries have been scarce until recently. A new dataset GRD by UNU-WIDER is providing consistent estimates of government revenues by disaggregating the data into non-resource tax revenues excluding social contributions. Secondly, the thesis is accounting for the impact of on budget aid to tax revenues which is a more precise measure of fungible aid. Thirdly, it is aiming to eliminate the endogeneity issues related to aid by using a two stage least squares (2SLS) instrumental method and a system Generalizes Methods of Moments (GMM). Finally, it is considering the long run impacts of tax revenue mobilization and aid by

discussing the results in the framework of social contract and trade-off between political costs of taxing and aid.

In conclusion, this thesis seeks to address the following questions: what is the tax response to (1) total ODA, (2) grants, (3) concessional loans, and (4) technical assistance in Africa? The purpose is to provide new evidence for tax-aid nexus and therefore give valuable policy suggestions for designing foreign aid in a way that it can enhance tax revenue mobilization in recipient governments.

The thesis is investigating the research problem with a cross-country analysis. This exhibits some limitations as it is unable to account for country specific variance. Aid, technical assistance and the conditionalities related to aid are always country specific. Additionally, there is great heterogeneity between African countries regarding their economic situation and government. Thus, different countries exhibit different responses to aid. Cross-country analysis provides more generalizable results, but it comes with compromise in in-depth knowledge. Policy recommendations should always take into account the country specific results together with cross-country evidence. Moreover, the empirical results presented in the thesis are limited to addressing the contemporaneous short run effects of aid. However, aid and technical assistance are likely to have long term impacts on taxing as well. In the absence of sufficiently long dataset, a time series analysis is out of scope of this thesis. The long run effects are nevertheless discussed in the light of theory.

1.3 Outline of the Thesis

This thesis is divided into four main sections. Chapter 2 is discussing background of taxing and foreign aid in Africa, sketching a theoretical relationship between aid and taxes and providing a literature review of the empirical evidence on the topic. Chapter 3 explains the data, methods and limitations. Chapter 4 presents the results and the discussion. Chapter 5 concludes.

2 Theory

2.1 Background

This sub-chapter gives a brief overview of taxing and foreign aid in Africa. Moreover, in order to understand the relationship between taxes and foreign aid, aid fungibility and additionality of aid are discussed. The chapter shows that where last two decades in Africa have experienced a radical tax reform and consequent increase in total tax revenues, much of the work is still incomplete. Large informal sector and lack of social contract around taxing is still undermining the development. Development cooperation has indeed acknowledged the need for developing better tax regimes, but some of the means to enhance it have proven to be inefficient due to lack of alignment with recipient countries needs and objectives. The chapter goes on by explaining the changing role of foreign aid and how it has tried to address the issue of taxing in Africa. Finally, it describes the aid fungibility issue, which is closely linked to the aid-taxing debate.

2.1.1 Taxation in Africa – What Has Worked and What More Should Be Done?

The idea of taxing and development is not new. Kaldor (1963) argued that for a country to embark on self-sustained economic growth, it needs to learn to tax. The history of taxation in Africa is not as gloomy as some may argue. The last 100 years have witnessed an eleven-fold increase in government revenues per capita (Albers, Jerven and Suesse, 2020). Moreover, in the last two decades, most of Africa has implemented a series of large-scale tax reforms. Most importantly, some of the trade taxes have been substituted with domestic value added taxes (VAT) leading to an increased trend in total tax revenues. The recovery period from 2000 onwards is characterised by improved governance, democratization and increased economic development (Albers, Jerven and Suesse, 2020). Prior to that, 1980 to 1999 experienced a shrinking in total tax revenues. This was largely due to structural adjustment programmes advocated by multilaterals like the IMF and the World Bank that were driving trade liberalization policies and smaller governments (Albers, Jerven and Suesse, 2020). Graph 2.1 shows a declining trend in all tax components until 2000.

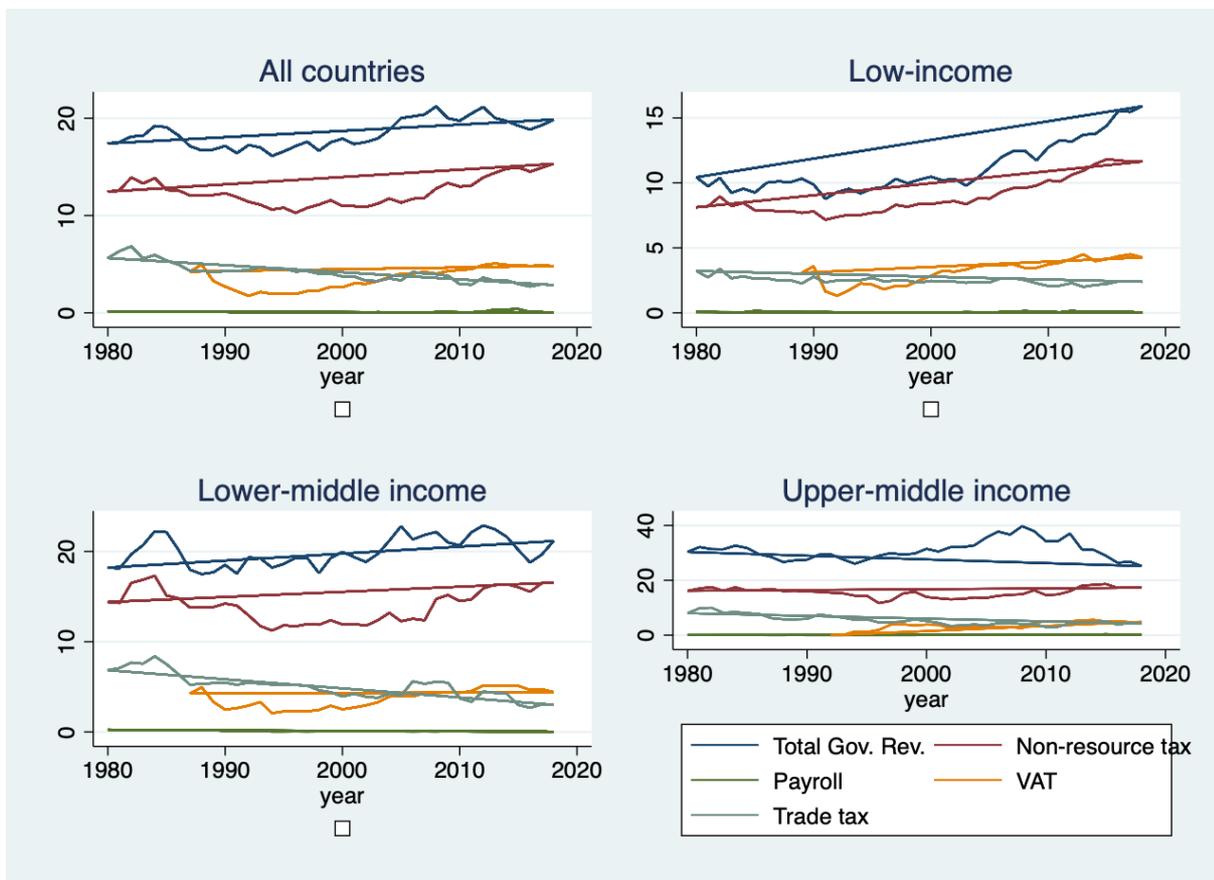


Figure 1 Tax revenue as a share of GDP divided to its components in Africa, 1980-2000 (GRD, 2021)

Despite the evident improvements in taxing, the work is still much incomplete. Africa, as well as rest of the developing world, showcases some common bottlenecks. The economic structure is strongly based on large informal sector, which typically consists of large number of subsistence level farmers and micro size urban enterprises. The informal sector is a hard-to-tax sector and returns on taxing efforts as small as the profit margins remain small (Araujo-Bonjeau & Chambas, 2004). The large size of the informal sector entails that the tax base in African countries remains small. Consequently, increasing the tax rate for the few registered individuals and enterprises would make the taxing system inequal and would place too much stress on those few registered taxpayers. This is undermining the social contract around taxes and reduces the credibility of tax authorities (Fjeldstad, 2013). Additionally, tax exemptions aiming to increase incentives for investments are showcasing another bad policy. Allowing some large enterprises to avoid taxes is hampering the social contract around taxes by increasing corruption and undermining the legitimacy of tax administration (Fjeldstad, 2013).

The largest tax innovations during the past two decades are VAT and autonomous revenue authorities (ARAs). VATs are collected on consumption, and they are often replacing trade, turnover and sales taxes. They are levied at all stages of the production chain and the taxes levied at earlier stages can be reduced by the companies from the total VATs paid. Substituting trade taxes with VATs has been a preferred policy especially in developing countries, because they can partially be used to tax the informal sector by taxing intermediary consumption (Araujo-Bonjeau & Chambas, 2004), and they can incentivise formalization of economic activity because the taxes levied on the intermediary consumption can be reduced from the total VAT which works as an incentive to register firms (Ahlerup et al., 2014). ARAs on the other hand, aim to reduce corruption and inefficiency by creating tax authorities

that are independent from the public sector, making them in theory less corrupt, more efficient and unaffected by political distortion. Despite their theoretical promise, Ahlerup et al., (2014) point out that VAT and ARAs are not a silver bullet but have to be interacted with good governance and economic development in order for them to have the desired impact. He found strong evidence for ARAs increasing the tax revenue in African countries in short and medium run.

Besides tax reforms like VAT and ARAs, aid donors have been trying to nudge countries to develop their taxing systems through various conditionalities. Where these conditionalities have been found to increase the total tax revenue (Tagem, 2017, Crivelli & Gupta, 2016), they have also been criticized for putting unnecessary pressure on that small pool of registered individuals and enterprises that produce most of the tax revenue in African countries and therefore weakening the reputation and legitimacy of the tax regime, consequently hampering the social contract between the taxpayers and governments (Fjeldstad, 2013).

In conclusion, large informal sector, tax exemptions aiming to incentivise investments and lack of social contract between taxpayers and tax levying governments are the largest obstacles for developing efficient taxing systems in Africa. VAT and ARAs have been significant improvements, but more should be done to develop efficient and equitable tax systems. Fjeldstad (2013) argues that tax policies should be designed in a way that in long run they will enhance the social contract and legitimacy of the tax levying government. This can be done by (1) broadening the tax base by including the informal sector and getting rid of tax exemptions even though it might be costly and unpopular in short run, (2) designing tax policies that are more user friendly, (3) improving governance by making it more transparent, equitable, fair, accountable and predictable, and (4) donors should make their tax conditionalities and technical assistance more supply-driven by aligning the objectives with those of the recipient countries' and enhancing local know-how and innovation. Overall, development of tax policies should include both short-run goals and long-run goals. Where the ultimate goal of course is to increase the tax revenue, it should be done in a way that tax levying institutions remain legitimate in the eyes of taxpayers. As shown above, not all policies that manage to increase tax revenue also increase the social contract around taxes. Looking tax policies from the perspective of social contracts aims to make tax systems more resilient for political turmoil or other external shocks.

2.1.2 Trends in Foreign Aid – from Structural Adjustment Programmes to General Budget Support (GBS)

Throughout the history of aid, aid effectiveness has been a contested topic among the aid donors and academia. The opinions around foreign aid varies from strongly optimistic to those that are more critical. One of the main questions is related to the role of the donor; should donors take an active role as a planner, or should they give more freedom to the recipient countries to allocate the aid in a way that suits their own goals. Sachs (2005) is one of the strongest advocates of the pro-aid camp, arguing that that poor countries are stuck in a “poverty trap” and in order for the countries to embark on a self-sustained economic growth, the countries need to receive a financial “big push”, that is, sufficient amounts of development

aid. He also argues that unsuccessful aid projects are merely an outcome of a financing gap. On the other side of the aid effectiveness debate there are economists like Easterly (2006) and Moyo (2009), to name a few, that have voiced their critical views about effectiveness of aid and argue that aid can create adverse incentives for growth, especially in presence of poor governance and corruption and that aid organizations are doing a poor job by implementing top-down aid programmes that are not aligned with recipient countries' needs and do not enhance the local skills and knowhow.

History of aid showcases how the idea of efficient foreign aid has shifted drastically. Initially, large scale top-down capital-intensive industrialization programmes in the 50s and 60s were the norm. Later on, in the 70s and 80s, highly conditional structural adjustment programmes emphasising trade liberalization and small governments were advocated by multilaterals like the IMF and the World Bank (Edwards, 2014). In Africa, trade liberalization entailed lowered trade taxes that led to shrinking in total tax revenues. Before 2000s, much of the development aid was allocated through "programme aid", which has been criticized for being strongly donor-driven and therefore lowering programme ownership or commitment by the recipient countries (Leiderer, 2012). The Paris Declaration on Aid Effectiveness published in 2005, can be seen as a pivot point in development cooperation. It aims to make aid more supply-driven, emphasizing five principles: ownership, alignment, harmonization, managing for results and mutual accountability

(<https://www.oecd.org/dac/effectiveness/parisdeclarationandaccraagendaforaction.htm>).

General budgetary support (GBS) became the new norm as an alternative to programme aid. GBS refers to aid that is offered directly to recipient countries governments to be used accordingly to their objectives. GBA is argued to improve aid effectiveness by increasing programme ownership and decreasing transaction costs (Leiderer, 2012). Regarding the tax policies, development cooperation after the 90s has been emphasising a shift from trade taxes to domestic VAT. Consequently, this has yielded higher total tax revenues.

Majority of official development aid is allocated through bilateral aid (Figure 2). OECD's Development Assistance Committee (DAC) donors account for a majority of aid. A small share of bilateral aid comes from other official donors. For instance, some of the middle eastern oil countries donate aid but it is found to be strongly biased to their neighbour countries that share similar Muslim governments (Werker, Ahmed & Cohen, 2009). Multilateral aid, i.e., aid allocated by donors like the IMF, the World Bank and the UN agencies account for approximately one third of official aid and the share has been increasing since mid-2000s. Multilateral and bilateral donors differ in their motives, characteristics and effects: bilateral aid tends to be connected to donors' own economic and strategic interests and it is often allocated proportionately more to their allies (e.g., ex-colonies or neighbours) and multilateral aid is characterised by stronger conditionalities (Ram, 2003). Where the total amount of aid to Africa has increased after 2000, ODA as a share of GDP has decreased since there has been substantial economic growth in many African countries (figure 4). The aid is generally divided to three components: grants, loans and technical assistance (figure 5). Grants account for majority of aid, where concessional loans are a small share of total aid. The share of loans has decreased since the beginning of 90s. ODA is usually given together with technical assistance, which can be e.g., professional services that aim to improve the fiscal management of aid funds. The amount of technical assistance has remained rather

constant over the four decades, but the share has shrunk as grants have increased simultaneously.

