The University Of Sheffield.

Public finance, foreign aid and political incentives

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A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

The University of Sheffield

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April 2018

Abstract

This thesis consists of three studies on foreign aid and its allocation by political leaders within recipient countries. It explores whether this allocation depends on personal motives and political purposes.

The first study focuses on the effect of aid on government spending using country-level data, distinguishing between several types of foreign aid that are expected to impact spending in different ways. The impact of institutional quality on aid fungibility is also considered since receiving foreign aid could promote corrupt or illegal activities on behalf of the recipient government by diverting aid into private pockets. The results suggest that aid fungibility depends on institutional quality, especially for off-budget aid.

The second study focuses on the effect of aid on tax revenues using country-level data, distinguishing between two types of finance to investigate whether or not aid pays for tax reductions. The results show that aggregate aid, aid in the form of grants or in the form of loans leaves tax revenues unaffected at all levels of institutional quality. These results suggest that aid is not fungible in the context of tax revenues and that aid does not finance tax reductions.

The third study focuses on the sub-national allocation of foreign aid flows from China and the World Bank using district-level data. This allocation of aid across regions is up to the discretion of the political leader. This study attempts to identify the strategy leaders use to maximise their vote share, or whether or not leaders favour co-ethnic regions. The results show that in competitive electoral environments, leaders divert aid away from their core voters and towards supporters of the opposition. In contrast, in non-competitive electoral environments without strong political motivations leaders favour their co-ethnic regions.

Acknowledgements

First and foremost, I would like to express my sincere gratitude to my three supervisors, George Efthyvoulou, Vassilis Sarantides and Aki Tsuchiya for their time, patient guidance and continuous support throughout my PhD studies. I am grateful for their feedback and all their comments that made this thesis possible, but most of all I am grateful for their support and understanding during one of my most difficult times. I would also like to express my thanks to my viva examiners Arne Risa Hole and James Rockey for their comments and suggestions.

Further to this, I would also like to thank the rest of the academic staff at the Department of Economics, who provided feedback, the support staff and other PhD students in the department, especially Konstantina Maragkou and Laura Requena, for their help and support. I am also grateful to the ESRC for financial support.

I would also like to express my deepest gratitude and appreciation to my family, my mother Eleni, Malcolm, my beloved father Anaxagoras whom I miss every day, and my wonderful sister Vasileia for their endless encouragement and unwavering belief in me. I owe everything to them and I dedicate this thesis to them.

Finally, I would like to thank three of my favourite people Andreas, Joanna and Yvoni, who always listened to me even though they did not understand much, encouraged me at every step of my studies and made this journey easier.

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Chapter 1

Introduction

1.1 Motivations and aims

1.1.1 Background and motivation

Foreign aid was first introduced as part of the Marshall Plan, or else known as the European Recovery Programme (Development Initiatives, 2013, Boschini and Olofsgård, 2007). The Marshall Plan aimed to help with the recovery of European countries after the Second World War. Aid initially started off as serving geopolitical interests and in time it aligned to the needs of developing countries and aimed to improve living standards. The amount of foreign aid distributed each year to developing countries from various donors has been rising in developing countries ever since, as shown by the World Development Indicators of the World Bank (WB) (World Bank, 2015) and this rise occurred in line with the Millenium Development Goals set by the United Nations for completion by 2015.

Foreign aid has various forms; it may be given to a government in the form of grants, loans, specified good (such as medicines and vaccines in the case of aid for health), or technical capacity (such as training projects or the transfer of knowledge) (Singer, 1965). It may also be targeted to non-governmental organisations instead of a government to avoid bureaucratic transactions (Severino and Ray, 2009). Aid may originate from multilateral donors, such as the WB, or bilateral donors, such as individual countries; and it may be given conditional on certain growth-enhancing policies as in the 1980s with the case of the Structural Adjustment Policies.

A precise definition of aid or Official Development Assistance given by the Organisation for Economic Cooperation and Development (OECD) is 'flows provided by official agencies, including state and local governments, or by their executive agencies; and each transaction is administered with the promotion of economic development and welfare of developing countries as its main objective; and is concessional in character and conveys a grant element of at least 25 per cent' (OECD, 2010).

Theoretically, aid aims to build the necessary infrastructure for development by building and strengthening institutions of both the government and non-government sectors, through the provision of resources and the technical know-how (Kühl, 2009). Early work on aid was focused on the two-gap Chenery and Strout (1966) model, which was based on

resource-gaps for savings and investment faced by developing countries. An extension of Bacha (1990) added the foreign exchange reserve gap to the model. The gap model states that aid helps fill the savings gap inducing investment, and therefore growth, until a point is reached where aid is no longer required for growth.

However, there is no consensus on the effect of foreign aid on economic performance. The empirical results are mixed and there is no agreement in the literature that aid contributes to economic growth (Dalgaard et al., 2004, Dalgaard and Hansen, 2001, Hansen and Tarp, 2001, Burnside and Dollar, 2000). Burnside and Dollar (2000) highlighted the importance of good policies and strong institutions by showing that aid has a positive effect on growth only in the presence of good policies. This finding has been challenged in the literature, but has nevertheless emphasised the significance of governance, institutions and politics with regard to the effectiveness of foreign aid (Easterly et al., 2004). Institutions are defined as 'a set of rules, compliance procedures, and moral and ethical behavioural norms designed to constrain the behaviour of individuals in the interests of maximising the wealth or utility of principals' (North, 1980). This gives rise to the multi-dimensional notion of governance, described by Kaufmann and Zoido-Lobatón (1999) as 'traditions and institutions by which authority in a country is exercised'.

These are broad definitions and include various components of economic and political institutions, such as the imposition of property rights, the distribution of resources and the implementation of rules and policies. (Acemoglu et al., 2004). This definition includes various components of governance that are thought to be inter-related. For example, having a high freedom of the press and a strong rule of law are found to be significant for the reduction of corruption since illegal activities can be uncovered and punished (Brunetti and Weder, 2003, Treisman, 2000). Kaufmann and Zoido-Lobatón (1999) describe six dimensions of governance: voice and accountability, political instability and violence, government effectiveness, regulatory burden, rule of law and corruption. Some components of institutions and their quality have been associated with improvements in economic growth and development since they affect the structure of society (Acemoglu et al., 2004, Kaufmann and Zoido-Lobatón, 1999).

Since aid is primarily given to governments of developing countries, the effectiveness of aid is likely to depend on how governments behave (Morrissey, 2015a, McGillivray and Morrissey, 2000, Devarajan et al., 1999). Aid flows increase the resources of the recipient government and raise their budget constraints, which allow governments to move to a higher indifference curve. This makes the consumption of more goods possible, depending on the preferences of recipient governments, which could make aid fungible (McGillivray

and Morrissey, 2000). Based on the findings of Bräutigam and Knack (2004) and Knack (2004, 2001), foreign aid may not be used as intended and this may in turn worsen the quality of governance by giving incentives for corruption. Aid is often associated in the literature as 'unearned income' that resembles natural resource revenues (Wright and Winters, 2010). The curse of natural resource revenues, which promotes rent-seeking activities and hinders growth, as well as the dependency on such resources are considered in the literature as being applicable to foreign aid flows as well (Djankov et al., 2008). Foreign aid flows may be used by the leaders of recipient governments for their own personal benefits. For example, they could divert aid into their private pockets or they could spend it in a way that serves their own political interests, or both (Wright and Winters, 2010). Aid allocation can be seen as a moral hazard problem between the donor (principal) and the recipient (agent) (Svensson, 2000). The principal diverts resources to the agent for the purposes of development but the agent uses these resources in other ways than those intended by the principal donor.

This raises the issue of 'fungibility', which is defined as aid not being used as intended by the donor (McGillivray and Morrissey, 2000, Griffin, 1970). This issue can be described as situations where government spending or tax revenues fall with aid receipts, when the pattern of allocation of government spending changes or other components of the budget are affected by aid receipts (McGillivray and Morrissey, 2000). Additionally, even if aid is used on a project that was intended by the donor, it could still be fungible if it frees up public resources to finance a marginal project that would otherwise not be financed with public funds (Devarajan and Swaroop, 1998). Fungibility is a major concern and according to the literature, it can be explained by any one of the following reasons: a difference in preferences between donors and recipients, aid illusion, malicious intent of recipient governments or the optimal choice of recipient governments to adjust their budget (Chatterjee et al., 2012, McGillivray and Morrissey, 2001).

A difference in preferences between donors and recipients can be caused because of the different information the two parties (donors and recipients) have on the country-specific characteristics of each recipient country, their needs, as well as the current economic and political situations of each recipient country (Prichard et al., 2012). Therefore, donors need to be informed of implemented aid projects and about any capacity problems in the recipient countries. Aid illusion may arise when lack of information by state officials leads to a misconception about the government budget, thus altering tax collection efforts or how public funds are allocated (McGillivray and Morrissey, 2001). The malicious intent of governments may be described as situations where aid flows are leaked into private accounts or when the presence of aid flows encourages governments to participate in illegal

rent-seeking activities (Bird et al., 2008, Moss et al., 2006, Bräutigam and Knack, 2004, Knack, 2001). Receiving aid may alter the composition of government expenditure towards oligopolistic sectors where rent extortion is easier (Mauro, 1998, Lin, 1994). From another perspective, however, the fungibility of aid may be described as the optimal choice of recipient governments, where aid flows are considered as external resources together with internal resources for the allocation of total resources across the budget (Chatterjee et al., 2012). For example, a prudent government might respond to aid flows by reducing and repaying debt. It could, also, be the case that aid resources free up domestic resources that would otherwise have been used for the project that the aid resources finance. This alternative use of domestic resources may fund a marginal project, which may prove to be productive and beneficial to the economy (Devarajan and Swaroop, 1998). Additionally, it could be that recipient governments decide to relieve themselves of the burden of taxation to fund expenditure. This decision could in fact be optimal from a welfare perspective since taxes are unpopular (Carter, 2010). Chatterjee et al. (2012) developed a long-run growth model taking into account the lump-sum transfer of foreign aid that relaxes the government's constraint. One of the main assumptions of their model is that the government does not maintain a budget surplus or deficit: its expenditure on capital and consumption goods always equate its revenues from taxation and foreign aid. The model suggests that the effect of aid on growth would be positive, so long the government spends some of it on investment goods. Nevertheless, recipient governments may treat the transfer of aid as a substitute of domestic sources and adjust their budget accordingly, rather than treating the aid flows as an additional source of revenue, thus making aid fungible. The model shows that the extent of the substitutability of resources would affect the degree of aid effectiveness and their theoretical results are supported by their empirical findings.

Since the primary recipient of foreign aid is the leader of the recipient government, how the leader allocates aid would in turn determine aid effectiveness (Morrissey, 2015a). The empirical literature yields mixed results on fungibility and on the effects of aid on spending and tax revenue patterns (Dieleman et al., 2013, Van de Sijpe, 2013, 2012, Lu et al., 2010, Mavrotas and Ouattara, 2006, Gupta et al., 2003, Devarajan et al., 1999, Feyzioglu et al., 1998, Boone, 1996, Pack and Pack, 1993).

1.1.2 Aims and research questions of this thesis

The literature on foreign aid argues that it can be used for personal motives and political purposes (Jablonski, 2014, Bräutigam and Knack, 2004, Knack, 2001). Following the theoretical and empirical literature, this thesis examines how aid is used and allocated

within recipient countries. It attempts to identify whether aid is used as intended or leaked into private pockets, and also whether aid is used as a means to target and favour specific groups for personal and political reasons.

Following the theoretical and empirical literature, this thesis uses country-level data to investigate the extent of fungibility and how foreign aid flows impact government spending patterns and tax revenue collection efforts in a sample of developing countries from the regions of Eastern Europe, the Caribbean, Latin America, Sub-Saharan Africa, North Africa and the Middle East, East Asia, South Asia, South-East Asia and the Pacific (This is addressed in Chapters 2 and 3). This is because we aim to understand whether aid is used as intended, namely whether aid increases government spending as it is expected, or finances tax reductions. Furthermore, the empirical literature identifies that foreign aid has an impact on institutional quality and governance (Bräutigam and Knack, 2004). Therefore, the importance of institutional quality on fungibility is also explored. The main hypothesis is that the extent of fungibility depends on institutional quality. An environment with low institutional quality and high degree of corruption, where illegal activities prevail and leaders are less accountable to the public, is more likely to make aid fungible than an environment with good institutions and a strong rule of law.

Recent developments in data collection methods from the perspective of the donor are exploited. The Creditor Reporting System (CRS) of the Development Assistance Committee of the OECD (OECD-DAC) asks donors to report various characteristics of foreign aid flows. Some examples are the purpose of aid (i.e. education, health, infrastructure and others), whether aid flows correspond to a specific project or technical co-operation activities, the first implementing partner of the aid flow or the type of finance. These developments in data availability allow different types of aid to be examined, either with regard to effectiveness or fungibility.

In addition to examining whether aid is used as intended, regional-level data are used to investigate the sub-national allocation of foreign aid flows in 17 African countries (This is addressed in Chapter 4). Political leaders could use foreign aid for their own personal or political agendas and divert aid to specific regions, for example to maximise their re-election prospects and vote share or favour their own ethnic group. We examine whether political leaders divert aid to their core voters or to supporters of the opposition. Furthermore, we investigate whether political leaders exhibit patterns of ethnic favouritism by diverting aid to co-ethnic regions.

Novel datasets have been constructed as part of this thesis, which include geo-coded information on aid flows from various donors. This recent development allows researchers

to examine aid allocation from the point of view of the recipient. Established geo-coded datasets on aid flows from China and the WB are used (Strange et al., 2017, AidData, 2016) as well as a newly-constructed dataset on election results that has been geo-coded for the purpose of this thesis from the constituency level to the district level (Kollman et al., 2016).