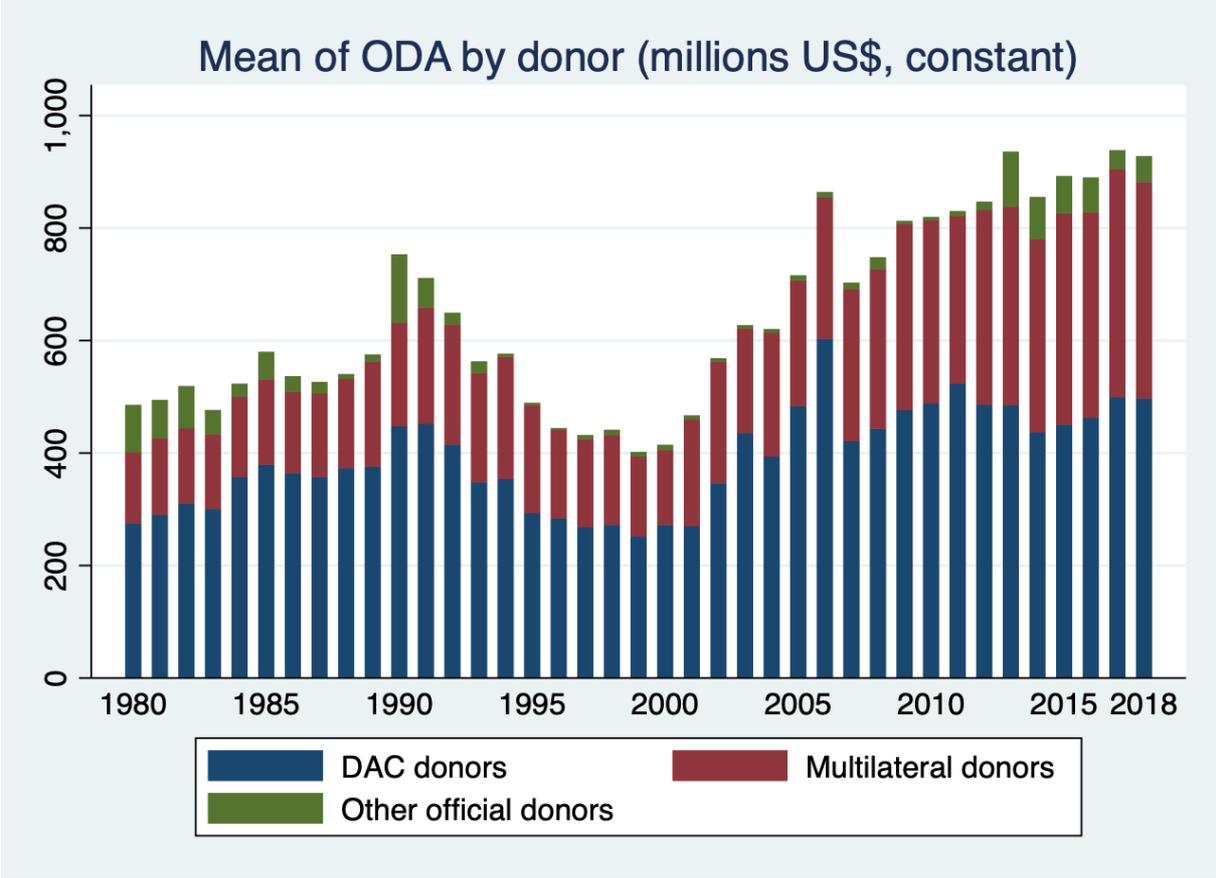


Figure 2 ODA by donor in millions of US \$ (constant). (OECD DAC, 2021)

Total DAC ODA in millions and as a share of GDP Africa, 1980-2018

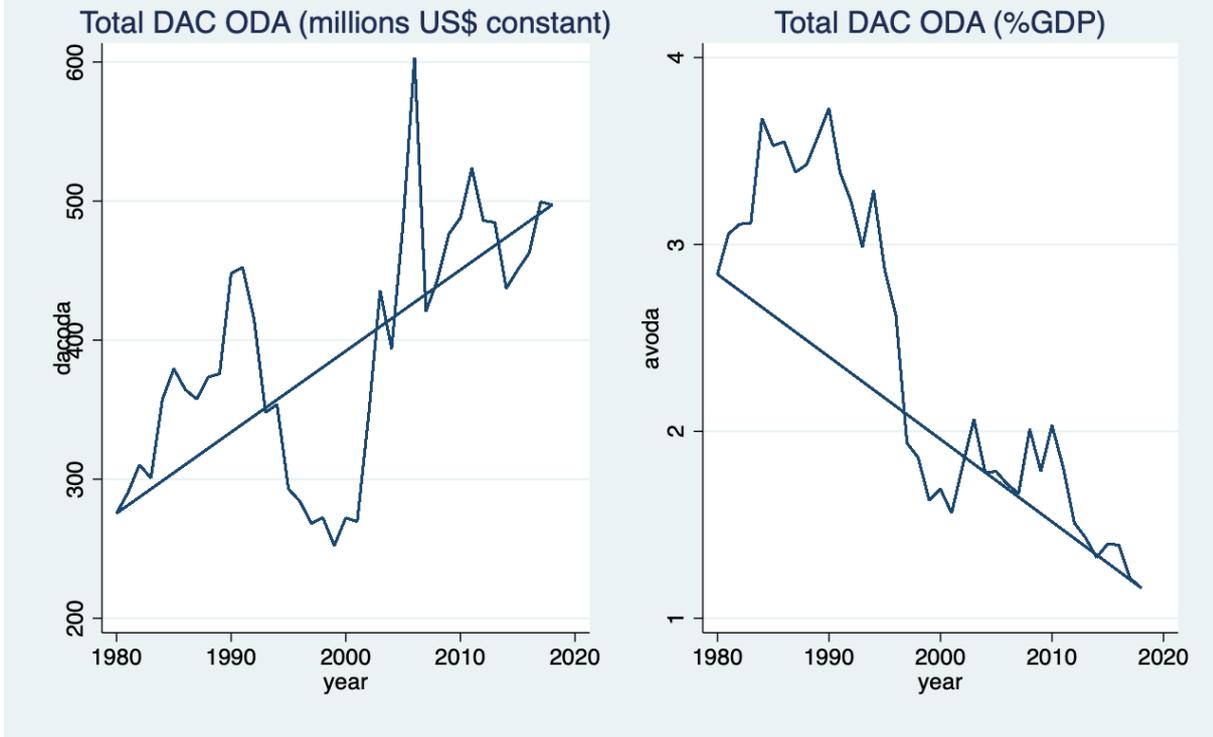


Figure 4 ODA in millions of US \$ (constant) and ODA as a share of GDP in Africa 1980-2018. (OECD DAC, 2021)

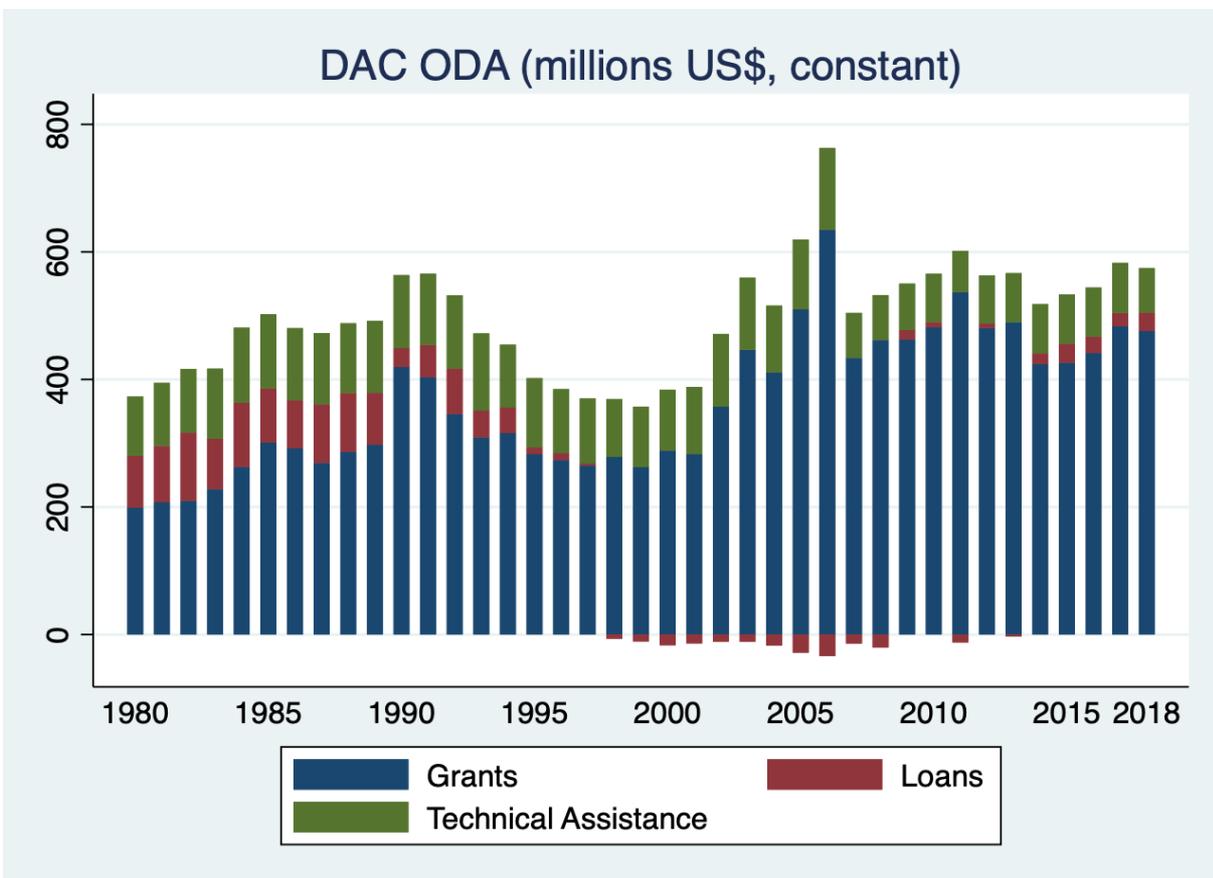


Figure 5 ODA and its components in millions of US \$ (constant) in Africa 1980-2018. (OECD DAC, 2021)

2.1.3 Aid Fungibility and Fiscal Response to Aid

Indeed, much of the contemporary debate around aid effectiveness is focusing on aid fungibility and fiscal response to aid, i.e., is aid used for the purposes it was allocated for or do flows of aid incentivise recipient governments to substitute some of the domestic revenue to aid, namely tax revenue or borrowing. Aid is fungible in aggregate level if government expenditures do not increase on par with aid. To understand the relationship between aid and tax revenues, it is important to zoom out and discuss aid fungibility.

Aid fungibility is a broad term which is used in literature to describe at least three types of fungibility: (1) general fungibility is referring to a situation where aid allocated to e.g., investments are used to finance other government expenditures, (2) sectoral fungibility, where aid allocated to one sector is used to finance another sector, e.g., health funds used to finance military funds, and (3) additionality of aid, which is looking at aggregate fungibility, e.g., if an increase in aid leads to a decrease in other revenues instead of increase in government expenditure (Morrissey, 2014). Additionality of aid is the type of the fungibility that is discussed in this thesis and domestic taxing is a key channel for it.

The aid-government expenditure nexus has sparked an extensive literature arguing for and against aid having a positive impact on expenditures. Empirical research has found that usually aid is increasing government spending, but it is not fully additional, i.e., spending does not increase at the same volume as aid (Morrissey, 2015). Opposing to this view, Remmer (2003), Brautigam (1992) and Knack (2001) are arguing that aid may have a positive “flypaper effect” on government expenditure in long run. They point out that because foreign revenue does not have the same domestic political costs as domestic revenue mobilization, aid is providing incentives and creating opportunities to increase public spending. In other words, they suggest that greater dependence on aid rather than domestic taxation leads to larger government spending due to larger public acceptance of aid over taxing. However, the opposite can be argued as well, especially in the case of poor governance: paying taxes can increase the public demand for good governance and thereafter, public expenditure (e.g., Clist, 2016; Araujo-Bonjeau & Chambas, 2003). Moreover, stronger reliance on foreign aid over domestic revenues can increase aid dependency and hinder a shift to self-sustained economic growth. For instance, donor countries are typically allocating more aid to least developed countries or lower middle-income countries (LDCs and LMICs) and therefore, a country that has become a middle-income country will experience *ceteris paribus* lower aid flows. This may create a mean reversion situation where reduced aid income pushed the economic growth back to the level of LMICs (Pirttilä, 2018). Opposing to the more optimistic views presented above, some influential papers have found that aid is indeed fungible, but less so in long term (Marc, 2017). Similarly, as with tax-aid studies, endogeneity issues have proven to be hard to overcome, which can explain why the results are so mixed. More work should be done to find robust instruments for cross-country studies and to research phenomena on country level. Due the evident controversy in the current literature on aid and government expenditure, no conclusive policy implications can be established.

Another point highlighted by Marc (2017), Tagem (2017) and Morrissey (2014), is a question about on and off budget aid. As shown in the previous section, a significant share of aid comes in a form of technical assistance. Therefore, it bypasses the budget and is by definition

non-fungible. Hence, using total ODA or grants as an explanatory variable is misleading since it cannot be expected that technical assistance would directly increase government expenditure. The OECD (<https://www.oecd.org/dac/dac-glossary.htm>) defines technical assistance as follows: “[technical assistance] includes both (a) grants to nationals of aid recipient countries receiving education or training at home or abroad, and (b) payments to consultants, advisers and similar personnel as well as teachers and administrators serving in recipient countries (including the cost of associated equipment). Assistance of this kind provided specifically to facilitate the implementation of a capital project is included indistinguishably among bilateral project and programme expenditures.” Since by this definition technical assistance is provided especially in order to implement projects and programme expenditures, it should also be separately investigated what is the impact of technical assistance to government expenditures. As usual in aid debate, the role of technical assistance is highly contested: on one hand, the advocates of technical assistance argue that it can increase aid effectiveness by building better governance, helping to design better fiscal and macroeconomic policies and reduce aid dependency through increasing tax efforts (Pirttilä, 2018; Tagem, 2017; Knoll, 2011) and on the other hand, the critiques of technical assistance argue that technical assistance has been strongly supply-driven and hence, it decreases program ownership and fails to acknowledge the true demands of the recipient countries (Leiderer, 2012).

2.2 Theoretical Approach

This sub-chapter discusses the theoretical relationship between taxes and development aid by using the government spending equation as a starting point. The equation explains how governments can respond to aid by adjusting their expenditures, tax revenues or borrowing. It also describes behavioural responses to aid, which is determined by a trade-off between political costs of taxing and political costs of aid, i.e., aid dependency and lack of autonomy. The chosen response has long run effects leading either to positive or negative feed-back loop which impacts tax revenues in long run positively/negatively. Finally, it sums up other determinants of tax revenue, which are also used as a motivation for control variables used in the thesis.

2.2.1 Modelling the Government Spending Equation

The debate about foreign aid and tax revenue is closely related to aid fungibility and additionality of aid. As governments receive foreign aid, they can choose to increase their spending, decrease taxing or both. In the latter case, aid is considered to be fungible. Not all fungibility is negative or related to fiduciary risks: recipient countries central banks can for instance use aid income to stabilize macroeconomy, i.e., inflation, exchange rate, and cushion the fiscal economy from volatile aid. (Aiyar et al., 2006). Aid can be also used to pay off debt.

In line with Knoll (2011) and Clement et al. (2003), government budget constrain (equation 2.1) is used to investigate the theoretical impact of foreign aid on tax revenue:

$$(2.1) \quad G_t = Rtax_t + Rother_t + A_t + B_t,$$

where G_t is total government spending net of absorption, $Rtax_t$ denotes for domestic tax revenue, $Rother_t$ is other domestic revenues e.g., resource revenue, A_t is net of on-budget aid inflow, which is excluding technical assistance and B_t denotes for net borrowing in a period t . The equation 2.2 is modelling the domestic revenue response to increase in foreign revenue, i.e., aid:

$$(2.2) \quad \frac{\Delta R}{\Delta A} = \frac{\Delta G}{\Delta A} - \frac{\Delta B}{\Delta A} - 1$$

Therefore, if government spending net of absorption does not increase or the borrowing decrease as in equation 2.3:

$$(2.3) \quad \frac{\Delta G}{\Delta A} - \frac{\Delta B}{\Delta A} < 1,$$

the domestic revenue mobilization will turn negative:

$$(2.4) \quad \frac{\Delta R}{\Delta A} < 0.$$

In other words, the contemporaneous government response to an exogenous increase in foreign revenue can be to (1) increase its spending or absorption, (2) decrease its domestic revenues, (3) decrease borrowing or (4) combination of the aforementioned.

In order to isolate the effect of aid on tax revenues, the thesis is using a measure of government revenue that is excluding resource revenue, grants and social contributions, because that is the part of the revenues that is expected to be impacted by aid (Tagem, 2017). Using total government revenue would make the coefficients biased by overestimating the aid fungibility. Regarding on and off-budget aid, new measures of net total aid and net grants are constructed by subtracting technical assistance. Technical assistance or technical co-operation can come in forms of providing know-how and technical support through personnel, capacity building, research and other associated costs. Therefore, technical assistance as non-fungible aid is a good proxy for off-budget aid (Marc, 2017).

Off-budget aid in a form of technical assistance or donor conditionalities may however have an indirect effect on tax revenue mobilization. Tagem (2017) found evidence that technical assistance within countries following IMF's met revenue conditionality¹ has a positive long-

¹ Met revenue conditionality includes quantitative targets like increasing VAT rate and structural targets like tax reforms or submitting a legislation.

run effect on tax revenue and similarly. Similarly, Crivelli and Gupta (2016) found that IMF conditionalities in countries with strong institutions can help to offset some of the negative impact of aid on taxes. Pirttilä (2018) discusses the possibility of well-directed technical assistance enhancing taxing systems but does not provide empirical evidence for his claims. However, not all authors are as optimistic about the role of technical assistance. It is seen as strongly supply-driven, undermining the recipient country ownership and commitment, being costly, lacking understanding of local context and weakening integration (Leiderer, 2012). As discussed in previous chapter, technical assistance accounts for approximately one sixth of total DAC ODA, but its significance has reduced after late 90s since the total amount of grants has increased proportionately more. Where the role of technical assistance has been researched within the fiscal response literature (Marc, 2017), there seems to be a gap in literature investigating the role of technical assistance on taxing. Out of the surveyed literature, only Tagem (2017) looked into it. Moreover, there seems to be lack of data of technical assistance that is specifically directed to enhancing tax capacity. The measure used in this thesis by OECD DAC consists of overall total technical assistance and is therefore an imprecise measure. IMF's MONA database includes information of different tax revenue related conditionalities but does not take report the monetary value of the technical assistance disbursed.

Beyond the aforementioned modelling, it is important to also notice the dynamic, long-term nature of the tax revenue, as recipient countries governments plan their spending intertemporally and many policy reforms, let it be domestic or related to donor conditionalities, may take more time to fully impact the tax revenue mobilization. Next chapter discusses long-term behavioural responses to aid in more depth.

2.2.2 Behavioural Response to Aid – Political Costs of Taxation and Aid Dependency

Building efficient taxing systems is hard and requires strong and legitimate institutions, which many countries in Africa are missing. Due to structural reasons like weak governments, large hard-to-tax informal sector, natural resource curse and political environment, aid is theorized to impact fiscal choices in the recipient countries differently. The literature has identified a few behavioural responses on aid as discussed below. Often the response is theorized to be different for grants and loans, because loans have to be paid back whereas grants include no such commitments.

Developing effective and legitimate tax systems is a path dependent process. Based on the behavioural response to aid, the process may exhibit a positive or negative feed-back loop that will have positive/negative impacts on overall tax revenue mobilization in long run. Thornton (2014) discusses the short-term and long-term incentives for governments to increase their tax capacity in response to aid. In short term, financing tax cuts with foreign revenue flows can be seen as a welfare-optimal choice where the government can choose a fiscal policy that balances between reducing taxes and increasing expenditure. In long-run government will encounter a moral hazard and aid may increase aid-dependency if they do not choose to invest in taxing and administrative capacity. If the government is maximizing its utility in short run

by financing tax cuts with aid, there may be a negative feed-back loop where simultaneous decrease in taxing and government spending undermines the public support on taxing and in long-run weakens the institutions and the social contract (Clist, 2016).

The behavioural response is unlikely to be as simplified as suggested above. Tagem (2017) argues that behavioural response is determined by a trade-off between the political costs of taxing and aid: the first one is evidently an unpopular choice among the taxpayers and the latter is increasing aid dependency and lack of autonomy, as foreign aid often comes with conditionalities. He provides further explanations for response to aid, since the sole amount of aid is unlikely to be the only determinant of fiscal response. He points out that technical assistance, donor conditionalities and recipients’ policies and reforms impact the response to aid. For example, conditions related trade liberalization or revenue management determine how governments choose to treat aid inflows. Finally, he mentions the nature of donor-recipient relations as a determinant for government response. Aid-volatility reflects the stability and predictability of aid flows. Highly volatile aid may weaken the effect on tax efforts, but also highlight the need for building effective taxing system due to unreliable aid. Depending on the chosen response, aid may have a similar, but positive feed-back loop described by Clist (2016), simultaneous increase in taxes combined with increased government spending and better public services may increase the public support on taxes and therefore strengthen tax capacity and institutions in long-run. Therefore, it is vital to design development co-operation in a manner that strengthens the domestic taxing systems, and the country moves to this positive path.

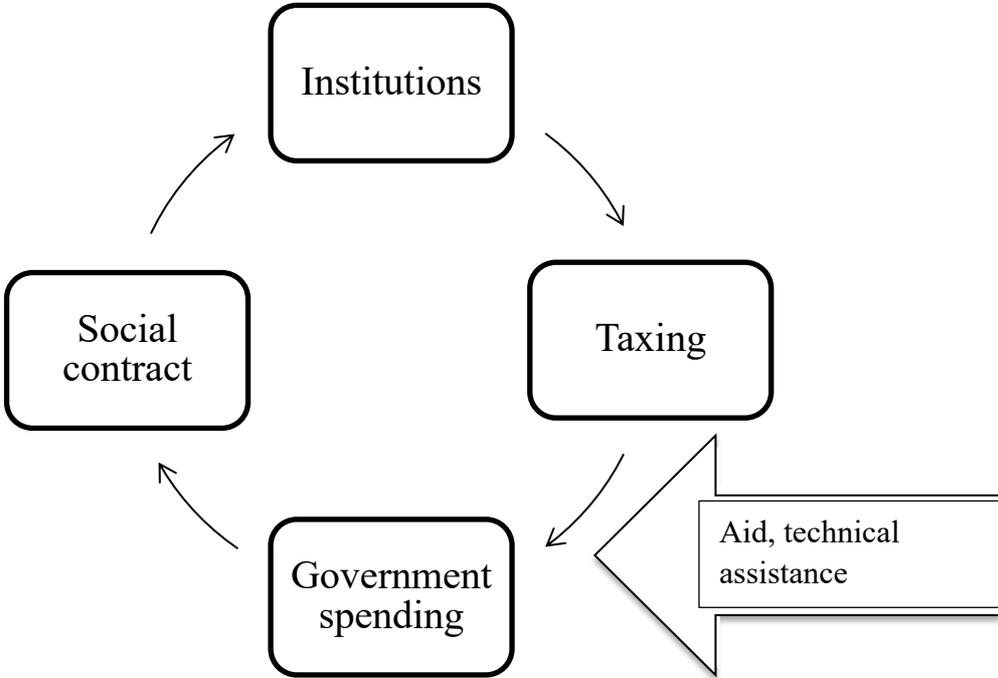


Figure 6 Positive/negative feedback loop for tax revenue mobilization

2.2.3 Determinants of Domestic Tax Revenue Mobilization

Building efficient taxing systems is costly and takes time. Some of the factors like inflation and external flows of revenue are impacting tax efforts on annual basis. However, it needs to be acknowledged that there are path dependent long-run impacts as well, i.e., strong institutions and administrative capacity takes time to develop, therefore, a non-dynamic model cannot explain all the variation in tax revenue. Previous literature has identified a series of predictors for country's tax efforts, which are used in this thesis as control variables.

Commonly used predictors for tax efforts can be divided into time variant factors capturing the composition of the economy, macroeconomic performance and the institutional capacity and time invariant country specific variables (e.g., geography, legal origin and ethnic fractionalism) and spatially invariant year specific variables (e.g., common shocks that impact all the countries similarly). The composition of the economy includes variables like GDP per capita, openness to trade (sum of imports and exports scaled by GDP), share of value added of agriculture sector and manufactures sector, share of rents from oil and mineral wealth. Annual inflation accounts for macroeconomic performance and perception based institutional quality index ICRG is used as a proxy for good governance. The time and space invariant unobserved variance is addressed by using year and country fixed effects.

GDP per capita is a proxy for overall economic development and therefore, is expected to be positively correlated with increased tax revenue per GDP (Fenochietto & Pessino, 2013). Openness to trade, measured as a sum of imports and exports as a share of GDP, may effect taxing through two opposite directions: (1) open countries tend to mitigate risks by developing larger governments (Rodrik, 2008) and generally trade is easier to tax than agriculture or informal sector, which both account for a significant share of output in developing countries, (2) openness to trade may be an outcome of trade liberalization and therefore reduced tariffs may decrease the overall tax mobilization (Benedek et al., 2014; Crivelli & Gupta, 2016).

The composition of the economy is impacting tax revenue mobilization especially in developing countries because some sectors are harder to tax. Manufacturing typically consists of larger companies, which are easier to tax than small scale farmers or traders (e.g., Fenochietto & Pessino, 2013). Agricultural sector on the other hand, especially in developing countries, tends to consist of small-scale farming and informal sector. Therefore, larger share agriculture value added tends to decrease total tax revenue (Araujo-Bonjean & Chambas, 2004). Additionally, a large share of revenue from natural resources is associated with weaker taxing systems through a natural resource curse, as they provide an additional income (Albers, Jerven & Suisse, 2020).

Inflation may impact taxing in two ways (Benedek et al., 2014). Firstly, if the taxes are unindexed, inflation can cause tax revenues to increase in unrealistic way. Secondly, high levels of inflation can be a sign of seigniorage and bad macroeconomic management. Finally, closely related to macroeconomic management, institutional quality and corruption impacts tax revenue mobilization, as stronger institutions and lack of corruption are a proxy for more efficient taxing authorities and a sign of public acceptance or social contract.

In addition to the aforementioned determinants, Fenocietto and Pessino (2013) has identified income distribution and education level to be good predictors of tax revenue mobilization. However, they are not used as control variables in the thesis because there are some gaps and disparities in inequality data. A widely used World Income Inequality Database (WIID) combines several sources of data, but there are big gaps in e.g., Gini data, and different estimates have rather large disparities leading to measurement error and shrinking dataset. Additionally, Tagem (2017) is estimating the causal relationship between taxes and development aid for samples consisting of countries with and without domestic tax reforms and donor conditionalities, which are likely to impact the fiscal response to aid. However, Ahlerup, Baskaran and Bigsten (2014) argue that in Africa, adoption of tax innovations, i.e., value added tax (VAT) and autonomous revenue authorities (ARAs) do not have a long-run association with total tax revenue mobilization. Clist and Morrissey (2011) are disaggregating the openness to trade into exports and imports, which they argue to have different tax revenue implications. Cassimon and von Campenhout (2007) are additionally controlling for domestic borrowing, external borrowing and debt relief which have two opposite possible effects: borrowing may substitute for tax revenue mobilization and indebted countries may have an extra incentive for collecting more tax revenue.

2.3 Previous Research

This chapter reviews the empirical literature on tax-aid nexus. So far, the results have been inconclusive, arguing either for a positive or negative relationship. As aid allocation is endogenous, i.e., poorer and less developed countries tend to receive *ceteris paribus* more aid, the causal relationship is difficult to establish. The literature has attempted to overcome the endogeneity issue by using various causal methods, but this thesis is arguing that the work is still incomplete.