Investigating how aid is allocated in countries and whether or not it is used as intended can be particularly useful for donor countries that divert large flows of their resources towards developing countries (World Bank, 2015). Examining the fungibility of different aid flows is important for donors when deciding how to allocate aid to developing countries. Generally, donors have a target of 0.7% of their GNI to be diverted as aid (Development Initiatives, 2013). In cases where aid is not used as intended, these resources could have alternative uses in the donor and/or recipient countries. Therefore, understanding which types of aid are non-fungible or less fungible could be beneficial for the development community. The same reasoning applies to aid flows from various donors at the regional level. Advancements in the availability of geo-coded aid flows allow researchers to investigate the pattern of aid allocation of different donors as well as different types of aid across countries. One of the most important recommendations to take away from research on aid fungibility is donor coordination and transparency since having many projects simultaneously on the same areas could contribute in enhancing the issue of fungibility and aid mismanagement.

Nonetheless, fungibility does not necessarily mean aid resources are wasted or that donors should stop diverting aid. As Morrissey (2015b) discusses, fungibility and the lack of additionality of resources on spending it not necessarily a cause for alarm. It could be the case that recipient governments are not fully aware of the amount of resources they receive or aid illusion may play a role. As mentioned earlier, receiving foreign aid may free up domestic resources and enable the financing of another project that the donors have not considered (Devarajan and Swaroop, 1998), or it could be the case that aid affects fiscal behaviour in general and optimal governments decide to reduce taxes. On the other hand, if the evidence suggests that aid flows are leaked outside of the budget into private pockets and are not spent to generate income, fungibility should be a cause for concern.

Building on the theoretical and empirical literature, the following research questions are addressed by this thesis:

Chapter 2 - Study 1:

1. What is the effect of foreign aid (aggregate flows, on- and off-budget aid) on total government spending? Is foreign aid fungible?

2. Based on the one-sided fungibility tests, what is the extent of fungibility of on- and off-budget aid (no fungibility, partial fungibility, full fungibility)?

3. Does the extent of aid fungibility depend on institutional quality? Is foreign aid more fungible with lower institutional quality rather than in environments of high institutional quality?

4. Is foreign aid for the purposes of education, health or infrastructure fungible? Does fungibility depend on institutional quality?

Chapter 3 - Study 2:

1. What is the effect of foreign aid (aggregate aid flows, aid in the form of grants and aid in the form of loans) on tax revenues? Does aid finance tax reductions?

2. Does the extent of aid fungibility depend on institutional quality? Is foreign aid more fungible with lower institutional quality rather than in environments of high institutional quality?

Chapter 4 - Study 3:

1. Which districts do political leaders target with aid? Do they target their core voters or voters of the opposition?

2. Do political leaders exhibit patterns of ethnic favouritism by targeting co-ethnic districts?

3. Does electoral competitiveness play a role for the sub-national allocation of aid?

1.2 Structure and content of this thesis

This thesis consists of three separate empirical studies discussed in Chapters 2, 3 and 4. Chapter 5 concludes. The studies are briefly discussed below.

1.2.1 Brief overview of Chapter 2

The first study examines aid fungibility and particularly how the pattern of government spending changes with institutional quality. The existing literature yields mixed results for fungibility; however, corruption and institutional quality are not considered in such models. The hypothesis of this Chapter is that the extent of fungibility depends on institutional quality in recipient countries, arguing that aid fungibility would be higher in countries with low quality institutions.

We take advantage of the extensive information given by the CRS of the OECD-DAC on data for foreign aid (OECD, 2013), where aid flows are disaggregated into different purposes, modalities and types of finance. Static and dynamic panel data models are estimated for a sample of 59 developing countries over the period 1990 - 2013. The conditional effect of total aid and its modalities are estimated for total public expenditure and the extent of fungibility is tested based on two one-sided fungibility tests, following the methodology of Van de Sijpe (2012). We distinguish between on- and off-budget aid since we expect the two types of aid to impact spending in different ways. On-budget aid refers to aid flows that are recorded in the government's budget and are given for specific programmes, whereas off-budget aid refers to aid flows that are not recorded in the budget and are given as technical cooperation. On-budget aid is expected to have a one-to-one impact on spending since government spending, by definition, includes external resources such as aid, while off-budget aid is not expected to have any impact on spending.

The results of this analysis provide evidence that the conditional effect of aid on total public spending depends on institutional quality in the expected direction for off-budget aid, whereas this is not true for on-budget aid. On-budget aid is found to be fully fungible at all values of institutional quality. Different model specifications and estimations methods are used and the results for off-budget aid are robust for the case of total public spending, suggesting that fungibility exists and that institutional quality plays a role for off-budget aid. The different specifications show that the fungibility of on-budget aid indeed depends on institutional quality. Furthermore, considering that aid has a heterogeneous effect on spending based on the level of institutional quality proves to be important in the context of fungibility. The degree of fungibility of off-budget aid is over-estimated in countries with high institutional quality if institutional quality is not considered.

1.2.2 Brief overview of Chapter 3

The second study also explores aid fungibility, this time examining revenues instead of expenditures. The effects of aid on tax revenues conditional on different levels of institutional quality are investigated to shed light as to whether aid pays for development or for tax reductions. The existing literature does not consider that aid might have a heterogeneous effect on taxes based on the level of institutional quality. The hypothesis of this Chapter is that the extent of fungibility, if it exists, would be higher in countries with low institutional quality.

This study uses a newly constructed dataset on general government revenues developed by the International Centre for Tax and Development, which collects tax revenue data

from various sources, such as international databases and country reports (Prichard et al., 2014). Following the literature, aid flows are disaggregated into types of finance: grants and loans. Static and dynamic panel data models are estimated in a sample of developing countries over the period 1990 - 2013.

The results suggest that total aid flows as well as aid disaggregated into grants and loans, do not reduce total tax or any sub-components of total tax. In some instances, a significantly positive effect of aid on taxes is identified. However, this positive identified effect does not always remain robust. Nevertheless, the results suggest that aid in the context of tax revenues is not fungible and it does not finance tax reductions. These results provide evidence against fungibility with regard to tax revenues at all levels of institutional quality, suggesting that foreign aid does not pay for tax reductions. This result is robust to alternative specifications.

1.2.3 Brief overview of Chapter 4

This Chapter investigates the sub-national distribution of foreign aid from China and the WB to identify whether political leaders use foreign aid for political purposes. The literature investigating the motives of recipient governments behind the sub-national allocation of aid across administrative regions is limited to studies of individual countries (Masaki, 2015, Jablonski, 2014, Dionne et al., 2013, Briggs, 2012). Political leaders may use aid targeting towards their ethnic groups, their birth region or towards areas of their core or opposition voters, depending on which strategy is expected to provide more electoral benefits (Kasara, 2007, Lindbeck and Weibull, 1987, Cox and McCubbins, 1986). Core voters are considered those that continuously support the incumbent unconditionally (Cox and McCubbins, 1986). Swing voters are considered those that have 'weak party preferences' and are indifferent to voting for a specific political leader and can thus be easily swayed into favouring the incumbent (Lindbeck and Weibull, 1987). The effect of competitive elections is also examined. How political leaders target aid may depend on the degree of electoral competitiveness and their certainty of getting re-elected (Hicken, 2011).

These types of favouritism are examined using administrative-level data at the district level for 17 African countries over the period 2000 - 2011. We use a novel dataset on legislative election results at the constituency level (Kollman et al., 2016), which are geo-coded at the district level for the purposes of this thesis. Established geo-referenced data are merged from various sources matched at the district and province levels, such as foreign aid commitments from China and the WB, night-time light intensity and population measures. Ordinary least squares regressions are estimated using appropriate fixed effects. The

different electoral strategies are investigated to understand whether leaders target core voters, swing districts or voters of that support the opposition. Ethnic favouritism is also examined to understand whether or not leaders target districts where members of their ethnic group reside in.

The results suggest that in environments of electoral competitiveness, leaders divert aid away from core voters and co-ethnic districts and towards opposition voters. These results are consistent with an intention to maximise re-election prospects by rewarding supporters of the opposition in an attempt to sway opposition voters into voting for them. In contrast, in non-competitive electoral environments without strong re-election incentives, leaders find optimal to target and favour their co-ethnic regions. These results are robust to alternative specifications and samples.

1.2.4 Brief overview of Chapter 5

This Chapter concludes this thesis, provides areas of future research and discusses some policy implications derived from the findings of this thesis. Overall, the results of the thesis support the idea that aid is not used as intended by the donor community, since it is not found to contribute to spending. The government is not found to be behaving optimally as the revenue side of the budget remains unaffected with aid receipts. Furthermore, looking at the sub-national allocation of foreign aid, it can be inferred that aid is used for political economy reasons and ethnic favouritism.

Chapter 2

Foreign aid and public spending: The role of institutional quality

2.1 Introduction

2.1.1 Background and motivation

Spending on social sectors and infrastructure projects is justified not just because it is viewed as a moral responsibility, but also because of the positive externalities and long-term effects of spending on health, education and infrastructure (Anomaly, 2013, Gradstein et al., 2005). Public goods in the form of education, health and infrastructure are provided to achieve social objectives, higher living standards and economic development (North, 1980). There is some theoretical and empirical evidence of a positive relationship between public capital expenditure and economic growth as well as between spending on education and health and development outcomes, especially in the presence of good governance (Oto-Peralías and Romero-Ávila, 2013, Mishra and Newhouse, 2009, Baldacci et al., 2008, Rajkumar and Swaroop, 2008, Bose et al., 2007, Michaelowa and Weber, 2007, Gupta et al., 2002, Tanzi and Davoodi, 1997).

Aid donors and international institutions have put a lot of emphasis on sectors such as education and health, as is evident by the targeted Millennium Development Goals (MDGs) set out by the United Nations for completion by 2015. These areas remain central in the post-2015 agenda for sustainable development (i.e. achieving universal primary education, reducing child mortality, improving maternal health and combatting diseases like HIV/AIDS and malaria). Therefore, any distortions in the composition of public expenditure are expected to affect economic development as well as the effectiveness of foreign aid targeted in such sectors. However, the empirical results are mixed and there is no agreement in the literature that aid contributes to economic growth. Aid is primarily given to governments of developing countries and the effectiveness of aid is likely to depend on how governments behave (Morrissey, 2015a, McGillivray and Morrissey, 2000, Devarajan et al., 1999). Based on the findings of Knack (2001) and Bräutigam and Knack (2004), foreign aid might not be used as intended and this may in turn worsen the quality of governance by providing incentives for corruption. This problem is known as 'fungibility' in the foreign aid literature.

Fungibility is defined as 'aid not being used as intended' (McGillivray and Morrissey, 2000).

Examples of fungibility include reductions in taxation, reductions in public spending or the adjustment of spending allocations. This issue can arise due to a number of reasons: a difference in preferences between donors and recipients, aid illusion, malicious intent of recipient governments or the optimal choice of recipient governments to adjust their budget based on the external resources they receive. Based on a field survey in Uganda, Reinikka and Svensson (2004) show that public funds allocated for the purposes of education and health do not reach their anticipated targets but are instead captured. Aid funds could be subject to such capture that would lead to aid not being used as intended by the donor community (Winters, 2014). The literature on fungibility yields mixed results (Dieleman et al., 2013, Chatterjee et al., 2012, Van de Sijpe, 2012, Lu et al., 2010, McGillivray and Morrissey, 2001, Feyzioglu et al., 1998).

Government behaviour is expected to impact aid effectiveness. Government behaviour is largely dependent on the quality of institutions, as characterised by corruption, the rule of law and bureaucratic control to name a few. According to Kaufmann and Zoido-Lobatón (1999), governance has several dimensions and is defined as 'traditions and institutions by which authority in a country is exercised'. Some of these dimensions of governance are thought to be inter-related: for example, corruption is likely to arise in situations with weak rule of law, a large bureaucracy or lack of monitoring of government officials (Svensson, 2005, Acemoglu and Verdier, 2000, Treisman, 2000, Krueger, 1974). Generally, corruption is a significant problem in both developed and developing countries and it is viewed as a constraint on both foreign aid and growth-enhancing policies. Theobald (1990) defines corruption as 'the illegal use of public office for private gain'. The theoretical and empirical literature suggests that corruption has several economic effects; one of which is how it affects public finances. There is evidence that corruption reduces tax revenues and distorts public spending towards area where higher rents may be extorted, such as on military spending or infrastructure projects, and away from social sectors, such as health or education (Delavallade, 2006, Hillman, 2004, Tanzi and Davoodi, 2000, Mauro, 1998).

2.1.2 Research question

The purpose of this study is to explore the relationship between foreign aid, government expenditure and institutional quality and more precisely to examine the effect that aid has on government expenditure under different levels of institutional quality. This relationship has important policy implications for both donor and recipient governments. In the presence of corrupt practices, aid funds, which have displayed a rising trend in developing countries, would not have the anticipated effect on growth and development and could be

subject to fungibility. This is an important issue for donor countries and international organisations, which have been focusing on diverting large volumes of aid to developing countries to alleviate poverty.

The literature on corruption identifies a 'quantity' and an 'allocation' effect on public expenditure that suggest that corruption contributes to reducing spending on social sectors such as health or education (allocation effect), while raising total public spending and infrastructure spending due to the possibility of available rents (quantity effect) (Delavallade, 2006, Tanzi and Davoodi, 2000, Mauro, 1998). Several papers on aid fungibility have estimated the effect of foreign aid on government expenditure and how it deviates from its targets. However, corruption is not a common control variable in such models. Van de Sijpe (2012) controls for the effect of corruption on government expenditure as a robustness check in his analysis for education and health expenditure. He finds that the hypothesis of no fungibility for the sector of health is rejected when corruption is included, thus warranting the inclusion of institutional quality in such models.

This study aims to explore this suggested relationship by employing an interaction term between foreign aid and institutional quality. This is done to shed light on the behaviour of governments in terms of expenditure at different levels of institutional quality in an attempt to explain whether fungibility is caused by corrupt institutions, a weak rule of law and a large bureaucracy. This study also distinguishes between different types of aid modalities and the extent of fungibility of each modality is investigated. Understanding which types of aid are not fungible or less fungible could prove beneficial for donors. Total government expenditure is examined as well as its composition, focusing on the sectors of education, health and infrastructure. A dynamic framework is employed using appropriate General Method of Moments (GMM) estimation in a panel analysis involving a large number of developing countries, defined by the World Bank (WB) as countries with low or middle income per capita from the regions of Eastern Europe, the Caribbean, Latin America, Sub-Saharan Africa, North Africa and the Middle East, East Asia, South Asia, South-East Asia and the Pacific, over the period of 1990 - 2013.

2.1.3 Research findings

The empirical results suggest to some extent that institutional quality plays a role for fungibility. Total aid disbursements have an insignificant effect on total public spending, conditional on different levels of institutional quality. The same is found to be true for total aid disbursements for each sector studied (education, health and infrastructure) at all levels of institutional quality. These results agree with the literature that fungibility

tends to be over-estimated if off-budget aid is not accounted for (Van de Sijpe, 2012). When on- and off-budget aid flows are considered the fungibility results are different.

Total on-budget aid is statistically insignificant for spending and fully fungible irrespective of institutional quality, whereas the degree of fungibility for off-budget aid is found to depend on institutional quality. More precisely, total off-budget aid is non-fungible when institutions are strong and fully fungible when institutions are weak, supporting the initial hypothesis of the study.

Alternative estimation methods are used as robustness checks, for example estimating a static model or using a categorical variable for institutional quality. Overall, the results remained robust for off-budget aid in the model of total public spending suggesting that institutional quality plays a role for the fungibility of total off-budget aid.

2.1.4 Structure

The next Section consists of a literature review of the relevant topics. Section 2.3 describes the empirical models that are estimated having as a dependent variable the various types of government expenditure and the methodology behind each model. The data used in each model are portrayed in Section 2.4 and the results are discussed and analysed in Section 2.5 along with some robustness checks. Lastly Section 2.6 concludes this Chapter. The results are presented in Section 2.7.

2.2 Literature Review

2.2.1 Foreign aid and fungibility

See Section 1.1.1 for a discussion on aid fungibility.

The empirical literature yields mixed results on fungibility and there is no agreement on the effect of foreign aid on public spending (Liang and Mirelman, 2014, Dieleman et al., 2013, Van de Sijpe, 2013, Harper, 2012, Van de Sijpe, 2012, Lu et al., 2010, Mavrotas and Ouattara, 2006, Gupta et al., 2003, Devarajan et al., 1999, Feyzioglu et al., 1998, Boone, 1996, Pack and Pack, 1993). Heller (1975) developed a model of fiscal response to aid assuming that the public sector aims to maximise its utility by considering its spending on public investment for development, maintenance and socioeconomic expenditures, as well as revenue from taxation, borrowing and aid in the form of grants and loans. When the model is estimated using a simultaneous equation system, the results support the theory of no fungibility. Based on this theoretical model, Gang and Khan (1990) and

Khan and Hoshino (1992) find evidence supporting the theory of no fungibility in India and Southeast Asia, whereas Franco-Rodriguez et al. (1998) find evidence of fungibility in Pakistan. Ouattara (2006) uses a different utility function than Heller (1975), but still finds no evidence of fungibility. Panel data techniques are used to estimate the fiscal response model and the author finds that aid is associated with increases in development spending on education and health but with reductions in non-development spending such as consumption expenditure.

Evidence of zero or near zero fungibility is also found by Feyzioglu et al. (1998). When the endogeneity of aid is considered, aid is found to have a positive impact on total government expenditure and public investment. Nevertheless, these results break down when total government expenditure is disaggregated according to sector and aid becomes fungible in the education, energy and agricultural sectors. Van de Sijpe (2012) also finds evidence of zero or near zero fungibility for the sectors of health and education. In his models, aid for the specific purposes is controlled for, the general aid given, income per capita, income per capita growth, urbanisation, trade, debt service, the debt level and the support to Non-Governmental Organisations (NGOs) in the form of aid. As a robustness check, a number of other variables are included in the models, such as measures of democracy, corruption, the rule of law, population, bureaucratic quality and other variables. When corruption is included in the models, the hypothesis of no fungibility is rejected for the health sector, although this finding could be a result of the change in the sample. This finding of no fungibility is supported by other studies that look at sector-specific aid such as Harper (2012), who finds evidence of no fungibility for health aid.

An important distinction made by Van de Sijpe (2012) is the classification of on- and off-budget aid, which is important for fungibility studies since failure to do so could overestimate the extent of fungibility, as evident by the difference in the fungibility estimates with and without this distinction. Aid flows are flagged to be on-budget, off-budget, given for investment purposes or classified as any other aid flows that do not fall into these three categories. Two types of aid modalities are of importance: on-budget aid that is given for specific programmes and is recorded in the government's budget and off-budget aid that is not recorded since it is given as technical cooperation. It is expected that the different aid modalities will have different effects on public spending. Since on-budget aid is considered in the government's budget choices, it is expected to affect government spending, whereas off-budget aid is not expected to impact spending. Off-budget aid involves aid activities and the transfer of resources that are intended for development but are not directly recorded in the recipient government's accounts and budget choices. It is important to distinguish between the two as they have different expected outcomes; both

in terms of their effectiveness and in their extent of fungibility (Van de Sijpe, 2013, 2012, Mavrotas and Ouattara, 2006).

On the other hand, Lu et al. (2010) and Dieleman et al. (2013) find evidence of fungibility in the health sector. Both papers use a dynamic framework and a similar dataset, sample and empirical model. Lu et al. (2010) focus on a sample of developing countries over the period of 1996 - 2006 and estimate a dynamic model for public health expenditure. They control for foreign aid given to the government and foreign aid given to NGOs, debt relief, income per capita, HIV prevalence and total government expenditure. Dieleman et al. (2013) extend the dataset used by Lu et al. (2010) and control for the same variables. The two papers agree in the results and find evidence for fungibility in the health sector, although problems may arise when foreign aid is not treated as endogenous by Lu et al. (2010). Foreign aid can be thought to be endogenous in the foreign aid literature since it is primarily given to developing countries that have low levels of income and possibly low levels of government expenditure to begin with.

Additionally, Liang and Mirelman (2014) focus on the sector of health and find evidence for fungibility. The authors also consider the endogeneity of foreign aid by using lagged values of aid in a Fixed Effects (FE) framework in a panel dataset for a number of both developed and developing countries. This paper also considers the heterogeneous effect of aid based on the socio-political risk of countries, where socio-political risk includes variables capturing several political dimensions, such as democratic accountability, corruption, ethnic tensions and government stability. The interaction terms between aid for health and the variables capturing socio-political risk suggest that aid is fungible but less fungible in situations of low corruption and less ethnic tension, despite the fact that the conditional effects of aid have been estimated at the means.

2.2.2 Governance and institutional quality

Theoretically, aid aims to improve any capacity problems, strengthen institutions and transfer knowledge and expertise in developing countries (Kühl, 2009). However, the effect of foreign aid on government expenditure could depend to a great extent on the quality of governance. Although we would expect foreign aid to impact governance and the performance of institutions in developing countries in a positive way, as shown by Tavares (2003), this may not always be the case. It could be argued that an environment with large influxes of foreign aid may foster corrupt and illegal activities regarding the appropriation of aid, thus deteriorating the quality of governance and institutions due to the large potential benefits of engaging in such activities (Bräutigam and Knack, 2004,

Knack, 2001). Nevertheless, as De Mesquita and Smith (2009) point out, there are types of foreign aid that are more susceptible to misuse than others so these different types of aid would affect institutional quality in a different way. Therefore, the relationship of foreign aid and governance or the quality of institutions may run in either of the two directions. Institutions can be referred to as 'organisations that construct budgets, manage economic policy and make decisions' (Bräutigam and Botchwey, 1999). This notion is important in the context of foreign aid as institutions are responsible for the construction of the budget that aid contributes to, its regulation and implementation.

Corruption is thought of as a 'persistent feature of human societies' (Aidt, 2009), may arise under different circumstances and due to its nature it can be defined in various ways (Svensson, 2005, Aidt, 2003). Theobald (1990) defines corruption as 'the illegal use of public office for private gain'. Corruption occurs at two main levels: 'grand' or 'political' corruption occurs at the preparation phase of a governmental project; and 'petty' or 'bureaucratic' corruption occurs in the every-day running of governmental transaction and most likely involves bribing low-ranked officials to overcome any bureaucratic controls (Acemoglu and Verdier, 2000, Tanzi, 1994, Krueger, 1974).

Corruption may take several forms. An example is when the government gives out contracts for the production of public projects. The government may decide to offer the contract to a specific firm for its own private reasons; for example the chosen firm may belong to a family member of a politician, or the firm may have bribed the government to get the contract. This type of rent-seeking activity occurs at the expense of the public. The chosen firm may not be offering the lowest cost or it may produce a public good of low quality. The phenomenon of corruption is common in the construction sector and corrupt activities can occur at every phase of a project in the construction sector; for example when assigning contracts to specific firms, when inspecting a project's performance, or when planning and designing an infrastructural project (Sohail and Cavill, 2006). In general, rent-seeking activities involve resources being transferred with the purpose of extorting rents or private benefits (Aidt, 2009). Not only is the whole process costly in terms of effectiveness, since the firm could have used the transferred resources more efficiently, but it is also illegal (Gravelle and Rees, 2004, Bhagwati, 1982).

The theoretical literature combined with the empirical evidence demonstrate that corruption has important effects and policy implications for the economic performance of a country as well as large welfare costs. Corruption acts as a tax on private investment, distorts the allocation of talent, fosters an environment of social unrest and civil conflict and is associated with reduced growth via public and private investment (Tanzi, 1998,

Mauro, 1995, Tanzi, 1994, Murphy et al., 1991). On the other hand, there are some who argue that corruption 'greases the wheels' of the economy and overcomes bureaucratic and 'red-tape' barriers, thus contributing to growth (Nye, 1967, Leff, 1964). In general, improvements in institutional quality have been associated with improvements in economic growth, but reverse causality could be an issue here since economic growth could lead to improvements in institutional quality through the development of rules and regulations (Glaeser et al., 2004, La Porta et al., 1999).

Corruption is also shown to affect public finances. There is evidence that corruption alters government behaviour by reducing tax revenues or distorting the composition of public expenditure (Hillman, 2004, Tanzi and Davoodi, 2000, 1997, Tanzi, 1994). Corruption is found to alter public spending away from social sectors and towards areas where higher rents may be extorted, such as military or defence spending, rather than health or education (Grigoli and Mills, 2014, Keefer and Knack, 2007, Delavallade, 2006, Mauro, 1998). Reverse causality may occur between expenditure and corruption since a specific composition of government expenditure may encourage an environment of corruption. Mauro (1998) examines the distortion of government expenditure as a result of corruption in a sample of developed and developing countries using instrumental variables estimation to correct for the issues of reverse causality between expenditure and corruption and any measurement error underlying the corruption indices. It is expected that the more corrupt a government is, the more it will allocate public funds in areas where it is easier to extort bribes, such as on military expenditure and away from education and health and the findings support this hypothesis. Tanzi and Davoodi (2000) estimate that corruption has a positive 'quantity' effect on public investment. They base their hypothesis on the idea that governments are likely to engage in capital spending to increase growth, or else on 'white-elephant' projects, whilst aiming to benefit themselves. For example, corrupt politicians may decide on which capital projects to undertake based on bribes or private links with a specific firm. Delavallade (2006) supports the findings of Mauro (1998) and Tanzi and Davoodi (2000) by using a FE model for a panel of developing countries. The issue of the endogeneity of corruption is corrected using three-stage least squares. Evidence for the 'quantity' effect of corruption on total government expenditure is found as well as for the 'allocation' effect of corruption on the composition of government expenditure; a negative allocation effect is found for the sectors of health, education and social protection and a positive allocation effect on the sectors of defence, culture and fuel and energy.

2.2.3 Contribution

It is evident from the aid literature that there is mixed results for fungibility (Liang and Mirelman, 2014, Dieleman et al., 2013, Van de Sijpe, 2012, Lu et al., 2010). The corruption literature shows that corruption has both a 'quantity' and an 'allocation' effect on public expenditure. Total public expenditure is found to increase with corruption due to available rents (quantity efect) and its composition is found to be altered towards sectors with more rent-seeking opportunities (allocation effect) (Delavallade, 2006, Tanzi and Davoodi, 2000, Mauro, 1998).

This study aims to investigate the extent of aid fungibility and whether or not institutional quality plays a role in an attempt to explain whether fungibility is caused by malicious intent in aid-recipient countries. In light of the studies summarised in Table 2.1, the focus of this study is to examine the effect of both foreign aid and institutional quality on total public expenditure and its allocation by using an interaction term between aid and institutional quality. The hypothesis of this study is that low institutional quality makes aid fungible or more fungible based on the assessment of Killick (1991) that the absorptive capacity of the state, or 'the ability of the economic system to put additional aid to productive use' is limited by lower institutional quality.

Table 2.1: Summary of key studies in the literature

Study	Sample	Estimation	Results	Sectors	Aid variable
Lu et al. (2010)	Panel (developing countries, 1996 - 2006)	GMM	Evidence of fungibility	Health	Aid to government
Van de Sijpe (2012)	Panel (developing countries, 1996 - 2006)	FE and GMM	Zero or near zero fungibility	Education and Health	On- and off-budget aid to government
Dieleman et al. (2013)	Lu et al. (2010) extended dataset	GMM	Evidence of fungibility	Health	Aid to government
Liang and Mirelman (2014)	Panel (aid-recipient countries, 1995 - 2010)	FE	Evidence of fungibility	Health	Aid to government

To our knowledge, other researchers have not incorporated both variables in their model, with the exceptions of Liang and Mirelman (2014) who consider both foreign aid and socio-political risk in the model for public health spending as well as Van de Sijpe (2012) who controls for corruption as a robustness check. Including institutional quality in the empirical model introduces a number of problems; such as measurement error and endogeneity. Corruption and institutional quality may be endogenous in the model for public expenditure since a specific allocation of public expenditure may foster an environment of corruption and rent seeking. Also, indices that measure the quality of institutions are

based on perceived levels, thereby being subject to the problem of measurement error. As robustness checks, alternative measures of institutional quality are considered to correct for these issues.