2.3.1 Aid and Tax Revenue Mobilization Debate

The empirical relationship between foreign aid and domestic revenue mobilization has been widely researched and so far, the evidence has been inconclusive. Depending on the specification of the model, the type of disaggregation of aid and taxes and the period investigated, the results vary from aid flows associated with decline or increase in tax revenue. This chapter surveys the previous attempts to establish causality between foreign aid and tax revenue with a careful review of the empirical strategies used in the investigations. The critique on the previous literature is also guiding the empirical strategy used in this thesis.

A much-cited article by Gupta, Clements, Pivovarsky and Tiongson (2003) is one of the first papers investigating the tax-aid relationship empirically. They found a statistically significant, negative association with total ODA, grants and taxes and a positive association with concessional loans and taxes by analysing 107 recipient countries during 1970-2000. The reasoning behind the association is that due to fiduciary reasons and aid fungibility, foreign revenue in the form of grants may finance tax-cuts and on the other hand, loans do not

increase such behaviour, because they need to be paid back at some point. The choice of econometric model, a fixed effect in panel data, is insufficiently addressing the endogeneity concerns that are strongly linked with the research problem: i.e., less developed countries, that tend to have less developed taxing systems, also tend to receive more aid. Therefore, an increase in aid flows is associated with lower tax revenue, but the causal relationship remains uncertain.

The aforementioned endogeneity issue associated with foreign aid has spun a further strand of literature trying to establish a causal link between the variables of interest. The typical methods used are Arellano-Bond's difference and system GMM (Arellano & Bond, 1991; Arellano & Bover, 1995), that uses the first lag of the dependent variable as an instrument and 2SLS instrumental method using e.g., cultural and historical proximity and distance between donors and recipients or population size and socioeconomic indicators as instruments. Furthermore, the GMM method treats panel data in a dynamic manner, taking into account contemporaneous effect and medium-term effects through lagged dependent variable. Taking the dynamic properties of the panel data into account is important for two reasons: (1) effects of aid may take some time to appear, (2) there is an endogeneity related to disbursement of aid: increased aid flow in a year t might be a reaction to inability to raise sufficient amount of domestic revenue. Clist and Morrissey (2011) found a positive relationship between grants and tax revenue in mid-term by using the GMM method for 82 developing countries on a later period 1985-2005. They also found that the contemporaneous effect was negative, which is in line with Gupta, Clements, Pivovarsky and Tiongson (2003). Additionally, Clist and Morrissey (2011) argue that there is a pivot point in the effect of aid, which becomes visible after limiting the sample to 1985-2005 instead of 1970-2000, as used in the previous study. The theoretic explanation for the pivot point is that by 1985, the IMF and the World Bank structural adjustment programs were in full swing, and those programs included conditionalities and technical assistance related to development of tax systems. However, the authors do not provide empirical evidence for the claim.

Crivelli and Gupta (2016) were separately investigating the impact of IMF conditionalities to the relationship of ODA and tax revenue. They found for a sample of 111 countries during 1993-2012 that IMF conditionalities (here used a dummy for IMF structural benchmarks) help to offset some of the negative effect of grants on tax revenue, even though the effect is still negative. Additionally, their results emphasise the role of good governance: the conditionalities had a more positive effect in countries with strong institutions. They use a dynamic 2SLS model with a Mills ratio instrument that includes variables related to recipients' relationship to IMF. However, a possible source for bias is that the instrument is related to allocation of IMF conditionalities, but the aid flows are accounted from bilateral DAC donors instead of multilateral donors. Albeit it can be assumed that IMF conditionalities and technical assistance impact the whole country's fiscal policies at least at certain level, even if they are measuring for the impact of bilateral aid. Also, Tagem (2017) is emphasizing the role of donor conditionalities and technical assistance in strengthening aid's impact on reinforcing the recipients' tax to GDP ratios. Using a dynamic CCEMG method, they found a positive long-run association between aid and taxes within countries that had an IMF 'met' revenue conditionality. The met conditionality entails e.g., measurable targets like increasing VAT and structural conditions relating to tax reforms. Tagem (2017) also investigated the short and long-run impact of technical assistance to tax revenue in countries that have

performed a tax reform (here used: implementation of autonomous revenue authorities (ARAs)) and found that countries that had implemented ARAs experienced a positive long-run impact of technical assistance to tax revenue. Technical assistance did not have a statistically significant impact on tax revenue in countries without tax reform or conditionalities in long-run nor in short-run.

Besides the GMM method, other strategies have been used to account for the endogeneity issues, namely 2SLS IV method. A popular instrument for exogenous aid allocation has been developed by Tavares (2003) and Larrain and Tavares (2004). It is using cultural and colonial proximity and bilateral distance between donors and recipients as an instrument. Thornton (2014) was studying 93 developing countries during 1984-2009 and arrived at same results as Gupta, Clements, Pivovarsky and Tiongson (2003): grants have a negative impact on tax revenue and concessional loans a positive one. The postestimation tests for instrument validity seem to be strong ($F\text{-stat} > 1000$). However, the study is only looking at contemporaneous effect instead of dynamic effect with lags. As has been discussed earlier in this chapter, most of the studies have indeed found a negative contemporaneous effect, but a positive medium or long-term effect. Another shortcoming in using cultural and geographical distance as an instrument is the shanking sample size due to missing values in data for donor's aid outflows. This happens because the instruments are a sum of aid flows by donor per year. Therefore, even one missing value in donor data yields a missing value in a given year and country. For Thornton (2014), the sample size shrank from ~ 2000 to ~ 1000 . Another strategy in the literature is to use population size, infant mortality, life expectancy and natural disasters as instruments (Benedek, Crivelli, Gupta and Muthoora, 2013). However, the F-statistics of the instrument validity are weak (< 10) and intuitively it is not clear if development indicators like infant mortality and life expectancy are truly exogenous, as they are also a good predictor of general underdevelopment, which is probably correlated with underdeveloped taxing systems.

Several studies have also disaggregated the tax revenue and aid into different sub sections (Mavrotas and Ouattara, 2007; Benedek, Crivelli, Gupta and Muthoora, 2013; Knoll, 2011 & Crivelli and Gupta, 2016). The results are mixed. Mavrotas and Ouattara (2007) researched project aid and financial program aid among 106 developing countries during 1970-2001 in a dynamic GMM model and found that project aid increases both total and trade tax, but financial program aid decreases trade tax. Their results are a good contribution to literature, as they show that also the aid modality matters. Another study was investigating specifically the impact of general budget support aid interacted with targeted conditionalities in 37 Sub Saharan African countries and found that grants have a positive impact on total tax revenue (Knoll, 2011). Regarding the different types of taxes, Benedek, Crivelli, Gupta and Muthoora (2013) found in their study that total aid is negatively associated with VAT, excise tax and income tax, but has a positive relationship with trade tax. They used a set of econometric estimation strategies from a baseline fixed effects model, to system GMM and an 2SLS IV method to address the issues of endogeneity and contemporaneous effect. However, their results have been criticized for using inconsistent dataset where the outcome variable is compiled from three different sources and the results could not be replicated (Clist, 2016).

Further critique for some of the studies is regarding the use of an appropriate measures for tax revenue and aid. Firstly, regarding aid, the research should be interested in measures that

effect the behaviour regarding taxing, i.e., aid that actually goes to budget. Large amount of aid is in a form of technical assistance and therefore it is off-budget aid and non-fungible (discussed in detail in 2.1.3). To measure on-budget aid, this thesis uses a net aid and net grants, which is void of technical assistance, as suggested by Tagem (2017). Secondly, some studies (see table 2.1) are using total government revenue as an outcome variable, which includes resource revenue. However, as Tagem (2017) rightfully points out, the measure of interest should be tax revenue excluding resource revenue, since that is the outcome variable that aid is supposed to impact. Within the UNU WIDER's GRD data set, total government revenue includes also grants and social contributions. Many of the surveyed articles do not clearly identify if the used measure is including or excluding social contributions and grants. Improper measure of taxes would bias the results, since aid does not impact social contributions and inclusion of grants would lead to double accounting.

The most common sources of data used in government revenue literature are the IMF's government finance statistics (GFS) database and UNU-WIDER's and ICTD's government revenue database (GRD). Some (Benedek, Crivelli, Gupta and Muthooru, 2013) have compiled their revenue data from various sources, increasing the risk for inconsistencies and measurement error, as has been pointed out by Clist (2016). GFS database suffers from missing values and therefore yields an unbalanced panel. GRD has been compiled from various sources, but serious efforts have been made to increase consistency, transparency and missing values (Prichard, 2016). The latter dataset has been chosen by most of the recent studies including this thesis.

Table 1 Methodological review of aid-tax nexus. Compiled by the author.

Positive relationship – Cross country analysis					
Name	Main findings	Method	Dependent and explanatory variables	Control variables	Countries /years
Clist & Morrissey (2011)	After 1985, grants and loans encourage tax efforts in medium term; contemporaneous effect is negative, change in later period: full period includes an insignificant negative effect	Fixed effects, GMM	Ln total tax/GDP; Grants, grants2, loans, loans2	Agriculture VA, industries VA, exports/GDP, Imports/GDP, GDP per cap	82 developing countries, 1970-2005 & 1985-2005
Mavrotas & Ouattara (2007)	Project aid increases total and trade tax, financial program aid decreases trade tax	OLS, fixed effects and systemic GMM	Total tax revenues/ Trade tax revenues/ Income tax revenues	GDP per capita trade Terms of trade	106 aid recipient countries; 1970-2001

			Project aid, Financial program aid	Inflation Governance indicator (freedom house civil liberties index) Shares of VA in agriculture, industries and services	
Tagem (2017)	Aid and taxes comprise an equilibrium relation with positive long-run association with aid and taxes.	Dynamic common correlated effects mean group estimator	Non-resource tax revenue excluding grants and social contributions Grants, loans and technical assistance	Level of development (LDC and LIC) Region Heterogeneity in aid flows Domestic revenue Donor conditionality (met revenue conditionality) Recipient policy reform (semi autonomous revenue authorities, SARA) Stability of donor-recipient relationships Heterogeneity in natural resource wealth	84 developing countries; 1980-2013
Knoll (2011)	GBS aid combined with well targeted conditionality has a positive impact on tax revenue mobilization	Time FE, Arrellano-Bond differenced GMM and system GMM	Central government revenue excluding grants/GDP General budget support (GBS) aid from bi and multilateral donors	GNI/GDP, ODA, agriculture VA, openness to trade, oil	37 Sub Saharan African countries, 2000-2008
Cassimon & Van	Increase in debt relief does not lead to reduction in domestic government revenue	Fiscal response model; vector autoregressive	(all per GDP) Government revenue (tax and non-tax),	(all per GDP) Government revenue (tax and non-tax)	28 HIPC countries; 1991-2004

Campenhout (2007)	collection and performs better than grants or loans	approach (VAR) with pooled OLS, FE and system GMM	Current expenditure, Investment Net domestic borrowing External borrowing External grants Debt relief	Current expenditure and investment Net domestic borrowing External borrowing External grants Debt relief		
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Negative relationship

Name	Main findings	Method	Dependent and explanatory variable	Control variables	Countries /years
Thornton (2014)	Grants have negative impact; Conditional loans have positive impact	2SLS IV (geographical and cultural distance)	Total tax revenue/GDP Total foreign aid; grant aid; conditional loans (bilateral DAC donors)	GDP per capita, openness, industry VA to GDP (easier to tax than agriculture), rents from natural wealth, GDP growth (to control for business cycles) IMF-dummy Corruption index (ICRG) GDP growth rate Region fixed effects Year fixed effects	93 developing countries; 1984-2009
Benedek, Crivelli, Gupta & Muthoora (2013)	Grants have negative effect on TRM, but the effect is weaker with efforts in mobilizing revenue; loans don't have an impact on TRM, ODA is negatively	OLS, OLS fixed effects, system generalized GMM, IV (population size, infant mortality, life	Total tax/GDP, VAT/GDP, excise tax/GDP, trade tax/GDP	GDP per cap, Share of agriculture VA - Share of industry VA Trade openness	118 countries; 1980-2009

	associated with VAT, excise tax and income tax, but has a positive relationship with trade tax; the aid has more negative effect on TRM in low-income countries and countries with weak institutions	expectancy and natural disasters)	Grans, grants2, loans, loans2	Inflation External indebtedness Quality of institutions ((ICRG corruption index) Oil exporters (D)	
Crivelli & Gupta (2016)	IMF conditionalities help to offset the negative impact of grants on tax/GDP, the effect is stronger in countries with high aid dependency and strong institutions (revenue conditionality cannot substitute poor institutions)	Pooled OLS, year FE, 2SLS (instrument inverse MILLS ratio) and lags	Total tax revenue, taxes on goods and services, income tax, trade tax, direct and indirect taxes ODA, ODA##IMF structural benchmark program	GDP per cap, agriculture VA, industries VA, openness to trade, inflation	111 low- and middle-income countries, 1993-2012
Albens, Jerven & Suesse (2020)	Aid has a substantial and significant negative impact on tax revenue mobilization	Long-run panel, fixed effects and causal estimation techniques	Change in real tax collection Access to aid (alliance similarity)	Other covariates: Gov- turnover Cohesive institutions Common interest shocks Access to credit markets Resources Time-varying controls: sovereign policy (dummy) territorial changes (d) hyperinflation episodes (d) socialistic economic systems (d)	1900-2015; 46 African polities;

				drought magnitude (continuous) real GDP growth years in sovereign default	
Gupta, Clements, Pivovarsky and Tiongson (2003)	Concessional loans increase tax revenue and grants reduce it modestly. Countries whth high level of corruption the effect is larger and offsets the positive impact of loans	Panel data regression, fixed effects	Tax effort (tax/gdp) Total aid/gdp Loans/gdp Grants/gdp Squared terms	Agriculture and industry VA/gdp Imports and exports of goods and services/GDP GDP per capita Robustness controls: Corruption (ICRG) Inflation Debt Oil (D)	107 countries, 1970-2000

2.3.2 Issues with Endogeneity – Critique on GMM and Instrumental Approach

As discussed above, the difference and system generalized methods of moments (GMM) model (Arellano & Bond, 2001, Arellano & Bover, 1995) has been a popular estimation strategy in the literature because it has a power to solve the endogeneity issue by using an internal instrument (the lag of the dependent variable) and it provides coefficients for medium-term lagged effects. Usually, good external instruments are hard to find, therefore the interest to GMM is understandable. However, the surveyed papers show some issues with using the method. This thesis argues that GMM is not a suitable method for solving the endogeneity issue. Roodman (2009) is insisting for careful use of the method because it is very sensitive for researchers’ choices, and it is not suitable for datasets containing “a large T and a small N” (T is the number of years and N is the number of countries) or for variables that exhibit random walk. Large T and small N is evidently an issue for all of the papers, as they are looking at time periods from 20 to 35 years. Large T is an issue because in GMM the number of instruments increase quadratically as the years increase. A rule of thumb for sufficiently small number of instruments is that $Z < N$. Large number of instruments leads to an over specified model that yields biased estimates and unreliable postestimation tests for strong

instruments (especially Hansen test, which yields too-good-to-be true p-values (close to 1) if the model is over specified), in which case the endogeneity issue remains unsolved, and a fixed effects model should be preferred model (Roodman, 2009). Moreover, Roodman (2009) suggests that GMM should be used in a thorough manner where all specifications (difference and system GMM and strategies reducing instruments, i.e., collapsing and lag limiting) and the number of instruments are reported. Where replication of the previous articles is out of scope of this thesis, a paper by Marc (2015) shows that a research on tax-aid relationship using 28 years and 67 countries (Chatterjee, Giuliano & Kaya, 2012) yields as much as 250 instruments by collapsing and 450 by using lag limits, which easily exceeds the rule of thumb $Z < N$.