Moreover, the studies mentioned earlier focus on education and health expenditure, whereas this study investigates other types of expenditure in addition to health and education, such as transport and communications to proxy for infrastructure expenditure and total expenditure. Looking at several types of expenditure should make the picture of corruption and institutions clearer and it will allow us to see how aid is allocated between different sectors that constitute a great part of the total budget.

The studies mentioned use datasets from different sources and their samples differ in terms of the time periods and country coverage. Furthermore, the choice of estimation method affects the estimated aid fungibility, indicating the lack of robustness in the results (Roodman, 2007). Overall, different estimation techniques, samples and controls, affect the estimated aid coefficient. The selected sample for this study consists of a large number of developing countries from all regions for the period of 1990 - 2013 and alternative estimation methods and samples are used to ensure the robustness of the results, for example system GMM and static FE.

This study also extends the methodology of Van de Sijpe (2012), where the fungibility of on- and off-budget aid flows is investigated. Interaction terms between each aid modality and the measure of institutional quality are included in the estimated models for public expenditure to investigate the extent of fungibility of the different types of aid.

2.3 Methodology

2.3.1 Empirical models

The purpose of this study is to investigate the extent of aid fungibility conditional on institutional quality. Dynamic models for government spending are estimated to account for the persistence in spending and to account for the serial correlation of the errors.

Specifically, the following panel data model is estimated as follows:

$$Y_{k,it} = \beta_1 Y_{k,it-1} + \beta_2 A_{k,it} + \beta_3 IQ_{it} + \beta_4 (A_{k,it}.IQ_{it}) + \gamma' X_{it} + \eta_i + \kappa_t + \epsilon_{it} \qquad (2.1)$$

where the variables correspond to:

- $Y_{k,it}$: Government expenditure for sector k in recipient country i at year t

- $A_{k,it}$: Disbursements of foreign aid, disaggregated according to sector k in recipient country i at year t
- IQ_{it}: The institutional quality index, which in this case is the average of the rule of law, bureaucratic quality and corruption indices of the International Country Risk Guide (ICRG) in recipient country i at year t
- $A_{it}.IQ_{it}$: The interaction term between foreign aid and institutional quality for sector k in recipient country i at year t
- X_{it}: A vector of controls in recipient country i at year t (e.g. income, debt relief, NGO aid, openness, agriculture value-added, civil conflict)
- η_i: The fixed effect component/unobserved heterogeneity
- κ_t: Time fixed effects/common shocks
- ϵ_{it}: The error component

for k = T, E, H, I; indicating total public expenditure, public education expenditure, public health expenditure and public infrastructure expenditure

Table 2.2 shows the dependent variables and aid variables used for each estimated model.

Table 2.2: Estimated models

Model	Expenditure (dependent variable)	Aid
T	Total public expenditure	Total aid disbursements
E	Public education expenditure	Education aid disbursements
H	Public health expenditure	Health aid disbursements
I	Transport and communication spending, to proxy for infrastructure expenditure	Transport and communication aid disbursements

In addition to using total or sectoral aid disbursements in the model ($A_{k,it}$), aid disbursements are broken down according to their modality and more specifically: Sector Programme (SP) aid or on-budget aid, Technical Cooperation (TC) or off-budget aid, Investment Projects (IP) aid and other (ONF) aid that does not fall into these categories. The procedure used to construct these aid modalities is explained in Section 2.4. When these aid measures are used instead of total aid disbursements, they are also interacted with the measure of institutional quality (IQ_{it}) to investigate the extent of aid fungibility for each sector further.

More precisely, the following model that considers the different aid modalities is estimated as follows:

$$Y_{k,it} = \delta_1 Y_{k,it-1} + \delta_2 SPaid_{k,it} + \delta_3 TCaid_{k,it} + \delta_4 IPaid_{k,it} + \delta_5 ONFaid_{k,it} + \delta_6 IQ_{it} + \delta_7 (SPaid_{k,it}.IQ_{it}) + \delta_8 (TCaid_{k,it}.IQ_{it}) + \xi' X_{it} + \eta_i + \kappa_t + \epsilon_{it} \quad (2.2)$$

where the aid variables correspond to:

- $SPaid_{k,it}$: On-budget aid, disaggregated according to sector k in recipient country i at year t
- $TCaid_{k,it}$: Off-budget aid, disaggregated according to sector k in recipient country i at year t
- $IPaid_{k,it}$: Aid for investment projects, disaggregated according to sector k in recipient country i at year t
- $ONFaid_{k,it}$: Other non-flagged aid, disaggregated according to sector k in recipient country i at year t

for k = T, E, H, I

Table 2.3 shows the definitions of the key variables in the estimated models.

Table 2.3: Key Variables

Variable		Definition
Government expenditure for sector k	$Y_{k,it}$	Public spending consists of recurrent and capital government spending, grants and external borrowings.
Total aid for sector k	$A_{k,it}$	Aid disbursements show the actual payments to recipients every year for all purposes.
On-budget aid for sector k	$SPaid_{k,it}$	Aid for specific programmes that are recorded in the recipient's budget.
Off-budget aid for sector k	$TCaid_{k,it}$	Aid for technical activities that are not recorded in the recipient's budget.
Investment aid for sector k	$IPaid_{k,it}$	Aid for activities targeted to increase physical capital.
Other aid for sector k	$ONFaid_{k,it}$	Other flows not flagged to be SP, TC or IP.
Institutional quality	IQ_{it}	The average of the corruption, law and order and bureaucratic quality indices of the ICRG.

The models include a number of other control variables in addition to aid, institutional quality and the interaction terms; namely income, debt relief and NGO aid. Variables that are found to be significant in other relevant studies are also included, such as the urbanisation rate, trade openness and civil conflict.

Econometric theory

Generally, panel data models include an unobserved heterogeneity component. This term can be modelled and estimated, using the FE model for panel data, or it can be considered as a component of the error term, using the random effects model. Dealing with this FE component usually involves taking First Differences (FD) and estimating the model or demeaning the variables and estimating a Within-Group (WG) estimator. When using the FE or WG estimators, terms that have no variation over time are removed together with the unobservable component. These estimators may prove to be a problem in a dynamic model since the Lagged Dependent Variable (LDV) will be correlated with the error term of the model, thus causing a bias in the estimated coefficients (Nickell, 1981). Several models have been developed to correct for this bias. Anderson and Hsiao (1982) introduced the notion of taking FD to remove the unobserved heterogeneity component and instrumenting these FD either with a lag of the variable or with a lagged difference. Arellano and Bond (1991) developed this idea further and introduced the difference GMM estimation method in this context in which all the moments conditions are exploited. A potential limitation of the Arellano and Bond estimation method is that lagged levels may prove to be weak instruments for variables that are in FD in cases when the LDV follows a random walk and is highly persistent. Arellano and Bover (1995) and Blundell and Bond (2000) suggested a method to correct for this problem, by estimating the model in both FD and in levels and instrumenting the endogenous LDV using both lagged values and lagged differences. This estimator is called the system GMM estimator.

An appropriate lag has to be selected under the assumption that the further lags chosen for instrumentation are uncorrelated with the errors in a dynamic model. Arellano and Bond (1991) developed an autocorrelation test that is available in Stata's xtabond2 command developed by Roodman (2009a), which employs the difference and system GMM estimators. In this dynamic model, it is expected that the Arellano and Bond's test would detect autocorrelation for the first lag because of how the model is constructed. If second-order serial correlation does not exist, then the second lag of the dependent variable can be used as an instrument since the second lag would be uncorrelated with the errors.

Identification strategy

For the purposes of this chapter, the system GMM method is used to instrument for the endogenous LDV in each model with lagged levels and lagged differences of the dependent variable. The Windmeijer correction for standard errors is used because of the bias that the standard errors suffer in small samples (Windmeijer, 2005). In the model for total government spending, the endogenous LDV is instrumented by going back one period and using its second and third lags, since these lags are uncorrelated with the errors in

the model ($\epsilon_{it} - \epsilon_{it-1}$) and as instruments they are valid following the Hansen tests for instrument validity. The Hansen test is used instead of the Sargan test because it is more robust in the presence of heteroscedasticity. The choice of lags depends on the Hansen test for instrument validity. Apart from restricting the number of lags used for instrumentation, all the instruments are collapsed to avoid the over-fitting of the endogenous variable that would in turn weaken the Hansen test for instrument validity (Roodman, 2009b)[2.1].

The system GMM method allows us to relax the assumption of exogeneity of aid to public spending. The aid measures are thought to be endogenous in this model, following the theoretical and empirical literature. Foreign aid is directed towards poorer countries that could perhaps have low government spending levels to begin with. Causality could run in either way, thus making aid flows endogenous in the models since both the level of government expenditure as well as the composition of government expenditure could affect aid flows. To identify the causal effect of aid, some of the popular instruments of foreign aid found the empirical literature are measures of recipient need, such as income or infant mortality and the population of aid-receiving countries since smaller countries are found to receive larger aid flows. These are not applicable for our analysis since the regressions have several variables of different types of aid flows that are considered to be endogenous (on-, off-budget aid, investment project aid and other aid flows) [2.2].

In this study, different types of aid are considered (total aid disbursements and the different modalities) and they are all considered endogenous as well as their interaction terms. In this framework, aid flows are instrumented in a similar manner as the LDV: using lagged levels and lagged differences.

Corruption is thought to be endogenous in the studies investigating its effect on expenditure (Delavallade, 2006, Mauro, 1998). As explained earlier, reverse causality between government spending and corruption may be an issue since a specific allocation of the government budget across the different sectors may encourage an environment of corruption. For example, in a country with high military spending opportunities for corruption are higher. A way to deal with this suggested endogeneity of corruption and therefore institutional quality is instrumental variables. Popular instruments for corruption used in the literature include ethnolinguistic fractionalisation and colonial dummies.

Such instruments are not helpful for the purposes of this chapter, since they are time-invariant and disappear in a dynamic panel data framework. For the purposes of this analysis, the institutional quality variable is treated as exogenous and instrumented by

[2.1] Several lag structures have been considered and the results using system GMM will be described in Section 2.5.

[2.2] Some initial results suggest that such instruments are weak.

itself. As a robustness check, the assumption of exogeneity of institutional quality is relaxed and the quality of institutions is treated as endogenous and instrumented using its past levels.

The remainder control variables (NGO aid, debt relief, income, urbanisation, trade openness, civil conflict) and the time dummies are instrumented with themselves. The interaction terms between aid and institutional quality are also treated as being endogenous and instrumented using its lagged levels and lagged differences.

Due to the presence of the interaction term between institutional quality and foreign aid, the conditional effects of foreign aid are calculated since the regression coefficients need to be adjusted in the presence of an interaction term. The conditional effects are then plotted against institutional quality (Brambor et al., 2006, Blalock, 2005, Friedrich, 1982) and the standard errors of the conditional effects of aid are computed using the Delta method (Oehlert, 1992).

As an alternative measure of institutional quality, institutional quality is ranked and categorised and different dummies are included in the regression instead of the continuous variable. For this reason, the ICRG measure for institutional quality is ranked into three categories: low, medium and high. This measure is constructed in such a way that countries are classified in the same way across the different samples and models. When using the categorical measure, the interaction term allows us to estimate the marginal effects of aid on government expenditure at the three levels of institutional quality (low, medium and high).[2.3]

The interaction term between foreign aid and institutional quality is included in the models to investigate the extent of fungibility and whether it depends on the level of institutional quality. It is expected that low institutional quality would make aid fungible or more fungible. Based on the definition of government expenditure, on-budget aid is expected to have a one-to-one effect on spending if aid is non-fungible. Any coefficients of less than 1 are indications for fungibility. Off-budget aid, however, by definition is not expected to affect government spending. Therefore, any coefficients of less than 0 are indications for fungibility. The effects of aid for investment and any other aid flows are unclear based on the theory, although we do not expect them to have a negative coefficient (Van de Sijpe, 2012). Nevertheless, aid for investment purposes is expected to be positively associated with infrastructure or investment spending (Van de Walle and Mu, 2007, Mavrotas and Ouattara, 2006).

Evidence concerning fungibility is mixed and a reason behind it might be corruption and

[2.3]Very few countries have variations in institutional quality (See Figure A.1.3 of Appendix A.1).

the quality of institutions, which are not controlled for in most of the studies examined. Institutional quality[2.4] is expected to enter negatively in the model for infrastructure spending and positively in the social sectors of health and education, based on the results of the empirical literature described earlier (Delavallade, 2006, Tanzi and Davoodi, 2000, Mauro, 1998). A negative coefficient of institutional quality for the sectors of education and health expenditure could indicate that the construction component of the specific sector receives a large share of the specific sectoral expenditure. This is based on the findings of other authors, who find that corruption reduces spending in the health and education sectors (Delavallade, 2006, Tanzi and Davoodi, 2000, Mauro, 1998) and also based on the assumption that the construction sector provides the most available rents (De Jong et al., 2009, Mackinnon, 2003). The assumption of corruption being most prevalent in the construction sector is backed up by the findings of Transparency International. In their report for the national Bribe Payers Index (TI, 2008) they showed that the construction sector is the most corrupt sector in the world. Nevertheless, this assumption cannot be tested with existing data since data on construction and sub-components of government expenditure are limited.

According to the literature, debt relief would be positively associated with government expenditure. This is because reducing the amount of debt would free up public resources since debt repayments would also fall. Therefore, the resources that would have been used for debt repayments can now be diverted towards government spending (Van de Sijpe, 2012, Nguyen et al., 2003, Gupta et al., 2002, Sachs, 1988). Nevertheless, there are some empirical results that do not support this idea (Depetris Chauvin and Kraay, 2005). Donors could be targeting aid to NGOs as a means of avoiding corruption and cumbersome bureaucracies (Wallace, 2009, Bräutigam and Knack, 2004, Bräutigam, 2000) and this is expected to have a positive effect on total public expenditure (Lu et al., 2010).

Robustness checks

Alternative estimation techniques are employed, namely using static panel data models with FE. Such models require the assumption of exogeneity of aid, suggesting that the allocation of foreign aid to countries does not depend on the pattern of public expenditure.

2.3.2 Fungibility tests

After estimating the regression coefficients and conditional effects for each level of institutional quality, the conditional effects of on-budget aid and off-budget aid are tested

[2.4] Higher values of institutional quality correspond to low corruption, strong law and order and a small bureaucracy.

against two one-sided fungibility tests to determine firstly whether or not aid is fungible and secondly the extent of fungibility. These tests follow the methodology of Van de Sijpe (2012) and Pettersson (2007).

The conditional effect of total aid disbursements is estimated to be:

$$\zeta_T = (\beta_2 + \beta_4.IQ_{it}) \tag{2.3}$$

The conditional effect of on-budget aid disbursements is:

$$\zeta_{SP} = (\delta_2 + \delta_7.IQ_{it}) \tag{2.4}$$

The conditional effect of off-budget aid disbursements is:

$$\zeta_{TC} = (\delta_3 + \delta_8.IQ_{it}) \tag{2.5}$$

These conditional effects are tested at each level of institutional quality since the conditional effect of aid depends on the continuous institutional quality measure.

By definition, government expenditure would increase with total on-budget aid disbursements since on-budget aid flows are included in the government expenditure variable as external resources. This allows us to test whether aid fungibility exists by testing whether the conditional effect of on-budget aid is equal to or larger than 1 (1 being the anticipated conditional effect of aid flows in the case of no leakages). If the conditional effect takes any value less than 1, it is an indication that some fungibility exists since on-budget aid is not completely transferred into government expenditure. A conditional effect between 0 and 1 is an indication of partial fungibility. To determine the extent of fungibility we test whether the conditional effect of on-budget aid is negative, indicating full fungibility.

The hypothesis of no fungibility of on-budget aid disbursements translates into:

$$H_0 : \zeta_{SP} \geq 1 \tag{2.6}$$

$$H_a : \zeta_{SP} < 1 \tag{2.7}$$

The hypothesis of full fungibility of on-budget aid disbursements translates into:

$$H_0 : \zeta_{SP} \leq 0 \tag{2.8}$$

$$H_a : \zeta_{SP} > 0 \tag{2.9}$$

Off-budget aid, as opposed to on-budget aid, is not recorded in the recipient government's accounts, therefore, different fungibility tests need to be constructed. Off-budget aid is not expected to raise government spending so to determine whether or not off-budget aid is fungible we test the sign of the conditional effect of off-budget aid. If the conditional effect of off-budget aid on spending is statistically insignificant it indicates that off-budget aid is not fungible and has no effect on spending. If it is positive it shows that off-budget aid crowds-in resources and raises government expenditure, but if the conditional effect is negative it is an indication of fungibility. Following Van de Sijpe (2012), to test the extent of fungibility of off-budget aid, we test whether the conditional effect is less than the marginal effect of public resources net of aid flows minus 1.

Public resources net of aid refer to resources raised domestically through taxes or resources raised by external borrowing and exclude aid flows. Devarajan et al. (2007) estimate the marginal effect of unconditional resources on government spending to be 0.12 for education and 0.04 for health, whereas Feyzioglu et al. (1998) estimate this to be even lower: 0.08 for education and 0.02 for health. These estimations suggest that the marginal effect of unconditional resources should be close to 0, therefore, Van de Sijpe (2012) assumes that this marginal effect is 0. Making this assumption would not affect the estimated coefficients, but could increase the probability of rejecting the null hypothesis of full fungibility of off-budget aid (Van de Sijpe, 2012)[2.5].

The hypothesis of no fungibility of off-budget aid disbursements then translates into:

$$H_0 : \zeta_{TC} \geq 0 \tag{2.10}$$

$$H_a : \zeta_{TC} < 0 \tag{2.11}$$

The hypothesis of full fungibility of off-budget aid disbursements then translates into:

$$H_0 : \zeta_{TC} \leq -1 \tag{2.12}$$

$$H_a : \zeta_{TC} > -1 \tag{2.13}$$

It is expected that in low levels of institutional quality, characterised by high corruption, a weak law and order system and a large bureaucracy, aid would be fungible and definitely

[2.5]The marginal effect of the unconditional resources could be calculated using a two-step procedure as in Devarajan et al. (2007) if reliable data on tax revenues and borrowing were available.

to a larger extent than in high levels of institutional quality.

2.4 Data

2.4.1 Sources

The sample used consists of developing countries from the regions of Eastern Europe, the Caribbean, Latin America, North Africa and the Middle East, Sub-Saharan Africa, South Asia, South East Asia, East Asia and the Pacific, over the period of 1990 - 2013. The sample used for model T consists of 59 countries over the 24-year time period. The sample used for model E consists of 51 countries, for model H of 70 countries and for model I of 51 countries. See Appendix A.6 for the full list of countries in each specification

Data for general public expenditure as a percentage to GDP are obtained from three separate sources. Total public spending data and transport and communications spending to proxy for infrastructure spending data are obtained from the Statistics for Public Expenditure for Economic Development (SPEED) database provided by the International Food Policy Research Institute (IFPRI) (IFPRI, 2013) that offers government expenditure by sector. Public education data are obtained from the dataset constructed by Clements et al. (2013) that collect government expenditure data using consolidated national accounts and country reports to correct for any missing values in the areas of education and health. Public health data are obtained from the World Developments Indicators (WDI) of the WB (World Bank, 2015). Different data sources for the dependent variables are used for the various models and are chosen based on the larger data availability.

The measure of institutional quality used for this study is the ICRG measure obtained from the Quality of Governance (QoG) dataset published by the University of Gothenburg (Dahlberg et al., 2015). The PRS Group publishes the ICRG index, which consists of economic, financial and political risk factors. The institutional quality index used for the purposes of this study includes three components of the political risk factors averaged together: the extent of corruption, bureaucratic control and law and order. This measure of corruption focuses mostly on political corruption in the form of patronage, favours, secret funding of parties in power, nepotism and ties between politicians and businesses (Howell, 2011). The component of bureaucratic quality focuses on interruptions in government services due to bureaucratic reasons. High-risk countries are those where the bureaucracy is embedded in the political system and government services. The component on law and order focuses on the strength of the legal system. High-risk countries suffer from a high crime rate with weak sanctions. The index has been rescaled and normalised and ranges

between 0 and 1, so that higher values indicate higher quality of governance.

The ICRG index of corruption is one of the most widespread measures for corruption and has been available since 1985 for a large number of countries. Nevertheless, it is based on the opinion of country experts on how political corruption is expected to affect international investment and businesses. According to its methodology, political data are collected and then transferred into risk points on the basis of the analysis of pre-set questions for each sub-component of the political risk component (i.e. corruption, law and order, bureaucratic quality). These pre-set questions are not made public and, therefore, cannot be challenged. Measuring corruption and the quality of institutions, is usually based on individuals' perceptions of corruption in any given country. Measuring perceptions introduces some measurement error since what certain people perceive as corruption is not uniform across the population or between countries. Nevertheless, individuals make decisions and behave accordingly based on such perceptions, thus the perception of corruption could be equally important (Razafindrakoto and Roubaud, 2010). Another issue is the fact that perceptions may be easily affected by either the current situation of a country and its economic performance, by the respondent's experiences or by the cultural and societal values of each country (Rothstein and Torsello, 2013). For example, business experts and local people do not experience corruption at the same level and their responses are expected to differ.

Data for foreign aid disbursements are obtained from the Creditor Reporting System (CRS) of Development Assistance Committee of the OECD (OECD-DAC) that offers disaggregated aid data according to donors, types of foreign aid and sectors (OECD, 2013). Data for total disbursements for all sectors are available to be used in model T. Data for disbursements for the purposes of the sectors of education, health and infrastructure are available to be used in models E, H and I, respectively. The CRS database offers data for disbursements and commitments and the differences between the two variables from year to year are attributed to the fact that commitments may actually be disbursed in a later year. For this reason, disbursements were chosen to best reflect foreign aid from the point of view of recipient countries. Aid disbursements are defined as the actual payments in each year and show the realisation of donors' intentions and previous commitments. Data for aid disbursements are available since 1990 from the CRS database although the availability of aid disbursements is low in the years prior to 2002. Data for debt relief are obtained from the DAC2a Table of the CRS for net debt relief. All of the aid variables have been rescaled to reflect percentages of GDP.

The CRS database classifies flows according to their type and their purpose and this

feature was used to construct the measure for aid disbursements. For each sector, data according to channels of delivery and aid modalities were obtained. The channel of delivery is the 'first implementing partner', who is responsible for the subsequent allocation of the ODA resources. We focused on concessional flows of resources according to the definition for ODA that have the public sector as the first implementing partner and more precisely ODA grants (flow code 11), ODA loans (flow code 13) and private concessional loans (flow code 30) that include flows from both bilateral and multilateral donors. The aid disbursements for certain sectors were also constructed using the purpose codes and purpose sectors assigned to each flow and more precisely for the sectors of education (sector code 110) and health (sector code 120. Aid disbursements for infrastructure are proxied by aid disbursements for transport and storage (sector code 210) and disbursements for communications (sector code 220). Data for flows that have NGOs as their first implementing partner were used to construct the 'NGO aid' variable for each sector k that is included in the regressions and measures total or sectoral aid disbursements that are directed to NGOs.

Data for different aid modalities were constructed to account for the idea that different aid modalities would have different effects on the composition of public expenditure. This methodology follows the procedure followed by Van de Sijpe (2012) as far as possible. The CRS database flags each aid flow according to its aid modality: Programme-Based Approaches (PBAs), Free-standing Technical-Cooperation (FTC), IP and other non-flagged aid (ONF). PBAs or SP aid includes aid flows that target a specific programme and aim for development. SP aid or PBAs is the aid modality that best resembles flows with a direct purpose for development on specific projects in specific sectors and that are recorded in the budgets of recipient countries. FTC or TC includes activities that are financed by donors but do not enter the national accounts directly. Some examples of TC include funding training activities for the people of the developing country or the transfer of certain supplies related to human capital. IP aid includes any flows whose aim is to increase the physical capital of a recipient country. Some flows are flagged twice so those flows are equally divided between the two modalities which they were flagged for. Some flows are not flagged at all and are recorded as ONF.

The WDI (2015) are also used to obtain data for a number of other variables used in the models, namely GDP per capita, HIV prevalence, trade openness, agricultural value-added, urbanisation, population variables, and GPD in current terms for the rescaling of the aid measures. The index of civil conflict is obtained from the Centre of Systemic Peace (Center of Systemic Peace, 2013). Detailed definitions of each variable and their sources can be found in Appendix A.7.

2.4.2 Descriptive statistics

Table 2.5 shows the descriptive statistics of the key variables. The sample of each model changes because of data availability; the sample used is based on developing countries that have available information for institutional quality (ICRG) and on public spending. Such data for developing countries are not always available and there is a large number of missing values in these samples. Most of the countries included in this sample come from the region of Sub-Saharan Africa.

It can be seen that a large portion of public spending is diverted to education and health, despite the differences in the samples for each model: around 15% of total spending is diverted to education and around 12% to health. The sector of health receives the largest share of NGO aid. It can be seen that a large amount of total aid is in the form of investment and on-budget aid, but aid flows are mostly not flagged for specific purposes. Aid for the purposes of education is mostly in the form of off-budget aid and aid for the purposes of infrastructure is mostly in the form of aid for investment purposes. Negative values for debt relief refer to the accumulation of more debt offsetting debt forgiveness. The mean of public spending is higher in upper-middle income countries than low income countries, explaining the need for foreign aid resources. This correlation is also true for institutional quality and income, as expected from the empirical literature.

2.5 Empirical Results

2.5.1 Empirical models

This Section discusses the results for the dynamic models of government expenditure (models T, E, H and I) using the system GMM estimation method because of its better properties outlined in the Section 2.3. The conditional effects of aid flows and the p-values for the two one-sided hypothesis tests are shown.

Total government spending - Model T

Table 2.6 shows the regressions for total public spending as a dependent variable. The relevant p-values for the tests of first and second order autocorrelation are passed, showing that only first degree autocorrelation exists, making the choice of the second lag for instrumentation a valid one. The relevant p-values for the Hansen test for instrument validity are also shown and it can be seen that the Hansen test is passed in all cases. There is also no issue of over-fitting as the number of instruments for each regression is less than the number of countries in each regression. The coefficients of the LDV using

GMM lie between the coefficient obtained using Ordinary Least Squares (OLS) and FE, as expected. It can be seen from the Table that the coefficient of the LDV using GMM is lower than the one obtained using FE.

Based on the definition of government spending, it is expected that aid would have some effect on it. Total government spending includes external resources or else aid flows. Aid is statistically insignificant without the interaction term between aid and institutional quality, providing some evidence of fungibility and that it does not depend on institutional quality (column (3) of Table 2.6). The first column shows the results for the static model and a significantly negative coefficient for total aid disbursements is estimated. For the model with the aid modalities, the coefficient of on-budget aid is statistically insignificant (Column (7) of Table 2.6). Based on the definition of on-budget aid, in cases of no fungibility when no fund are leaked, a one-to-one effect with public spending is expected. This insignificant coefficient gives evidence of fungibility. Nevertheless, it is argued in the literature that the lack of a one-to-one relationship between aid and spending is not always a cause for concern since aid funds could be saved as reserves (Harper, 2012). Off-budget aid has a significantly negative coefficient in the model without the interaction (column (7) of Table 2.6), giving evidence for fungibility irrespective of institutional quality. More specifically, an increase of total off-budget aid of 1% of GDP is associated with a decrease of 0.95% of GDP, significant at 10 percent. This significantly negative coefficient is found in the static model as well. The other types of aid have statistically insignificant coefficients in column (7) of Table 2.6 using GMM. Positive coefficients would be expected if no funds were leaked and this could be an indication of fungibility of those aid flows. Aid for investment purposes has a significantly positive coefficient in the models estimated using FE showing evidence against fungibility. Nevertheless, the extent of fungibility of investment aid is unknown as a theoretical model does not exist to examine the coefficient against certain hypotheses.