The papers surveyed above do not follow the procedure suggested by Roodman (2009), making the results somewhat unreliable. Mavrotas and Ouattara (2007) use a panel with 31 years and 106 countries, and they do not report the number of instruments, nor do they explain if they used any of the restrictions for the number of instruments. The Hansen statistics are quite high, which is an indication of over specified model. Knoll (2011) uses a panel of 37 countries for 8 years. The T is indeed smaller, but the same issues are included: number of instruments is not reported, there is no discussion about instrument restrictions and the Hansen statistics are high. Benedeck et al. (2014) are using a panel of 29 years and 118 countries. Where they do report the number of instruments, in some of the specifications the number exceeds the rule-of-thumb, and the Hansen statistic is too high. Because of these shortcomings, this thesis argues that GMM has so far been unable to fully overcome the endogeneity issue. One strategy could be to create year averages or divide time period into sub-samples. However, that would not remove the problem of small sample size (which is getting even smaller using the suggested strategy) nor the possible random walk in the main variables. The thesis tested the run system GMM for 4 sub-periods using both lag limits and collapse command. Where the models show sufficiently strong instruments, the results are not yielding almost any significant results. This is probably indication of another violations; the main variables show too much random walk, and the sample size is too small. The results of the system GMM are reported in appendix 1.

Finding good external instruments is usually hard. The 2SLS instrumental variable approach used by Thornton (2014) is providing good postestimation tests for the validity of the instruments, but it may pose some limitations. The instruments (cultural and geographical proximity of the donor and recipient) are dividing the aid recipients into treatment and control groups. However, the instrument is only considering DAC donors, but the analysis is using total aid, which includes also multilateral donors and non-DAC donors. The instruments are unable capture the allocation of aid by those donors, which means that countries that receive more aid by multilaterals and non-DAC donors are probably treated as a control group. Therefore, the estimation strategy does not fully tell us what the impact of aid on taxes is. The instrument should be consistent with the endogenous variable used, i.e., using aid from DAC donors would be more appropriate. Moreover, one of the assumptions for a valid instrument is the “exclusion restriction”, the instrument should be correlated with the outcome variable only through the endogenous variable, i.e., aid. However, colonial history and religion are possibly linked to the legal system in the recipient countries (British colonies tend to heritage a British legal system etc. Also, Muslim countries tend to have different legal systems as well) and legal system is likely to be correlated with the tax system. This thesis was using a

similar instrument, but for African countries and used aid by DAC donors as endogenous variable. The instrument yielded weaker test statistics than those of Thornton (2014) which might be an indication of the aforementioned inconsistencies with the instrument and the chosen aid measure.

3 Data

This chapter presents the data used in the thesis and the limitations.

3.1 Source Material

The dataset used in the thesis is compiled from various sources, but in a way that each variable comes from a single source. This increases the comparability of data and reduces measurement error, as different sources may have a different methodology to collect data. The dataset used in the investigation is a panel consisting of 53 African countries in 39 years from 1980-2018. The total number of observations is 2067. The sources and explanations are presented in the table 3.1. Missing values in some control variables yield a different sample while using different models.

As an outcome variable, this thesis is using non-resource tax revenue excluding grants and social contributions as a share of GDP. The tax data is retrieved from Government Revenue Database (GRD). GRD is compiled by International Centre for Tax and Development (ICTD) and UNU-WIDER institute. The database is preferable to many previous ones (e.g., IMF Government Finance Statistics) because it contains fewer missing values, and it has disaggregated government revenues to tax revenues, social contributions and resource revenue. This provides a more accurate measure of the sole tax revenue component of government revenue. A generally low quality of data, which is especially pronounced in the African context and government revenues, raises questions of wrongly conducted research and misleading policy implications (Jerven, 2013). The GRD dataset is providing more transparent and comprehensive data on tax and government revenue by analysing data from all international sources, classifying it in a standardized way and using compatible sources (Prichard, 2016).

The explanatory variables i.e., net ODA, net grants, concessional loans and technical assistance are all disbursements from OECD DAC donors. The measures exclude both the non-DAC official donors and the multilateral donors which together account for a relatively large share of total foreign aid and they are expected to have different kinds of objectives and include different kinds of conditionalities as discussed in chapter 2. The decision to use DAC donors instead of total official donors is stemming from the used of the instrument, which is only accounting for DAC bilateral aid. In line with Tagem (2017), this thesis constructed new measures for net aid and net grants which are void of technical assistance. Technical assistance is off-budget aid and is therefore non-fungible (Marc, 2017). Therefore, on-budget aid, measured by net ODA and net grants, is more suitable measure for assessing the impact of aid on taxing. Secondly, the impact of technical assistance as an interaction with aid is

separately assessed because technical assistance usually includes activities like capacity building regarding development of effective taxing systems and fiscal management of aid funds. However, technical assistance is a broad measure that also includes other professional services. Therefore, it is an imprecise measure of technical assistance allocated directly to taxing and fiscal management and should be understood as a proxy. To our understanding, there is no data on monetary value of technical assistance directed to tax capacity. The data on different aid components are retrieved from OECD’s Development Assistance Committee (DAC) database and all aid data is scaled by GDP, which is retrieved from the World Penn Tables 10.0. The donated aid data which is used in the instrument is also retrieved from the OECD DAC database. Unfortunately, due to large amounts of missing data² in the donor disbursements, the sample size in the instrumental variable model shrinks to a subset of 26 countries instead of initial 53 countries that are available in the GRD dataset.

The control variables used in the thesis are retrieved from various sources. GDP per capita comes from the World Penn Tables 10.0, openness to trade, agriculture and manufactures value added, inflation and natural resource rents come from the World Bank’s World Development Indicators (WDI) and the index for quality of governance comes from QoG institute. Additionally, the bilateral distance, common main religion and shared colonial history data used in the instrument is retrieved from CEPII’s GeoDist dataset.

Table 2 Variables and their sources

Name of the variable	Comments	Source
Non-resource tax revenue/GDP	Excluding social contributions, grants and resource revenues	GRD by UNU-WIDER
<i>Explanatory variables</i>		

² Instruments are a sum of aid donated by each eleven donors to a given country on a given year. Therefore, even one missing value in the donor data yields a missing value for the whole year/country pair.

Net ODA/GDP	Net ODA disbursements excluding technical assistance from DAC donors, constant US\$ 2018	ODA: OECD DAC database GDP: World Penn Tables 10.0
Net grants/GDP	Grants excluding technical assistance from DAC donors, constant US\$ 2018 (disbursements)	ODA: OECD DAC database GDP: World Penn Tables 10.0
Total net ODA loans/GDP	ODA loans from DAC donors, constant US\$ 2018	ODA: OECD DAC database GDP: World Penn Tables 10.0
Technical assistance/GDP	Total technical assistance from DAC donors, constant US\$ 2018	ODA: OECD DAC database GDP: World Penn Tables 10.0
<i>Control variables</i>		
GDP per capita	Real GDP at constant 2017 national prices (in mil. 2017US\$)	GDP and population: World Penn Tables 10.0
Openness to trade	Imports + exports as a % of GDP	The World Bank's WDI
Agriculture value added	Agriculture, forestry, and fishing, value added (% of GDP)	The World Bank's WDI
Manufacturing value added	% of GDP	The World Bank's WDI
Inflation	Inflation, GDP deflator (annual %)	The World Bank's WDI
Mineral rents	Mineral rents (% of GDP)	The World Bank's WDI
Oil rents	Oil rents (% of GDP)	The World Bank's WDI

ICRG	The mean value of the ICRG variables Corruption, Law and Order and Bureaucracy Quality, scaled 0-1. Higher values indicate higher quality of government.	QoG Institute (Original Data Source: International Country Risk Guide - The PRS Group)
<i>Data for the instrument</i>		
Total bilateral net ODA by donor	Top 11 DAC donors in 1980: Australia, Canada, France, Germany, Italy, Japan, Korea, Netherlands, Spain, the UK and the US, constant US\$ 2018	ODA: OECD DAC database
Bilateral distance between donor and recipient	Bilateral distance between donor and recipient based on the geographic coordinates of the capital cities.	CEPII GeoDist database
Former colony	Dummy, 1=former colony, 0=not former colony	CEPII
Common main religion	Dummy, 1=shared common main religion, 0= no shared common religion	CEPII

Summary statistics of the variables of interests are presented in the table 3.2. The mean tax revenue equals 12.4% of the GDP, but there is large variation from 0.6% to 60%. The trend in tax revenue as a share of GDP has been rising since 2000, but with a strong decline experienced in the 90s and a subsequent increase since the 2000, as is shown in the figure 7. Grants account for the largest share of official development assistance with the mean of 1.5% of GDP. Loans account for only 0.2% of GDP on average and technical assistance 0.7%, which is surprisingly large share. There is also significant variation between years and countries in net grants, as can be seen from the 2.2 standard deviation. Total ODA measured in constant US dollars has been increasing throughout the measuring period, the ODA per GDP has been declining. ODA and its components are shown in the figure 8.

Table 3 Descriptive statistics of the variables used in the analysis

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Non-resource tax ex social contributions and grants/GDP	1666	12.38	7.104	.6	59.98
Net ODA/GDP	1835	1.68	2.431	-.60	23.15
Net grants/GDP	1893	1.519	2.177	-.02	30.02
Loans/GDP	1835	.161	.835	-8.20	11.85
Technical assistance/GDP	1893	.676	.835	0	6.45
GDP per capita	1911	4294.99	5111.42	289.82	46685.95
Openness to trade	1769	67.74	34.24	6.32	311.35
Agriculture VA/GDP	1766	23.46	14.78	.89	79.04
Manufactures VA/GDP	1599	11.39	6.69	0	50.04
Inflation annual %	1886	38.98	642.54	-31.57	26765.86
Mineral rents/GDP	1912	1.47	3.97	0	46.62
Oil rents/GDP	1898	4.33	10.67	0	78.54
ICRG	1276	.40	.14	.04	.90

Average tax revenue and net ODA (% of GDP), 1980-2018

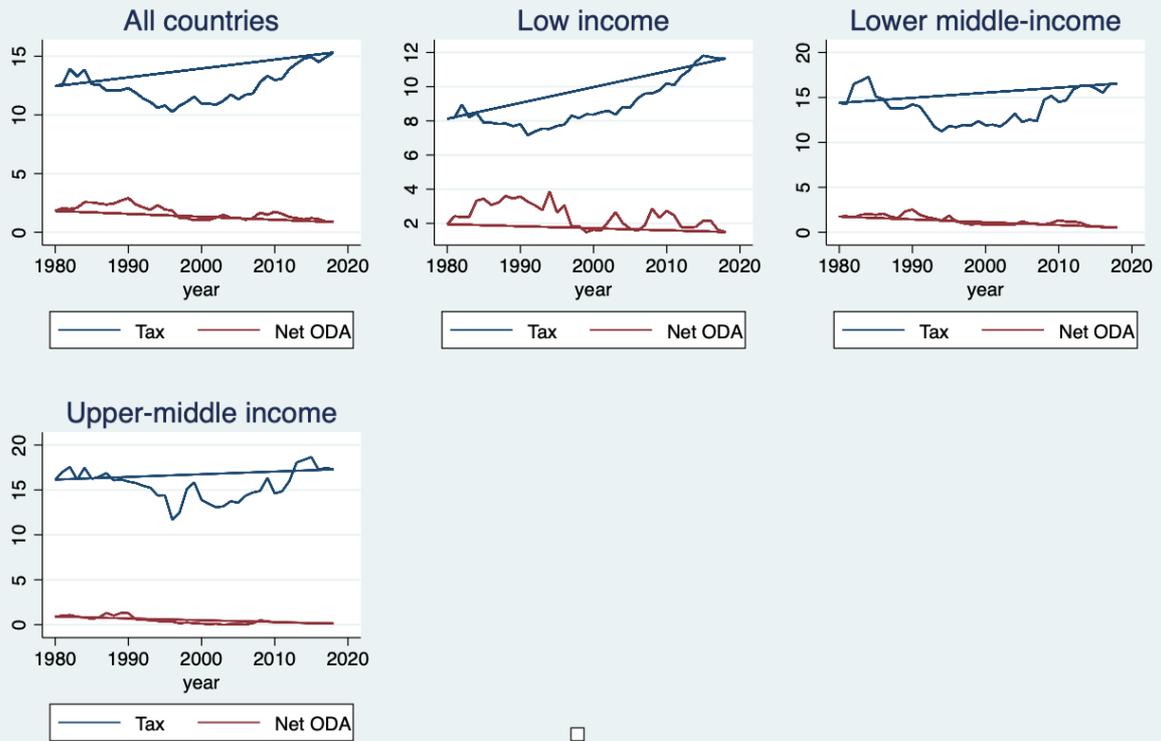


Figure 7 Source: tax revenue (GRD, 2020), net ODA (OECD DAC, 2020)