The coefficient of the ICRG variable is insignificant for all models, contradicting the results of Tanzi and Davoodi (2000) that identify a 'quantity' effect of corruption on total public spending. This could occur because the ICRG variable measures bureaucratic quality and the rule of law in addition to corruption. NGO aid has, surprisingly, a negative coefficient only in the model with the aid modalities using GMM. NGO aid is expected to have a positive coefficient (Lu et al., 2010) but in this analysis it is associated with reductions in public spending, suggesting that NGO aid is fungible (Yontcheva and Masud, 2005). Debt relief is insignificant for the model of total public spending agreeing with Depetris Chauvin and Kraay (2005) that find debt relief to have no association with spending.

The other variables that are controlled for, apart from openness, HIV prevalence and the share of agriculture value-added in the economy are insignificant. A positive effect of trade is an indication that any gains from trade are fed back in the economy and re-distributed in the form of public spending as a safety net against exposure to the terms of trade risk (Rodrik, 1998). HIV prevalence is associated with increases in public spending possibly via the health sector or education sector for prevention and monitoring (Mishra and Newhouse, 2009, Gupta et al., 2002, Schwartländer et al., 2001). A higher share of agriculture in the economy is generally associated with reductions in tax revenues, as such an informal sector with high levels of subsistence farming is difficult to be taxed. This could have an effect on spending as lower tax revenues for the economy would mean less funding for public expenditure (Teera and Hudson, 2004, Slemrod, 2002, Ghura, 1998).

Figure 2.1 shows the conditional effects of aid disbursements at the range of the ICRG variable using system GMM (columns (4) and (8) of table 2.6). Figure 2.1(a) shows the conditional effect of total aid disbursements, Figure 2.1(b) shows the effect of on-budget aid disbursements and Figure 2.1(c) of off-budget aid disbursements. It can be seen that the conditional effect of total aid disbursements is not statistically significantly different from 0 at any value of the ICRG suggesting that some fungibility exists and is independent of the quality of institutions.[2.6] Total on-budget aid is generally found to be insignificant, although when the ICRG takes the value 0.3 this conditional effect is significantly negative and takes the value of -0.12. The conditional effect of total off-budget aid is found to be dependent on institutional quality. The conditional effect is significantly negative when institutions are weak and as institutional quality improves the conditional effect becomes statistically insignificant. An insignificant effect for off-budget aid is no indication for fungibility since off-budget aid is not expected to impact spending. When the ICRG ranges between 0 and 0.3, the conditional effect of off-budget aid is between -2.22 and -0.66.[2.7]

Table 2.7 shows the p-values for the two one-sided fungibility tests for on- and off-budget aid. The first row of this Table shows the p-values for the two fungibility tests on the regression coefficients obtained using system GMM when the interaction terms are not included. Based on these p-values the hypothesis of no fungibility of on-budget is rejected at all values of the ICRG (column (1) of Table 2.7), whereas the hypothesis of full fungibility is not rejected at all values of the ICRG (column (2) of Table 2.7). This further supports the finding of fungibility of on-budget aid and more precisely full fungibility and disagrees with the initial hypothesis of the paper that the extent of fungibility depends on

[2.6] As institutional quality improves, the conditional effect increases and becomes positive.

[2.7] 19 countries of the sample take values between 0 and 0.3 for the ICRG and examples are Cote d'Ivoire, Nigeria and Togo.

institutional quality.

When institutional quality is considered, the p-values for the fungibility tests of total off-budget aid show that the hypothesis of no fungibility is rejected (column (3)) when institutions are weak (ICRG values of 0 - 0.3) and not rejected elsewhere. The hypothesis of full fungibility is not rejected (column (4)) when institutions are weak (ICRG values of 0 - 0.3) and rejected when institutions are strong (ICRG values of 0.4 - one).[2.8] These tests show that the extent of fungibility for total off-budget aid depends on institutional quality and that lower institutional quality makes off-budget aid fungible. The hypothesis of full fungibility of off-budget aid is not rejected when institutions are weak (ICRG values of 0 - 0.3) and rejected when institutions are stronger (ICRG values of 0.4 - one).

Overall, the results agree with the finding that aid fungibility tends to be over-estimated if the different aid modalities are not accounted for. The conditional effect of total aid disbursements is found to be statistically insignificant for spending and therefore fungible, but these results break down when on- and off-budget aid disbursements are considered, highlighting the importance of examining the different aid modalities. Additionally, including the interaction term proves important for total off-budget aid. Without the interaction term total on-budget aid is insignificant (column (3) of Table 2.6) and according to the p-values for the fungibility tests it is also fully fungible (first row of Table 2.7). These results remain with the inclusion of the interaction term at all values of the ICRG. On the other hand, total off-budget aid is significantly negative without the interaction term (column (3) of Table 2.6) and based on the fungibility tests it is fully fungible at the 10% level (first row of Table 2.7).

Comparing these results with the results including the interaction terms, the results for off-budget aid change. More precisely, the effect of total off-budget aid is significantly negative only when institutions are weak and insignificant when institutions become stronger. The fungibility tests show that when institutions are strong, off-budget aid is non-fungible. This shows the importance of examining the heterogeneous effect of aid based on institutional quality, as the extent of fungibility would be over-estimated in countries with environments of strong institutions if the institutional quality is not considered.

Donors make a case for on-budget aid as it allows a more transparent management of aid resources, especially in countries that are highly aid-dependent. Nevertheless, on-budget aid is found to be fully fungible and the extent of fungibility is not found to depend on institutional quality. This agrees with the findings of CABRI (2008) that finds no evidence of a correlation between on-budget aid and public finance management, concluding that

[2.8] Some examples of countries that take values between 0.4 and 1 for the ICRG are Burkina Faso, Malawi and Sri Lanka.

on-budget aid is more easily captured.

Composition of government spending - Models E, H and I

Regarding the results on fungibility of aid for different purposes, the detailed results are available in Appendix A.3.

The fungibility tests (Table A.3.3) suggest that on-budget aid for education is fully fungible at low levels of institutional quality (ICRG values of 0 - 0.3) and non-fungible at the higher values. On-budget aid for health is found to be fully fungible at the low to middle values of the ICRG (0.2 - 0.7) and non-fungible at the higher values. On-budget aid for infrastructure is found to be non-fungible at all values. Off-budget aid for education, health and infrastructure is found to be non-fungible at all values of the ICRG. These results provide some support for the initial hypothesis of this study that institutional quality matters for the degree of fungibility.

Long-run effects

Dynamic models are estimated for public spending and because of the presence of the LDV the long-run effects of aid need to be estimated (See Figures A.4.1, A.4.2, A.4.3 in Appendix A.5). The long-run effects follow the same pattern with the short-run effects.

2.5.2 Discussion

The initial hypothesis of this study is not supported by the findings of aggregate aid disbursements: institutional quality does not seem to play a role for the extent of fungibility of aggregate aid. Nevertheless, the suggested fungibility of total aid disbursements is found to be over-estimated as shown by the empirical literature. By disaggregating aid flows according to their modality we find that the extent of fungibility depends on the aid modality and on institutional quality. This could be an indication that corruption, the general mis-management of aid flows by bureaucrats and participation in illegal activities with low chance of getting caught or punished are likely causes of aid fungibility. Environments with low institutional quality are likely to foster illegal activities and the malicious actions of the governments. On the other hand, the degree of aid illusion could also be larger in such environments due to the large bureaucracy.

The fungibility results of on- and off-budget aid for the different estimated models are summarised in Table 2.4.

Including the interaction term proves important especially for total off-budget aid and off-budget aid for the purposes of health. For example, without the interaction term, total

Table 2.4: Summary of results

	On-budget aid (SP)	Off-budget aid (TC)
Model T	Insignificant & fully fungible at all values of ICRG.	Negative & fully fungible at low values of ICRG. Positive & non-fungible at high values of ICRG.
Model E	Insignificant & fully fungible at low values of ICRG. Insignificant & non-fungible at high values of ICRG.	Insignificant & non-fungible at all values of ICRG.
Model H	Insignificant & fully fungible at low-middle values of ICRG. Insignificant & non-fungible at high values of ICRG.	Positive & non-fungible at ICRG=0.3 onwards.
Model I	Insignificant & non-fungible at all values of ICRG.	Insignificant & non-fungible at all values of ICRG..

Higher values of the ICRG indicate higher quality of institutions.

off-budget aid is found to be partially fungible at the 10% level (first row of Table 2.7). When institutional quality is considered, the hypothesis tests suggest that off-budget aid is fully fungible when institutions are weak and non-fungible when they are strong. Similar results hold for aid for the purposes of health: inferences change when we consider the fungibility tests of the coefficient of on- or off-budget aid and the corresponding tests conditional on the value of the ICRG. More precisely, without the interaction term total off-budget aid is found to be partially fungible, whilst considering the interaction term changes this result: total off-budget aid is found to be fully fungible when institutions are weak and non-fungible when institutions are strong. These models show the importance of examining the heterogeneous effect of aid based on institutional quality, as we would wrongly estimate the extent of fungibility for environments with strong institutions if institutional quality is not considered.

Examining the three components of spending, namely education, health and infrastructure, does not shed light on the origin of the fungibility result with regard to total public spending and total off-budget aid. The conditional effects of total, on- and off-budget aid flows for the purposes of education, health and infrastructure are in almost all cases statistically insignificant (with the exception of on-budget aid for health). These results could be explained by two possible reasons. Firstly, aid is given for other purposes apart from education, health and infrastructure and the fungibility result of total off-budget aid could originate from other purposes. Some examples of other aid purposes not examined by this study are aid for the purposes of population policies, aid for the purposes of water and sanitation or aid for the purposes of conflict resolution. Also, the variability of aid flows for different purposes is low compared to total aid. This could explain the lack of significant results. The dataset for aid of different purposes contains a large number of zeros and aid flows close to 0 (See Table 2.5).

Furthermore, there is no evidence to support the 'quantity' effect of corruption identified

in the empirical literature (Tanzi and Davoodi, 2000). There is some evidence of the allocation effect for the model of public education spending, but overall institutional quality is not found to be statistically significant for public spending. Regarding NGO aid, our analysis shows that it may be fungible as it is found to be negatively associated with total public spending. Nevertheless, this negative association does not originate from spending on education, health and infrastructure as NGO aid is found to be insignificant for those types of spending. As mentioned earlier, NGO aid is expected to have a positive coefficient on spending since this type of aid is used by international donors as a means of avoiding cumbersome governments and rent-seeking activities (Wallace, 2009, Bräutigam and Knack, 2004, Bräutigam, 2000). An insignificant or negative effect could be an indication for the fungibility of such aid (Yontcheva and Masud, 2005). Furthermore, aid in the form of debt relief is not found to be associated with changes in public spending based on the results of this study. A theoretical model is not available to characterise the extent of fungibility of aid in the form of debt relief, but an insignificant coefficient could be indication of fungibility since resources that would have been spent on debt repayments could now be diverted towards public spending (Van de Sijpe, 2012, Nguyen et al., 2003, Gupta et al., 2002, Sachs, 1988). Moreover, aid targeted to the three different components of spending studies in this study is always found to be insignificant suggesting that there are no spillover effects of aid from other sectors. This means that in the cases where aid is found to be fungible for specific sectors, the fungible aid flows are not transferred into the sectors studied in this study: education, health or infrastructure. The fact that different forms of aid are found to be fungible based on the results of this study is not necessarily a cause for concern. Fungibility could arise for any number of reasons, as mentioned earlier, one of them being the optimal choice of recipient governments. Aid flows might affect tax revenue or the external debt and aid flows might, therefore, be allocated elsewhere within the government's budget.

2.5.3 Robustness checks

To ensure that the results are robust and are not sensitive to the estimation method used, alternative estimation methods and samples are used.

Static models with FE and standard errors clustered at the country level are estimated. Furthermore, an alternative measure for total government spending is considered by using the WB measure for expense as a percentage of GDP that measures all payments for the operating activities of the government (World Bank, 2015).[2.9] (See Appendix A.2).

[2.9] Static models are estimated as the number of observations falls to 571 from 979.

Furthermore, to further extend the FE analysis, lagged values for the aid variables are considered as well as contemporaneous ones. Lagged values are used to correct for the potential endogeneity of aid and public spending since countries that receive foreign aid might be countries with low government spending that require external funds to fill in the gaps. The first and second lags are considered so as to ensure that past values of aid do not impact the results. In the static model, as a robustness check, lagged values of the ICRG variable are also used to correct for the potential endogeneity between institutional quality or corruption and public spending. Also, institutional quality is measured using the average of the Worldwide Governance Indicators developed by Kaufmann and Zoido-Lobatón (1999) (World Bank, 2014). The FE models are also estimated using a categorical measure for institutional quality, rather than a continuous one. Countries are classified to have low, medium or high institutional quality. Countries whose mean institutional quality throughout the time period examined is higher than the mean institutional quality of all countries in the sample are classified as having high institutional quality and countries whose mean is lower are classified as having low institutional quality. To complement this categorisation, countries are also classified to have low or high institutional quality based on their median institutional quality value rather than the mean. If there are any discrepancies between the two categorisations, then these cases are classified as having medium level institutional quality. Moreover, a common sample is generated where the same observations for all four models of public spending are used.[2.10] These results are shown in Appendix A.4)

The results for model T remain mostly robust with these alternative methods of estimation. More precisely, when the original model is estimated with FE and when the alternative dependent variable is used, the results with regard to aggregate aid and off-budget aid remain robust. Initially, on-budget aid was found to be statistically insignificant and fully fungible for all values of the ICRG. With static FE models and the alternative dependent variable, the results become stronger and the fungibility of on-budget aid is also found to be dependent on institutional quality in the direction expected (See Appendix A.2).

2.6 Conclusion

The aim of this study was to examine aid fungibility for total aid disbursements and for some of its components, by looking at the sectors of education, health and infrastructure. These sectors were considered because of their importance for development and the importance donors place on them, especially since they aim in improving related development

[2.10]The number of observations of the common sample is 510.

indicators (MDGs/post-2015 agenda). The hypothesis of this study was that institutional quality plays a role for fungibility and more specifically that aid disbursements are more fungible when institutional quality is low, described as situations of a large bureaucracy, a weak legal system and a high degree of corruption. Investigating whether the effect of aid on government expenditure depends on institutional quality can shed light on the cause behind fungibility. Fungibility can arise for a number of reasons: due to the optimal choice of recipient governments that consider their total revenue - including domestic and external sources - when allocating funds across their budget, malicious intent or aid illusion.

Following the work of Lu et al. (2010), Van de Sijpe (2012) and Dieleman et al. (2013), dynamic models were estimated using the system GMM method to capture the persistence of public expenditure and different aid modalities were considered (on- and off-budget aid). As a robustness check, static models with FE were also estimated. Looking at aid disbursements as a whole, over-estimates the degree of fungibility, as suggested by Van de Sijpe (2012) and this is supported by the findings of this study. The hypothesis that institutional quality plays a role for fungibility is not supported when total aid disbursements are considered. Total aid disbursements as a whole and total aid disbursements for the sectors considered (education, health, infrastructure) are found to have an insignificant effect on expenditure. The results become interesting when we distinguish between on- and off-budget aid and consider if the two types of aid have different effects on expenditure.

Total on-budget aid disbursements are found to be insignificant and fully fungible, whereas off-budget aid is found to be non-fungible when institutions are strong and fully fungible when institutions are weak, suggesting that the quality of institutions does play a role for the fungibility of off-budget aid. In other words, total aid disbursements received are substituting domestic resources instead of complementing them and government spending does not increase (in some cases it even decreases - if the conditional effect is negative). This result could be explained as the optimal choice of the governments to consider aid disbursements as part of total revenue as a whole when allocating resources across their budget, but it could also be explained by malicious intent of government officials at the receiving end of aid disbursements, especially for the cases of off-budget aid where the extent of fungibility depends on institutional quality. This could be an indication that the reason behind the fungibility of off-budget aid is not a optimal choice, but malicious intent. On the other hand, weak institutions could also exacerbate the issue of aid illusion when uninformed government officials misperceive the budget and available revenues. Nevertheless, in some cases where aid is found to be fungible, the fungibility result does not depend on institutional quality and this could indicate that malicious intent or aid illusion are

not the causes behind fungibility, for example for total on-budget aid flows. The fact that the fungibility of total on-budget aid is found to be independent of institutional quality is surprising as on-budget aid disbursements correspond to the flows received and handled by the recipient governments. Nevertheless, with alternative econometric specifications, the fungibility of on-budget aid is indeed found to depend on institutional quality.

Off-budget aid refers to activities that are financed by donors and are intended for development, such as the provision of know-how in the form of training activities or education programmes to augment the human capital of developing countries. Total off-budget aid is found to be fungible when institutions are weak and this suggests that the activities aimed for development, for example training activities aimed to raise human capital, are not utilised to raise spending.

Debt relief is also found to be insignificant for spending. Although we expect the resources targeted for debt repayments to be spent elsewhere and raise government spending, an insignificant effect might indicate that governments are behaving optimally and those resources are used somewhere else within the budget and not on spending. For the different components of spending, non-sector specific aid was also included and the results suggest that there are no spillover effects of aid between sectors, therefore, any fungible aid resources for education, health or infrastructure are spent outside of these sectors.

The same models of public spending were estimated with and without the interaction terms and the effects of aid were tested against the fungibility tests in both cases. The importance of considering institutional quality for fungibility is highlighted particularly for total public spending. The degree of fungibility based on the fungibility tests changes with institutional quality for off-budget aid and if the heterogeneous effect of institutional quality on off-budget aid is not considered, we would have inferred that off-budget aid is fully fungible, thus over-estimating the degree of fungibility in environments of high institutional quality.

These results have their limitations, particularly with regard to the data used. The available data for public expenditure lack information on the sub-components of sectoral expenditure and this could have been helpful with estimating the extent of aid fungibility. Furthermore, these results are largely based on the ICRG measure of institutional quality. As discussed previously, measures of institutional quality are highly subjective as they involve perceptions and the assessment of country experts, who can easily be affected by a number of factors. The conditional effect of aid as well as the fungibility tests, were estimated over the range of this institutional quality measure and this could be problematic for the values estimated at the extremes, although looking at the descriptive statistics

indicates that extreme values of the ICRG are not present in these samples. Furthermore, the measure capturing institutional quality is an average of three political components: bureaucratic quality, the extent of corruption and law and order and it is unclear which component drives these results. Another limitation of this study is the quality of data used. Data for developing countries suffer from the problem of a large number of missing values, especially in Africa (Devarajan, 2013), and this can prove to be a problem when GMM estimation is used, where using past levels and past differences as instruments reduces the number of available observations even further.

Furthermore, looking at the revenue side of the budget and how taxation changes with foreign aid could help in identifying the effect of aid on public finances as a whole and would make the picture of fungibility and institutional quality clearer. Since foreign aid is found to substitute domestic resources for spending, the domestic resources are either spent elsewhere, diverted into private accounts, or used to finance tax reductions or debt reductions. Tax revenue constitutes a large part of the government's revenue used to finance expenditure and repay any public debt. How foreign aid and institutional quality together affect tax collection efforts and the various types of tax revenues is important in developing countries, where institutions are weak and corruption is more prevalent. Bureaucratic corruption is likely to affect the collection of tax revenues by bribing tax collectors for tax exemptions (Gupta, 2007). Foreign aid and bureaucratic corruption could have contradicting effects on government revenues. Therefore, examining the two variables together and considering an interaction term between the two could prove to be helpful in understanding the extent of fungibility in terms of public finances at different levels of institutional quality. The following study (Chapter 3) investigates the extent of fungibility with regard to tax revenues. This is done to understand whether the absence of an effect of aid on spending is explained by the government behaving optimally and adjusting other components of the budget, such as tax revenues.

2.7 Figures and Tables

Table 2.5: Descriptive statistics, 1990 - 2013

Variable	Mean	Std. Dev.	Min	Max
Total: 979 observations (59 countries for 1990 - 2013, unbalanced)				
Total public spending	22.377	8.749	0.250	61.720
Total aid disbursements	4.744	10.774	0	184.863
Total on-budget aid	0.767	4.538	0	90.576
Total off-budget aid	0.367	0.731	0	10.735
Total investment aid	0.800	1.170	0	7.935
Total other non-flagged aid	2.810	9.089	0	175.739
Total NGO aid	0.220	0.928	0	12.595
Debt relief	0.484	2.725	-0.907	63.899
ICRG	0.447	0.125	0.097	0.898
Education: 772 observations (51 countries for 1990 - 2013, unbalanced)				
Total education spending	3.420	2.174	0	12.860
Education aid disbursements	0.252	0.445	0	3.828
Education on-budget aid	0.022	0.101	0	1.189
Education off-budget aid	0.077	0.141	0	1.303
Education investment aid	0.061	0.148	0	1.981
Education other non-flagged aid	0.092	0.219	0	2.428
Education NGO aid	0.015	0.087	0	1.211
Debt relief	0.417	2.839	-0.346	63.899
ICRG	0.462	0.109	0.097	0.805
Health: 1044 observations (70 countries for 1990 - 2013, unbalanced)				
Total health spending	2.688	1.429	0.113	11.247
Health aid disbursements	0.297	0.537	0	4.732
Health on-budget aid	0.022	0.083	0	1.214
Health off-budget aid	0.037	0.081	0	1.043
Health investment aid	0.068	0.132	0	1.356
Health other non-flagged aid	0.170	0.364	0	3.900
Health NGO aid	0.034	0.128	0	1.905
Debt relief	0.604	3.273	-0.907	63.899
ICRG	0.428	0.113	0.111	0.875
Infrastructure: 746 observations (51 countries for 1990 - 2013, unbalanced)				
Total infrastructure spending	1.218	1.034	0	7.690
Infrastructure aid disbursements	0.292	0.511	0	5.267
Infrastructure on-budget aid	0.009	0.053	0	0.779
Infrastructure off-budget aid	0.014	0.083	0	1.955
Infrastructure investment aid	0.202	0.391	0	4.993
Infrastructure other non-flagged aid	0.067	0.202	0	3.339
Infrastructure NGO aid	0	0.002	0	0.037
Debt relief	0.399	2.760	-0.346	63.899
ICRG	0.468	0.110	0.097	0.806

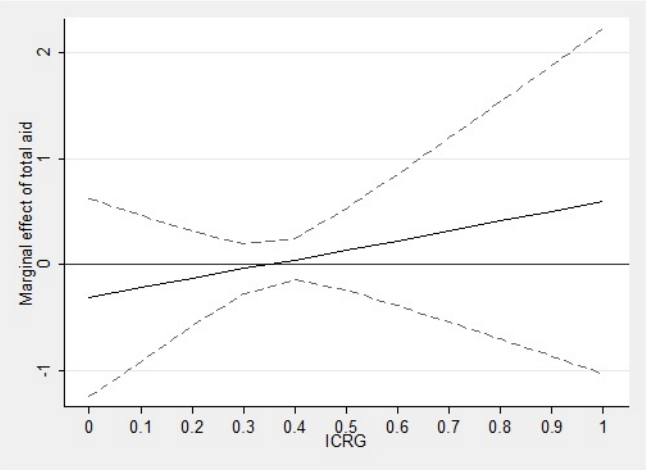
The variables are expressed in percentages of GDP, with the exception of the ICRG variable. The sample of each model changes due to data limitations, leaving an unbalanced panel dataset from 1990 - 2013.

Table 2.6: Total public expenditure model - Model T

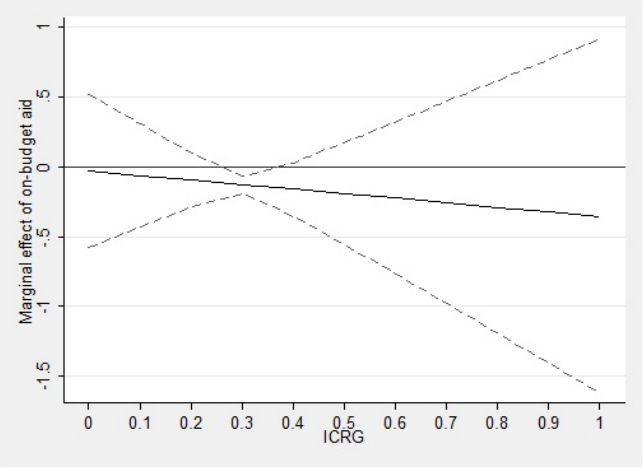
	Total aid disbursements				Total aid modalities			
	FE	FE	GMM	GMM	FE	FE	GMM	GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total public spending, lagged		0.635***	0.554***	0.608***		0.625***	0.517**	0.530***
		(0.097)	(0.170)	(0.140)		(0.102)	(0.220)	(0.096)
Total aid disbursements	-0.263*	0.071	-0.031	-0.311				
	(0.141)	(0.085)	(0.268)	(0.571)				
Total on-budget aid					-0.380	0.084	-0.117	-0.025
					(0.473)	(0.274)	(0.075)	(0.333)
Total off-budget aid					-2.521***	-0.180	-0.953*	-2.217***
					(0.767)	(0.530)	(0.538)	(0.790)
Total investment aid					0.802*	0.566**	-0.290	-0.352
					(0.407)	(0.216)	(0.475)	(0.284)
Other non-flagged aid					0.050	-0.005	0.059	0.047
					(0.048)	(0.037)	(0.158)	(0.069)
ICRG	0.666	-0.247	2.934	1.650	1.306	-0.597	3.993	2.613
	(5.152)	(2.435)	(4.665)	(4.969)	(5.267)	(2.569)	(3.551)	(3.418)
Interaction (ICRG*Total aid)	0.775*	-0.124		0.909				
	(0.399)	(0.250)		(1.543)				
Interaction (ICRG*On-budget aid)					0.986	-0.113		-0.327
					(1.570)	(0.870)		(1.102)
Interaction (ICRG*Off-budget aid)					3.991	-0.494		5.175
					(3.154)	(2.000)		(3.122)
Total NGO aid	-0.033	-0.008	-0.098	-0.084	-0.013	-0.004	-0.137***	-0.123***
	(0.090)	(0.045)	(0.063)	(0.078)	(0.090)	(0.043)	(0.044)	(0.044)
Debt relief	0.026	-0.021	0.036	0.074	-0.138	-0.041	0.022	0.050
	(0.173)	(0.087)	(0.622)	(0.361)	(0.139)	(0.099)	(0.244)	(0.116)
GDP per capita	-7.663*	-2.480	-1.909	-1.523	-8.090*	-2.880	-2.126	-1.792
	(4.013)	(1.928)	(1.748)	(1.336)	(4.080)	(1.956)	(1.513)	(1.250)

Urbanisation	-0.183	-0.104	0.015	0.011	-0.169	-0.079	-0.002	-0.001
	(0.242)	(0.099)	(0.041)	(0.036)	(0.252)	(0.105)	(0.033)	(0.029)
Openness	-0.006	0.003	0.036**	0.030*	-0.004	0.002	0.042*	0.041***
	(0.023)	(0.010)	(0.015)	(0.016)	(0.021)	(0.010)	(0.024)	(0.014)
Civil conflict	0.266	0.039	0.165	0.090	0.238	0.035	0.050	0.071
	(0.229)	(0.092)	(0.257)	(0.295)	(0.229)	(0.092)	(0.294)	(0.256)
HIV prevalence	-0.135	-0.051	0.158	0.129	-0.139	-0.053	0.182**	0.178***
	(0.138)	(0.055)	(0.101)	(0.104)	(0.144)	(0.057)	(0.088)	(0.059)
Population ages 0-14	-0.703**	-0.264**	0.000	-0.015	-0.742**	-0.306**	-0.023	-0.010
	(0.295)	(0.129)	(0.083)	(0.085)	(0.280)	(0.124)	(0.081)	(0.064)
Agriculture value added	-0.294***	-0.175***	-0.137**	-0.112	-0.276***	-0.176***	-0.128*	-0.118**
	(0.086)	(0.044)	(0.065)	(0.071)	(0.080)	(0.041)	(0.068)	(0.056)
AR(1) test			0.006	0.003			0.009	0.003
AR(2) test			0.990	0.825			0.997	0.956
Hansen test			0.576	0.348			0.592	0.917
Diff-in Hansen test			0.712	0.870			0.744	0.839
No. of instruments			37	40			46	52
No. of countries	59	59	59	59	59	59	59	59
N	979	979	979	979	979	979	979	979

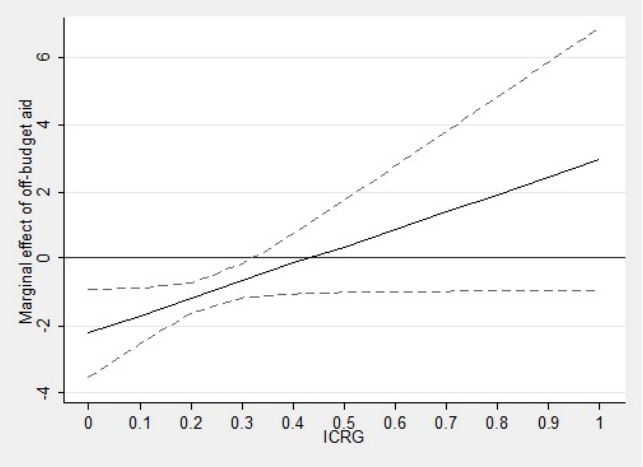
All specifications control for a full set of country and year fixed effects. The endogenous variables are instrumented by using the second up to third lags. p-values for the autocorrelation tests for the first and second lags are provided. p-values for the Hansen test of instrument validity and the difference-in Hansen test showing the validity of the additional lags used by System GMM are also provided. The fiscal variables, aid, debt relief, openness and agriculture-valued added are expressed as percentages of GDP. Urbanisation and HIV prevalence are expressed in as percentages of total. Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.