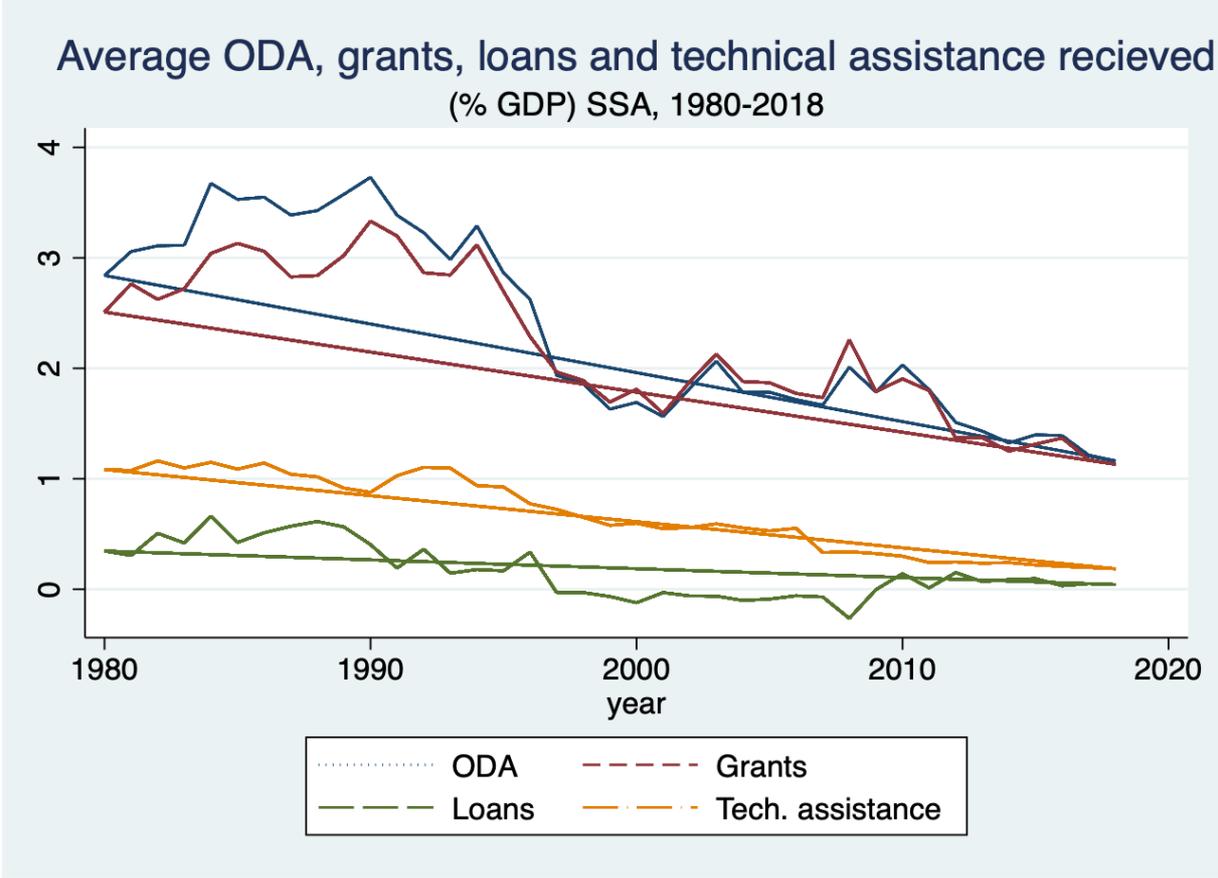


Figure 8 ODA and its components as a share of GDP (OECD DAC, 2020)

4 Methods

This chapter is first describing the model used in the thesis. The modelling strategy is to use a pooled OLS as a baseline, then fixed effects to account for unobserved variance and finally, a 2SLS IV method. The preferred method for total ODA, ODA interacted with technical assistance and grants is the IV method. The instruments for loans and interaction of grants and technical assistance are weak. Therefore, fixed effects are used as a second-best option. The chapter goes on by presenting the results and the discussion of the findings.

4.1 The Model

This thesis is separately estimating the causal relationship of foreign aid and tax revenue mobilization and if technical assistance can enhance the fiscal response by the recipient country. The estimation strategy is to use pooled OLS as a baseline, then fixed effects model and finally 2SLS panel IV estimation. The system GMM was found to be unsuitable for the data available. The GMM results are presented in appendix 1.

The previous attempts at trying to establish a causal relationship between aid and taxing have failed at arriving in consensus. One of the largest obstacles for establishing the causal link is endogeneity: aid is often allocated disproportionately more to countries that are poorer and on years that experience economic downturns. Therefore, this thesis is approaching the question by using both a fixed effect model and panel 2SLS IV method to account for endogeneity. The instrument used in this analysis is developed by Tavares (2003) and Tavares and Larrain (2004). It is using geographical and cultural proximity as an instrument. The logic is that those recipient countries that are geographically and culturally closer to the donor countries, tend to receive *ceteris paribus* more aid. However, the instrument is weak for loans and the interaction between technical assistance and grants. In those cases, fixed effects are used as the second-best estimation strategy. However, loans account for only a small share of total ODA and are therefore less significant for the overall analysis.

As a baseline model, the thesis is using pooled OLS and FE model. FE model is tackling some of the omitted variable bias by controlling for time-invariant factors by looking at within-unit variation. In other words, FE model is dividing the error term into time-invariant and time-variant parts ($\mu_i + \varepsilon_{it}$). The time-invariant error term can control for latent and non-latent country-specific factors, e.g., geography, legal origin etc. This allows correlation between μ_i and X_{it} . Therefore, additional controls for these time-invariant factors are not required. To account for exogenous time specific shocks, e.g., the global financial crisis, year dummies are added. This is a specification strategy chosen by most of the studies (e.g., Thornton, 2014). However, this might not be always suitable, since different countries may

react differently to these shocks (Tagem, 2017), which might cause some bias in the estimators used in this thesis. FE model does not come without pitfalls. It assumes that all explanatory variables need to be strictly exogenous, i.e., uncorrelated with the error term (Angrist et al., 2010). Aid is highly likely to be endogenous and therefore the 2SLS is applied. Finally, measurement errors are more pronounced in FE than in OLS (Angrist et al., 2015). To account for measurement error, the thesis is using the best available dataset GRD by UNU-WIDER, which is aiming to use the most compatible sources as possible.

The fixed effects equations are (4.1, 4.2, 4.3, 4.4, 4.5, 4.6):

$$(4.1) \quad nr_tax_{it} = \alpha + \beta tot_aid_{it} + \beta X_{it} + \mu_i + \varepsilon_{it}$$

$$(4.2) \quad nr_tax_{it} = \alpha + \beta grants_{it} + \beta X_{it} + \mu_i + \varepsilon_{it}$$

$$(4.3) \quad nr_tax_{it} = \alpha + \beta loans_{it} + \beta X_{it} + \mu_i + \varepsilon_{it}$$

$$(4.4) \quad nr_tax_{it} = \alpha + \beta tot_aid_{it} + \beta technical_assistance_{it} + \beta tot_aid_{it} * \beta technical_assistance_{it} + \beta X_{it} + \mu_i + \varepsilon_{it}$$

$$(4.5) \quad nr_tax_{it} = \alpha + \beta grants_{it} + \beta technical_assistance_{it} + \beta grants_{it} * \beta technical_assistance_{it} + \beta X_{it} + \mu_i + \varepsilon_{it}$$

$$(4.6) \quad nr_tax_{it} = \alpha + \beta loans_{it} + \beta technical_assistance_{it} + \beta loans_{it} * \beta technical_assistance_{it} + \beta X_{it} + \mu_i + \varepsilon_{it},$$

where nr_tax_{it} is non-resource tax revenue excluding grants and social contributions, tot_aid_{it} is the total ODA net of technical assistance from official bilateral DAC donors, $grants_{it}$ is grants excluding technical assistance, $loans_{it}$ is concessional loans and $technical_assistance_{it}$ is technical assistance for country i in year t respectively. X_{it} is a vector of control variables including GDP per capita, share of agriculture value added, share of manufactures value added, openness to trade (imports + exports and a share of GDP), annual inflation, rents from mineral wealth/GDP, rents from oil/GDP and ICRG perception-based corruption index. μ_i is the time-invariant fixed effects and year fixed effects and finally, ε_{it} is the error term that is independent over time and between individual countries. The theoretical relationship between the control variables and the possible channels of causality are motivated in the chapter 3.1.

The second estimation strategy used in the thesis is a 2SLS on panel data. In presence of good instrument, 2SLS can establish a causal relationship and get rid of the endogeneity issue. Technically, 2SLS method yields a local average treatment effect (LATE) which equals reduced form estimate divided by the first stage estimate:

$$(4.7) \quad LATE = \frac{E[Y_{it}|Z_{it} = 1] - E[Y_{it}|Z_{it} = 0]}{E[D_{it}|Z_{it} = 1] - E[D_{it}|Z_{it} = 0]}$$

where, Y_{it} is the outcome variable of interest (tax revenue), Z_{it} is the instrument (geographical and cultural proximity) that is closer to 0 when there is selection into treatment and is closer to 1, when there is not selection into treatment, D_{it} is the treatment status depending on the values of Z_{it} . Similarly as in the FE models, IV method increases the internal validity of the

results, but comes with the cost of external validity: LATE is only describing the countries that are selected into “treatment”, i.e., countries that receive exogenously more aid as per the instrument, but tell us nothing about the countries that are excluded of the treatment (Angrist et al., 2015).

The set of instruments includes bilateral distance between donor and recipient countries, their shared main religion and colonial history. The theoretical motivation for the chosen instruments is that aid is allocated based on cultural and historical similarities, e.g., British and French are donating more aid to their former colonies (Alesina and Dollar, 2000). For consistency reasons, this thesis is using aid disbursements only from bilateral DAC donors in the analysis, since the instrument is capturing the DAC donors. This differs from the strategy chosen by Thornton (2014), which is using total official aid flows that includes also non-DAC donors and multilateral donors, which are both excluded from the instrument. This may impact the instrument in an unrealistic way as it automatically treats countries receiving less DAC aid as the control group, even though they would receive multilateral or other official aid. The fact that the same instruments used in this thesis is yielding much weaker test statistics may be partly due to this reason and partly due to using a different sub-sample (Africa instead of all developing countries).

As panel data need continuous time-variant instruments, they are constructed using following strategy:

1. Choose 11³ largest DAC donors in the starting year 1980 (Australia, Canada, France, Germany, Italy, Japan, Korea, the Netherlands, Spain, the UK and the USA) and the constant US dollar value of their bilateral total ODA to each recipient country in each year. Include another variable with the inverse of the bilateral distance, a dummy for shared main religion and a dummy for shared colonial history (1= yes, 0= no).
2. The outflows of ODA for each country are multiplied by the aforementioned variables.
3. Each category is summarized yielding 3 instruments.

$$(4.8) \quad aid * distance_i = \sum_{j=1}^{11} (inverse \ of \ bilateral \ distance_{i,j}) * aid$$

$$(4.9) \quad aid * colonial \ history_i = \sum_{j=1}^{11} colonial \ history_{i,j} * aid$$

³ The number of donors were limited to 11 in order to avoid too small sample size. The instrument is using a sum of donated aid * bilateral distance/religion/colony and therefore, even one missing observation in one of the donors on given year and recipient yields a missing value in the whole instrument.

$$(4.10) \quad aid * religion_i = \sum_{j=1}^{11} shared\ religion_{i,j} * aid$$

To determine a good instrument, three assumptions need to hold (1) strong first stage, i.e., the instrument Z_{it} needs to be correlated with the selection into treatment D_{it} , (2) independence assumption, i.e., Z_{it} should be as good as randomly assigned, that is, uncorrelated with the explanatory variables, and (3) exclusion restriction, i.e., Y_{it} and Z_{it} should be correlated only thorough selection into treatment (Angrist et al., 2015). Regarding the first stage, donor countries are shown to favour recipient countries that are historically and culturally closer to themselves. However, this does not seem to fully apply empirically when looking at a sub-set of African countries: post estimation tests for strong instruments for both loans and the interaction with technical assistance are weak. Also, some of the instruments are yielding coefficients with unexpected sign, i.e., distance and colonial history seem to be negatively correlated with aid. In conclusion, geographical and cultural closeness does not seem to be a good predictor of allocation of DAC loans and technical assistance. For them, fixed effects coefficients are used instead. Loans account only a small share of total ODA, so they do not have a significant impact on the overall results. What comes to the exclusion restriction, it is plausible to assume that the instruments are at least mostly uncorrelated with tax revenue, especially geographical distance. However, colonial history might yield a different type of a legal system depending on the colonial ruler and legal system may be somewhat correlated with tax revenue mobilization. In conclusion, intuitively the exclusion restriction does not necessarily fully apply, which contradicts with the reasoning of Thornton (2014) and Tavares (2003).

4.2 Results

This thesis is investigating the relationship between aid and tax revenue mobilization by using various estimation methods: pooled OLS as a baseline, year and country fixed effects and 2SLS instrumental method with fixed effects. Generally the literature has found mixed results regarding the role of foreign aid. Most of the studies have found a negative contemporaneous effect on grants and a negative one on loans (see literature review). However, long run estimates tend to be positive for both. There is a gap in the literature assessing the role of technical assistance on tax revenues. Due to improved specification and more precise measures of tax revenue and on-budget aid, the results bring some new light to the relationship between aid and tax revenue mobilization. The main findings are: (1) using a measure of on-budget ODA, which is void of technical assistance, the contemporaneous effect of ODA on tax revenues is positive, (2) the positive impact of ODA is stronger once the endogeneity issue is removed, (3) concessional loans alone do not seem to exhibit any statistically significant impact on tax revenue but once interacted with technical assistance, the impact is negative and statistically significant, (4) throughout the specifications, technical assistance seems to have a statistically significant and substantially negative impact on tax revenue, although the endogeneity cannot be fully ruled out, and finally (5) the quest for finding a valid instrument to get rid of the endogeneity issue remains pronounced: instruments are weak for technical assistance and grants interaction and loans. For them, the second-best fixed effects model is the preferred model.

The results for net ODA and technical assistance within different estimation strategies as presented in table 4.1. The columns one and two show the baseline model using pooled OLS for net ODA and net ODA and technical assistance interaction respectively, three and four present the results for fixed effect models and five and six are for the instrumental variable approach. For this table the columns six and seven are the preferred model since the instrument are valid. The Craig-Donald F-statistic is above and nearly above the critical values (max 20% bias) given by Stock and Yogo (2005). Also, in the first stage equation, two of the instruments are statistically significant, although colonial history is having an opposite sign to what it should have based on theory. The results show that net ODA has a statistically significant and quite substantial positive impact on tax revenues: one percent larger share of ODA to GDP yield 1.1 percentage point increase in tax revenues as a share of GDP. However, the interaction with technical assistance decreases tax revenue by 0.45 percentage points. The R² is reasonably high (0.36 and 0.43) which indicates that the chosen specification explains 36 % and 43 % of the variation respectively. The fact that the model that includes technical assistance exhibit a higher R² shows that technical assistance is a good predictor for tax revenues. Literature has identified several reasons why technical assistance may have a negative impact on taxing. For instance, it is said to be highly donor-driven, ignoring the recipient countries needs and decreasing programme ownership or the commitment by the recipients (Leidener, 2012). The channels of causality are elaborated more in the discussion section below. Out of the control variables, good governance, measured by the ICRG index and openness to trade are having a large and significant positive impact on tax revenues, as was expected. In line with the theory, inflation and reliance on resource rents are having a negative impact on taxes. All of the models are looking at a contemporaneous effect, meaning the instant short run effect.

Table 4.1 Results for net ODA and technical assistance in pooled OLS, fixed effects and 2SLS fixed effects

VARIABLES	(1)	(2)	(3)	(4)	(6)	(7)
	Pooled OLS ODA	Pooled OLS ODA and tech assistance	FE ODA	FE ODA and tech assistance	2SLS ODA	2SLS ODA and tech assistance
Net ODA/GDP	-0.132 (0.105)	0.000670 (0.165)	-0.0629 (0.0536)	0.129* (0.0737)	0.499 (0.376)	1.105* (0.625)
Tech. as./GDP		-1.500* (0.767)		-0.950*** (0.362)		1.186 (1.688)
ODA##tech.as.		0.0222 (0.0802)		-0.0789* (0.0403)		-0.453* (0.261)
GDP per capita	0.000222 (0.000190)	0.000202 (0.000188)	2.86e-05 (7.84e-05)	4.62e-05 (7.74e-05)	-0.000663*** (0.000200)	-0.000331 (0.000209)
Openness to trade	0.0614*** (0.0184)	0.0641*** (0.0180)	0.0229*** (0.00494)	0.0249*** (0.00494)	0.124*** (0.0184)	0.0987*** (0.0129)
Agri. VA/GDP	-0.163*** (0.0535)	-0.157*** (0.0529)	-0.0269 (0.0168)	-0.0168 (0.0167)	-0.0473 (0.0304)	-0.0347 (0.0311)
Manuf. VA/GDP	0.104 (0.0917)	0.104 (0.0908)	0.0134 (0.0262)	0.0202 (0.0259)	-0.0158 (0.0443)	0.00662 (0.0453)
Inflation	-0.00350** (0.00139)	-0.00370** (0.00145)	-0.00234*** (0.000824)	-0.00230*** (0.000814)	-0.0154*** (0.00424)	-0.0102** (0.00445)
Mineral rents/GDP	-0.120 (0.123)	-0.133 (0.122)	0.0117 (0.0268)	0.0112 (0.0265)	-0.231*** (0.0501)	-0.169*** (0.0501)
Oil rents/GDP	-0.303*** (0.0726)	-0.310*** (0.0729)	-0.137*** (0.0199)	-0.137*** (0.0196)	-0.238*** (0.0479)	-0.207*** (0.0434)
ICRG	6.142 (4.461)	6.416 (4.497)	3.327*** (1.100)	3.563*** (1.084)	4.546** (2.143)	5.297** (2.117)
Year FE			Yes	Yes	Yes	Yes
					Yes	Yes

Country FE	Yes		Yes			
Distance			0.657	0.657		
			(1.190)	(1.190)		
Common religion			0.000907**	0.000907**		
			(0.000354)	(0.000354)		
Colonial history			-0.00198*	-0.00198*		
Under identification test (p)			0.0001	0.0006		
Cragg-Donald F-stat			6.4	5.321		
(Stock-Yogo critical value for 20% max bias)			(6.46)	(6.46)		
Sargan (p-value)			(0.034)	(0.0732)		
Endogeneity (p)			(0.7699)	(0.0432)		
Constant	11.63***	10.08***	11.33***	10.73***		
	(3.743)	(3.404)	(1.098)	(1.092)		
Observations	845	845	845	845	352	352
R-squared	0.583	0.589	0.346	0.369	0.366	0.432
Number of id			33	33	26	26
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

The results for net grants and technical assistance are presented in the table 4.2. The columns one to four are presenting the baseline models and six and seven are presenting the instrumental variable models. The chosen model for grants is the IV model (Cragg-Donald F-statistic > Stock-Yogo critical value for 10% maximum bias) and for grants and technical assistance the fixed effects is used due to weak instrument. Net grants do not show any statistically significant results. However, technical assistance in interaction with grants show a negative and statistically significant association with tax revenue. Unfortunately, the endogeneity issue remains pronounced in the fixed effect model. Technical assistance is likely to be endogenous in a similar manner as aid: donors may allocate more technical assistance to countries with weaker taxing systems and overall, less developed institutions. The control

variables show similar story as in the literature and in the previous model. Additionally, the share of value added of agriculture and manufactures are both significant and yield a negative coefficient. As expected, large agriculture sector is harder to tax due to large share of informal and small-scale farmers. However, the manufacturing sector is usually pointed out to be easier to tax, since it typically consists of larger firms working in the formal sector. From this we can conclude that in Africa, it is actually the service sector that is easier to tax. Again, the R2s are reasonably high (0.3 and 0.2), indicating that the models have explanatory power.

Table 4 Results for grants and interaction with grants and technical assistance

	(1)	(2)	(3)	(4)	(6)	(7)
VARIABLES	Pooled OLS ODA	Pooled OLS ODA and tech assistance	FE ODA	FE ODA and tech assistance	2SLS ODA	2SLS ODA and tech assistance
Net grants/GDP	-0.148 (0.114)	-0.0350 (0.139)	-0.0979* (0.0571)	0.0757 (0.0747)	0.565 (0.458)	1.438 (1.008)
Tech. as./GDP		-1.329 (0.884)		-0.391 (0.411)		5.041 (4.348)
ODA##tech.as.		0.0134 (0.104)		-0.130** (0.0540)		-0.941 (0.593)
GDP per capita	0.000227 (0.000194)	0.000207 (0.000190)	9.65e-05 (8.68e-05)	0.000127 (8.63e-05)	-0.000337 (0.000262)	3.19e-05 (0.000301)
Openness to trade	0.0564*** (0.0164)	0.0585*** (0.0158)	0.0187*** (0.00490)	0.0200*** (0.00492)	0.100*** (0.0208)	0.0729*** (0.0183)
Agri. VA/GDP	-0.169*** (0.0490)	-0.164*** (0.0486)	-0.0462** (0.0181)	-0.0378** (0.0181)	-0.107*** (0.0380)	-0.116** (0.0527)
Manuf. VA/GDP	0.0921 (0.0879)	0.0925 (0.0868)	0.00600 (0.0290)	0.0139 (0.0288)	-0.119** (0.0577)	-0.0829 (0.0648)
Inflation	-0.00355** (0.00138)	-0.00373** (0.00144)	-0.00244*** (0.000921)	-0.00233** (0.000915)	-0.0149*** (0.00562)	-0.00668 (0.00708)
Mineral rents/GDP	-0.111 (0.123)	-0.125 (0.122)	-0.00573 (0.0293)	-0.00373 (0.0291)	-0.261*** (0.0679)	-0.155** (0.0771)
Oil rents/GDP	-0.300***	-0.307***	-0.122***	-0.122***	-0.178***	-0.159**

	(0.0717)	(0.0717)	(0.0221)	(0.0219)	(0.0571)	(0.0645)
ICRG	6.304	6.519	3.955***	4.013***	6.063**	5.183
	(4.282)	(4.328)	(1.191)	(1.179)	(2.576)	(3.401)
Years FE			Yes	Yes	Yes	Yes
Country FE			Yes	Yes	Yes	Yes
<hr/>						
Distance					0.910	0.910
					(1.009)	(1.009)
Common religion					0.00104***	0.00104***
					(0.000300)	(0.000300)
Colony					-0.00263***	-0.00263***
<hr/>						
Under identification test					28.247	11.511
					(0.0000)	(0.0093)
Cragg-Donald F-stat					9.09	3.461
(Stock-Yogo critical value for 10% max bias)					(9.08)	
Sargan					5.858	6.653
(p-value)					(0.0534)	(0.0359)
Endogeneity test					5.884	3.774
(p-value)					(0.0153)	(0.0520)
<hr/>						
Constant	12.05***	10.59***	11.58***	10.97***		
	(3.426)	(3.020)	(1.164)	(1.166)		

Observations	872	872	872	872	359	359
R-squared	0.574	0.579	0.300	0.316	0.208	0.145
Number of id			33	33	26	26
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table 4 presents the results for loans and technical assistance. The suggested instrument is not valid for loans nor interaction with technical assistance (the instruments are not significant in the first stage and the Cragg-Donald F-statistic is too low). Therefore, fixed effects is the preferred model, which is showing no statistically significant results for loans but a statistically significant and negative association with technical assistance and tax revenue. One percentage point increase in technical assistance is associated with a 1.4 percentage point decrease in tax revenue. The R2 is sufficiently high (0.37). Loans account for a small share of total ODA only, therefore, the results do not impact the overall analysis in the thesis significantly.

Table 5 Results for loans and interaction with loans and technical assistance

	(1)	(2)	(3)	(4)	(6)	(7)
VARIABLES	Pooled OLS	Pooled OLS	FE ODA	FE ODA and tech assistance	2SLS ODA	2SLS ODA and tech assistance
	ODA	ODA and tech assistance				
Loans/GDP	0.228 (0.173)	0.377 (0.466)	0.0955 (0.121)	0.128 (0.213)	-4.503 (3.182)	-2.341 (2.445)
Tech. as./GDP		-1.404*** (0.481)		-1.356*** (0.272)		-2.098*** (0.687)
ODA##tech.as.		-0.0181 (0.193)		0.0102 (0.105)		0.979 (0.997)
GDP per capita	0.000240 (0.000186)	0.000205 (0.000184)	2.60e-05 (7.84e-05)	2.92e-05 (7.72e-05)	-0.000693** (0.000335)	-0.000527*** (0.000196)

Openness to trade	0.0591***	0.0653***	0.0229***	0.0267***	0.0959***	0.0877***
	(0.0178)	(0.0177)	(0.00495)	(0.00493)	(0.0188)	(0.0110)
Agri. VA/GDP	-0.166***	-0.155***	-0.0256	-0.0215	0.00801	-0.00542
	(0.0533)	(0.0523)	(0.0168)	(0.0166)	(0.0538)	(0.0268)
Manuf. VA/GDP	0.102	0.103	0.0123	0.0153	-0.0127	-0.0431
	(0.0913)	(0.0903)	(0.0262)	(0.0258)	(0.0745)	(0.0463)
Inflation	-0.00340**	-0.00370**	-0.00228***	-0.00248***	-0.0115	-0.0143***
	(0.00141)	(0.00144)	(0.000822)	(0.000811)	(0.00732)	(0.00401)
Mineral rents/GDP	-0.115	-0.132	0.0122	0.00551	-0.286***	-0.224***
	(0.123)	(0.123)	(0.0268)	(0.0264)	(0.0958)	(0.0523)
Oil rents/GDP	-0.300***	-0.311***	-0.138***	-0.138***	-0.160**	-0.159***
	(0.0721)	(0.0726)	(0.0199)	(0.0196)	(0.0689)	(0.0371)
ICRG	6.353	6.360	3.315***	3.557***	8.919**	7.536***
	(4.554)	(4.583)	(1.101)	(1.086)	(3.739)	(1.801)
Year FE			Yes	Yes	Yes	Yes
Country FE			Yes	Yes	Yes	Yes
Distance					-0.489	-0.489
					(0.594)	(0.594)
Shared religion					-0.000130	-0.000130
					(0.000177)	(0.000177)
Colonial history					0.000825	0.000825
Underidentification test					4.935	6.987
					(0.4248)	(0.0723)

Cragg-Donald F-stat					0.821	2.260
Sargan					0.475	9.281
(p-value)					0.7884	0.0097
Endogeneity test					6.773	0.969
(p-value)					0.0093	0.3248
Constant	11.43***	9.938***	11.28***	11.06***		
	(3.712)	(3.402)	(1.098)	(1.083)		
Observations	845	845	845	845	352	352
R-squared	0.582	0.590	0.346	0.367	-0.789	0.435
Number of id			33	33	26	26
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

4.3 Discussion

The discussion about taxing and development is not new. Kaldor (1963) argues that building an efficient taxing system is playing a key role in reaching self-sustained economic growth and avoiding aid dependency. Both, recipient’s fiscal policies and foreign aid, should be designed in a way that allows incrementally more reliance on domestic tax revenue. However, building efficient and legitimate taxing systems is hard and requires a social contract around paying taxes. The fiscal response in the initial period can lead to a positive or negative feedback loop in the long run (Clist, 2016). If governments choose to maximize their utility in short run by financing tax cuts instead of increasing government spending, the social contract around taxes weakens and the country will become more dependent on aid. This will further hamper taxing in the long run as suspicious taxpayers are less willing to contribute. Therefore, poor choices in the initial period may lead to a negative feedback loop. Vice versa, if the choice in the initial period is to continue to tax and increase government spending, the social contract around taxes will increase. In long run, this leads to more reliance on tax revenues

and higher demand for public services by the taxpayers, i.e., creates a positive feedback loop. The fiscal response in the initial period is determined by a trade off between political costs of taxing and political costs of lowered autonomy and aid dependency (Tagem, 2017).

There have been some concerns that foreign aid may work as a disincentive to raise tax revenues (see literature review). However, this thesis is providing evidence that foreign aid in fact has a positive impact on taxes in short run in Africa. This can be seen in the aggregate level as well. The total amount of tax revenues per GDP has been rising since 2000, while the amount of aid as a share of GDP has been declining. This can be interpreted a positive sign, showing that countries are less aid dependent and have embarked on a path to self-sustained economic growth. It also signals that African governments are indeed capable of making good independent policy choices despite the moral hazard created by foreign aid. Self-evidently, good governance is playing a key role in this equation, and it seems that recent positive developments in democratisation, governance and economic growth have made it easier for African governments to choose the positive fiscal response to aid (Albers et al., 2020). This gives a positive outlook of the future as well, as it seems that the African countries on average are on this positive feedback loop path.

Despite the positive developments, much of the work is incomplete. Technical assistance, i.e., professional services provided to improve fiscal management of aid funds, is commonly given by donors as a part of foreign aid. Technical assistance could be an opportunity to help countries to build better taxing administration and policies and avoid aid dependency. Notwithstanding the positive aims, the thesis found that technical assistance in fact has a negative impact on tax revenues. As criticized by some (Leiderer, 2012), technical assistance is said to be costly, ineffective and strongly driven by donor motives. Inability to align with the objectives and means with the recipient governments' goals weakens program ownership and accountability of the aid programmes. Moreover, solutions developed in the rich developed countries are rarely suitable as such for developing countries.

Where the results shed light on technical assistance having a negative impact on average, it should be emphasised that the results are very context specific: there are many ways to provide technical assistance and the recipient countries, and their tax policies are very different. For instance, other studies have found that technical assistance has a positive impact on tax revenues while interacted with well targeted conditionalities and right tax reforms (Tagem, 2017). Moreover, technical assistance is likely to impact tax revenues over long run while the results in the thesis provides information on the contemporaneous effects.

However, the negative relationship between technical assistance and tax revenues should be taken seriously and the donors should carefully consider how to improve the efficiency of technical assistance. Fjeldstad (2013) points out several bottlenecks in taxing and development cooperation in Africa that should be emphasised to while designing technical assistance and tax policies. Generally, due to large informal sector the tax base in Africa remains small, leaving little room for raising tax rates as it would put too much pressure on the small number enterprises and individuals working in the formal taxable sector. Moreover, giving out tax exemptions for companies aiming to incentivise investments seems to be a bad policy that makes tax authorities more corrupt and unequal. Both of the reasons weaken the social contract around taxes and decreases tax revenues in long run. Despite having low

returns on efforts, technical assistance should be designed in a way that broadens the tax base and treats all of the companies in an equitable way. As usual, context is paramount in designing tax policies. Fjeldstad (2013) argues that technical assistance should be made more inclusive by aligning the goals and utilizing local knowledge and innovation. After all, even the Paris Declaration for Aid Effectiveness (OECD, 2005), which is determining the principles for DAC development cooperation, is emphasising five key points: ownership, alignment, harmonization, managing for results and mutual accountability.

Providing loans instead of grants as development assistance has been discussed as a way to improve aid effectiveness and tax efforts. This is due to some papers finding evidence of grants having a negative impact on taxes and loans a positive one (e.g., Gupta, Clements, Pivovarsky & Tiongson, 2003)). The underlying assumption behind such policies seems to be that recipient countries pose fiduciary risks and the moral hazard with foreign aid is prominent. As shown above, such fiduciary risks do not seem to be an issue in Africa, as governments are increasing tax revenues in tandem with foreign aid. Emphasizing loans as a preferred aid modality has been overly pronounced in the policy debates as the evidence for the negative impact has been weak (see literature review). By improving many of the shortcomings in the previous studies, the thesis did not find any statistically significant relationship with loans and taxing. Moreover, the share of loans comparing to total aid has always been small. Replacing most of the grants with loans would certainly increase the debt burden in the developing countries. The negative impacts would likely overweight the positive ones.

Finally, the quest for finding good instruments to research tax-aid nexus in cross-country level is incomplete, especially regarding the role of technical assistance and loans. As shown in the literature review, many of the studies have not been able to satisfactorily overcome the endogeneity issue. This makes it hard to establish a causal relationship and design correct policies. Moreover, fiscal response is strongly context specific: technical assistance can come in many forms, the conditions related to aid are different across countries and the economies and governments are different. Therefore, policy designs should always include also country specific case studies as evidence. In conclusion, some general points can be made: (1) foreign aid has a positive impact on tax revenues and therefore the worries about fiduciary risks and moral hazard related to aid and taxing are small, (2) technical assistance has a negative association with taxes, albeit the results are contemporaneous effects, therefore the role of technical assistance should be reconsidered and efforts should be made to make it more demand-driven, and (3) promoting loans over grants as a preferred aid modality does not seem to be backed up by enough evidence and the negative effects of increasing poor countries debt burden may overweight the positive ones.

5 Conclusion

The aim of the research was to bring new evidence on tax-aid discussion. The thesis is answering the question: how foreign aid impacts tax revenues in Africa? Foreign aid is disaggregated to total ODA, grants, concessional loans and technical assistance. As a contribution to the previous literature, it is: (1) using more precise measure of tax revenues that is excluding resource revenues and social contributions, (2) disaggregating aid data into on and off budget aid, (3) investigating separately what is the impact of technical assistance to tax revenues, (4) removing the endogeneity issue in aid by using 2SLS instrumental method, and (5) investigating the relationship in a sub-sample of African countries in the years 1980-2018.

The results bring new evidence to the discussion as they found that ODA has a statistically significant and positive contemporaneous impact on tax revenues. Previous studies using total ODA as an explanatory variable have found a negative contemporaneous short run effect of ODA on tax revenues and a positive long run effect. It is significant that also short run effects are in fact positive. The results yielding a negative short run effect have led to policy discussions that are emphasising loans as a preferred aid modality. This is however harmful, because the negative outcomes, i.e., increasing debt burden, may outweigh the positive ones. Moreover, this thesis did not find any statistically significant impacts for loans. Share of loans of total ODA is small.

The evidence of positive short run impact of ODA on taxes gives a positive outlook of taxing in long run. The theory states that development of taxing systems is a path dependent process that may follow a positive or negative feedback loop. If government is using aid for public expenditure instead of financing tax cuts, the social contract around taxes will increase and in long run taxes are more justifiable and the institutions are more legitimate. The positive spiral is also visible in long run. Where the tax revenues as a share of GDP have been rising since 2000, the aid as a share of GDP has been declining. Moreover, it is a sign of recipient governments' abilities to manage aid funds independently and efficiently. Most of the studies finding negative impact for aid are emphasising the fiduciary risks and moral hazard related to aid. This assumption should be relaxed, and foreign aid should allow more autonomy for recipient countries to implement their development programmes.

Technical assistance is an umbrella term for professional services provided to the recipient governments as a part of foreign aid. The aim of technical assistance is to help in fiscal management of aid funds and developing tax systems has been on the agenda for several decades. The thesis shows that despite the positive aims, the effect is in fact adverse. Technical assistance interacted with all aid components has a substantial negative impact on tax revenues. However, it must be noted that the positive effects may take time to occur and therefore contemporaneous association does not provide information about these long run effects. Moreover, technical assistance may take many forms and other studies have provided

evidence on positive long run association when interacted with well targeted conditionalities. However, the negative relationship with technical assistance should not be ignored, but it should be developed in a way that it reaches its objectives. Technical assistance has been criticised for being too much donor driven, which has led to weaker commitment by recipient countries to aid programmes. Therefore, it should be designed in a way that it is more aligned with the recipient's objectives and enhances local knowledge and innovation.

As shown in the research, the quest for finding good instruments is incomplete. Both instrumental variable approach and GMM have been insufficient for fully accounting for endogeneity, leaving room for bias in the cross-country estimates. The thesis was not able to find a good instrument for loans nor technical assistance. Moreover, as countries and foreign aid is heterogenous, case studies would provide more in-depth knowledge on fiscal response to aid. Policies should always be designed ad hoc to the country needs. Cross-country studies can provide only so few generalizable facts.

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Appendix A

Results of system GMM for 4 time periods. Outcome variable is non-resource tax revenue and instrument is the lag of the dependent variable.

	(1)	(2)	(3)	(4)
VARIABLES	2008-2018	2000-2008	1990-1999	1980-1989
L.nrtax_ex_sc	1.350*** (0.331)	0.713 (0.526)	0.855* (0.417)	0.953 (1.965)
L.netoda_gdp	-0.749** (0.304)	0.0514 (0.294)	-1.113 (0.867)	-0.487 (5.188)
gdppercap	0.000423 (0.000452)	9.70e-05 (0.000256)	-0.000107 (0.000707)	-1.68e-06 (0.000695)
trade_share	0.00639 (0.0622)	0.00608 (0.0156)	0.0499 (0.0416)	0.0140 (0.155)
ag_va_share	0.283 (0.199)	-0.00825 (0.0601)	-0.210 (0.184)	-0.111 (0.285)
manu_va_share	-0.0647 (0.172)	0.0200 (0.130)	-0.382 (0.265)	-0.437 (0.849)
infl_ann_pro	-0.0953** (0.0381)	-0.000558* (0.000310)	-0.0148* (0.00804)	-0.0222 (0.0515)
resource	-0.00658 (0.100)	-0.0858 (0.0557)	-0.189 (0.122)	0.0743 (0.513)
icrg	-27.38* (16.05)	4.618 (22.27)	0.639 (14.04)	-5.225 (24.09)
F-stat	463.03	886.57	488.66	37.50

AR (2)	0.33	0.75	0.22	0.77
Sargan (p)	0.16	0.01	0.54	0.14
Hansen (p)	0.41	0.45	0.49	0.28
No. instruments	42	22	22	19
Constant	-0.122	1.987	10.48	9.630
	(7.263)	(3.732)	(7.091)	(40.17)
Observations	296	256	225	85
Number of id	33	31	28	18
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

	(1)	(2)	(3)	(4)
VARIABLES	2008-2018	2000-2008	1990-1999	1980-1989
L.nrtax_ex_sc	1.000	0.987***	0.818***	1.581
	(0.745)	(0.269)	(0.222)	(1.796)
L.netgrants_gdp	-0.152	0.0665	-0.270	-1.130
	(0.514)	(0.229)	(0.617)	(0.916)
gdppercap	0.000101	-0.000140	0.000111	0.000281
	(0.000687)	(0.000316)	(0.000460)	(0.00197)
trade_share	-0.0102	0.0138	0.0497*	-0.0499
	(0.0833)	(0.00845)	(0.0275)	(0.344)
ag_va_share	0.0136	-0.0647	-0.0645	-0.147

	(0.185)	(0.119)	(0.122)	(0.379)
manu_va_share	-0.0922	0.0157	-0.180	-0.892
	(0.342)	(0.0768)	(0.145)	(0.782)
infl_ann_pro	-0.0444	0.000110	-0.00976	-0.00850
	(0.0658)	(0.000630)	(0.00636)	(0.0495)
resource	-0.107	-0.0721	-0.230	0.547
	(0.383)	(0.0425)	(0.142)	(0.816)
icrg	-8.168	-2.421	-9.376	10.39
	(32.90)	(9.904)	(7.659)	(18.52)
Constant	6.134	2.873	7.666	1.316
	(9.107)	(4.672)	(7.184)	(37.60)
F-stat	441.78	787.39	670.94	4.03
AR(2)	0.53	0.36	0.18	0.27
Sargan	0.14	0.01	0.22	0.18
Hansen	0.31	0.29	0.32	0.29
No. Instruments	24	22	22	19
Observations	310	264	230	85
Number of id	33	31	28	18
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				
	(1)	(2)	(3)	(4)
VARIABLES	2008-2018	2000-2008	1990-1999	1980-1989
L.nrtax_ex_sc	0.335	0.691	1.010***	1.585**
	(2.547)	(0.691)	(0.301)	(0.594)

L.loans_gdp	3.954	-3.296	-1.098	0.611
	(6.149)	(5.862)	(0.837)	(0.441)
gdppercap	0.000664	0.000348	8.00e-05	6.71e-05
	(0.00108)	(0.000593)	(0.000247)	(0.000164)
trade_share	0.0423	-0.0130	0.0755**	-0.00928
	(0.183)	(0.0412)	(0.0356)	(0.199)
ag_va_share	0.700	0.110	-0.0304	0.0108
	(1.202)	(0.246)	(0.0861)	(0.596)
manu_va_share	0.0304	0.177	-0.145	-0.653
	(0.313)	(0.464)	(0.189)	(1.861)
infl_ann_pro	-0.110	-0.000962	-0.0103	-0.0232
	(0.0748)	(0.00142)	(0.00734)	(0.0300)
resource	-0.0786	-0.157	-0.185	0.335
	(0.257)	(0.248)	(0.131)	(0.563)
icrg	20.77	7.257	-4.124	1.011
	(113.8)	(28.58)	(5.928)	(6.110)
Constant	-17.62	-2.162	-0.106	-1.752
	(41.48)	(11.23)	(8.223)	(38.19)
F-stat	55.89	107.25	483.50	0.4
AR(2)	0.40	0.68	0.38	0.39
Sargan	0.16	0.67	0.32	0.77
Hansen	0.53	0.85	0.85	0.76
No. Instruments	22	21	22	19
Observations	296	256	225	85
Number of id	33	31	28	18

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)
VARIABLES	2008-2018	2000-2008	1990-1999	1980-1989
L.nrtax_ex_sc	1.180 (1.269)	0.701*** (0.116)	0.738** (0.328)	0.582 (0.769)
L.tech_gdp	-3.364 (38.04)	-2.050 (2.037)	-7.233 (8.173)	-0.739 (3.732)
gdppercap	8.99e-05 (0.00174)	-6.18e-05 (0.000135)	-0.000294 (0.000438)	6.88e-05 (0.000422)
trade_share	-0.0254 (0.376)	0.0163* (0.00884)	-5.67e-07 (0.0640)	0.133 (0.0797)
ag_va_share	-0.0320 (0.621)	-0.0924* (0.0476)	-0.237 (0.147)	0.120 (0.148)
manu_va_share	-0.0479 (0.585)	0.0471 (0.103)	-0.310 (0.283)	0.280 (0.438)
infl_ann_pro	-0.0568 (0.0754)	-0.000903** (0.000359)	-0.0105 (0.00617)	-0.0114 (0.0234)
resource	0.0329 (0.745)	-0.130*** (0.0274)	-0.112 (0.172)	-0.272 (0.415)
icrg	-11.26 (18.62)	1.660 (7.313)	0.666 (16.21)	-8.715 (15.19)
Constant	6.361	5.552	16.14	-3.859

	(45.29)	(3.715)	(15.76)	(13.07)
F-stat	844.35	1710.57	338.85	1833.13
AR(2)	0.57	0.29	0.51	0.31
Sargan	0.03	0.97	0.71	0.29
Hansen	0.11	0.98	0.62	0.60
No. Instruments	23	22	22	18
Observations	310	264	230	85
Number of id	33	31	28	18
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				