(a) Total aid disbursements



(b) Total on-budget aid disbursements



(c) Total off-budget aid disbursements

Figure 2.1: The conditional effects of total aid
The effects are calculated from Table 2.6. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

Table 2.7: Model T - Fungibility tests for on- and off-budget aid disbursements

ICRG	$H_0 : \delta_{SP} \geq 1$ (1)	$H_0 : \delta_{SP} \leq 0$ (2)	$H_0 : \delta_{TC} \geq 0$ (3)	$H_0 : \delta_{TC} \leq -1$ (4)
No interaction	0.000	0.124	0.082	0.930
0	0.001	0.530	0.003	0.938
0.1	0.000	0.601	0.000	0.918
0.2	0.000	0.780	0.000	0.253
0.3	0.000	1.000	0.024	0.154
0.4	0.000	0.910	0.395	0.061
0.5	0.000	0.800	0.670	0.052
0.6	0.000	0.747	0.781	0.050
0.7	0.002	0.717	0.833	0.049
0.8	0.010	0.698	0.862	0.049
0.9	0.023	0.685	0.881	0.048
1	0.040	0.675	0.893	0.048

p-values for the one-sided fungibility tests are shown over the range of the ICRG variable. Columns (1) and (3) correspond to the test of no fungibility for on- and off-budget aid, respectively. Columns (2) and (4) correspond to the test of full fungibility for on- and off-budget aid,respectively. These tests are based on the conditional effects of Table 2.6.

Appendix A:

A.1 Descriptive statistics

Appendix A.1 contains information on the variables used for the analysis.

Figure A.1.1 shows the normal distribution of the ICRG variable used.

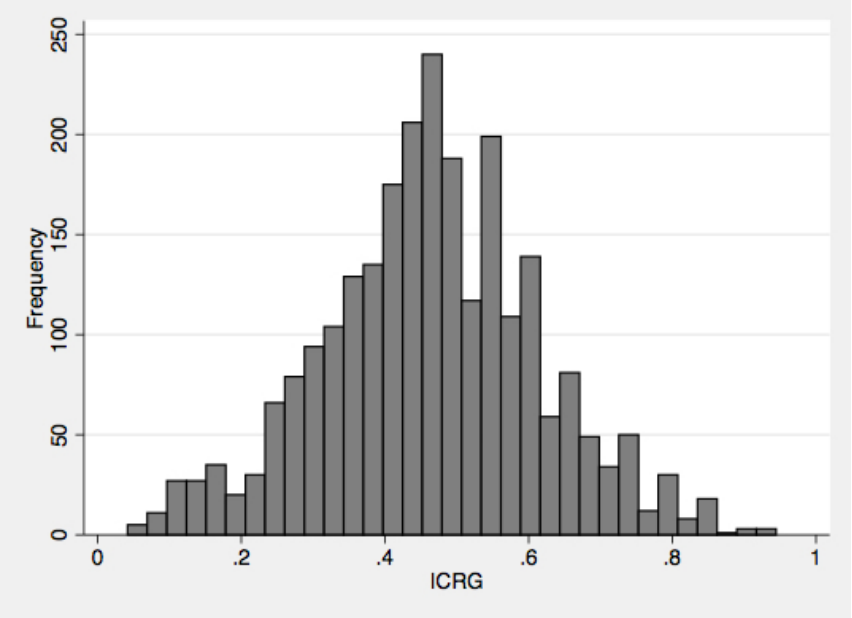


Figure A.1.1: ICRG distribution

Figure A.1.2 shows aggregate aid flows for total aid and for the different sectors over time in the common sample of 510 observations.

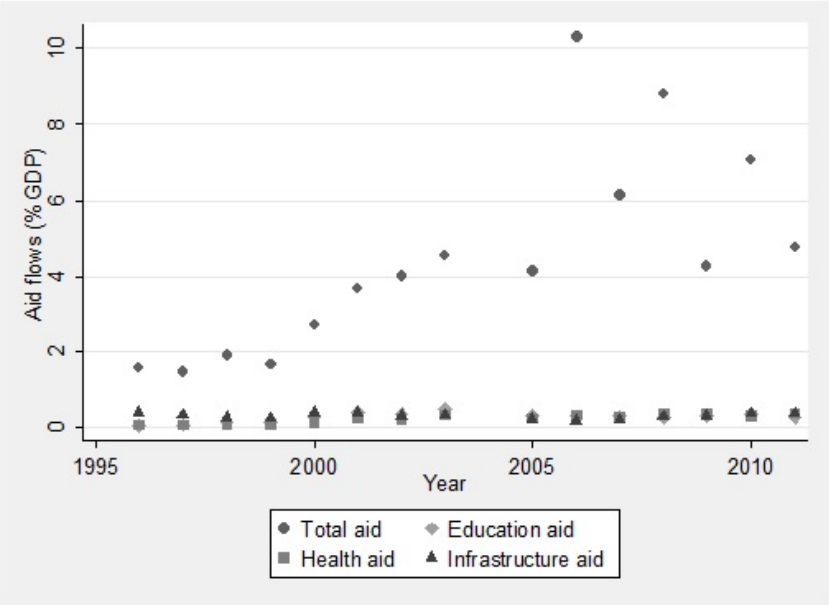


Figure A.1.2: Aggregate aid flows over time

Figure A.1.3 shows ICRG over time by country in the sample.

Figure A.1.3: ICRG over time by country

A.2 FE results

Appendix A.2 shows the conditional effects of model T with static FE and standard errors clustered at the country level. The results with FE support the original findings that the degree of fungibility of off-budget aid depends on institutional quality in the anticipated direction. Additionally, this econometric specification shows that the degree of fungibility of on-budget aid also depends on institutional quality in the anticipated direction. Furthermore, the one-sided fungibility tests in the specifications without the interaction terms (first row of Tables A.2.1 and A.2.2) show that fungibility would be over-estimated in environments of high institutional quality if the interaction term is not considered.

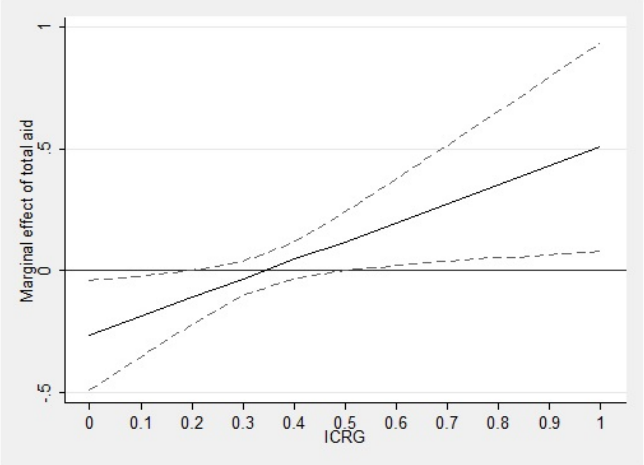
Table A.2.1 shows the p-values for the two one-sided fungibility tests. The results with FE suggest that on-budget aid is fully fungible when institutional quality is low to medium (values 0 - 0.6) and non-fungible when institutional quality is high (values 0.7 - one). Off-budget aid is found to be fully fungible when institutional quality is low (values 0 - 0.4) and non-fungible as institutional quality improves (values 0.5 - one).

Table A.2.1: Model T (Static FE) - Fungibility tests for on- and off-budget aid disbursements

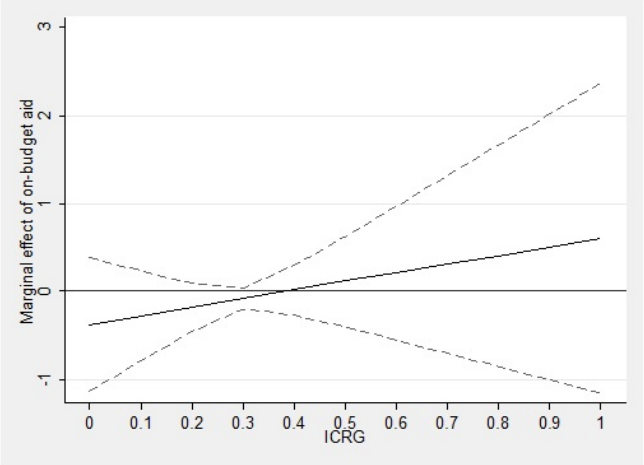
ICRG	$H_0 : \delta_{SP} \geq 1$ (1)	$H_0 : \delta_{SP} \leq 0$ (2)	$H_0 : \delta_{TC} \geq 0$ (3)	$H_0 : \delta_{TC} \leq -1$ (4)
No interaction	0.000	0.159	0.001	0.226
0	0.001	0.797	0.000	0.980
0.1	0.000	0.819	0.000	0.990
0.2	0.000	0.866	0.000	0.990
0.3	0.000	0.873	0.000	0.801
0.4	0.000	0.467	0.068	0.451
0.5	0.003	0.361	0.280	0.299
0.6	0.045	0.325	0.458	0.232
0.7	0.132	0.308	0.573	0.196
0.8	0.221	0.297	0.646	0.175
0.9	0.295	0.291	0.696	0.161
1	0.357	0.286	0.730	0.302

p-values for the one-sided fungibility tests are shown over the range of the ICRG variable. Columns (1) and (3) correspond to the test of no fungibility for on- and off-budget aid, respectively. Columns (2) and (4) correspond to the test of full fungibility for on- and off-budget aid,respectively. These tests are based on the conditional effects obtained using FE portrayed in Figure A.2.1.

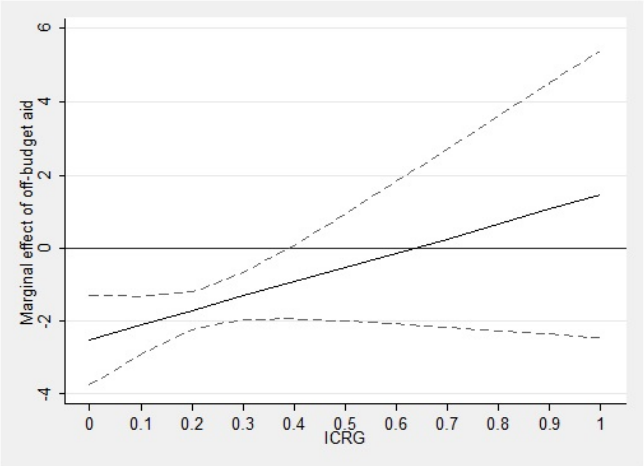
Figure A.2.1 shows the conditional effects of total aid flows on total general public spending.



(a) Total aid disbursements



(b) Total on-budget aid disbursements



(c) Total off-budget aid disbursements

Figure A.2.1: The conditional effects of total aid on government spending (Static FE) Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

Table A.2.2 shows the p-values for the two one-sided fungibility tests in the models with the alternative measure of government spending (government expenses) as a dependent variable.

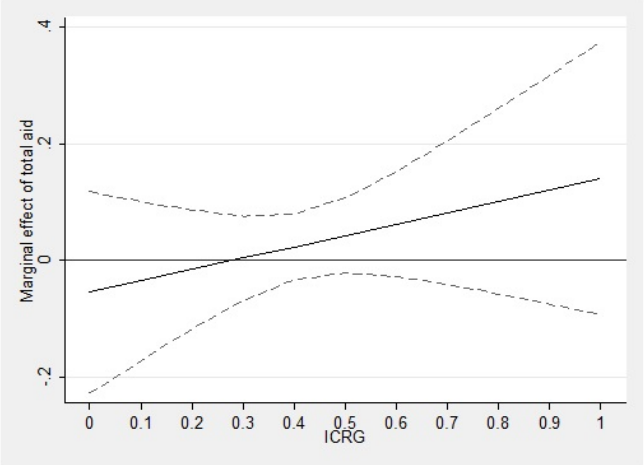
The results suggest that on-budget aid is fully fungible when institutional quality is low to medium (values 0 - 0.5) and non-fungible when institutional quality is high (values 0.6 - one). Off-budget aid is found to be fully fungible when institutional quality is low (values 0 - 0.3) and non-fungible as institutional quality improves (values 0.4 - one).

Table A.2.2: Model T (Static FE) - Fungibility tests for on- and off-budget aid disbursements with alternative dependent variable

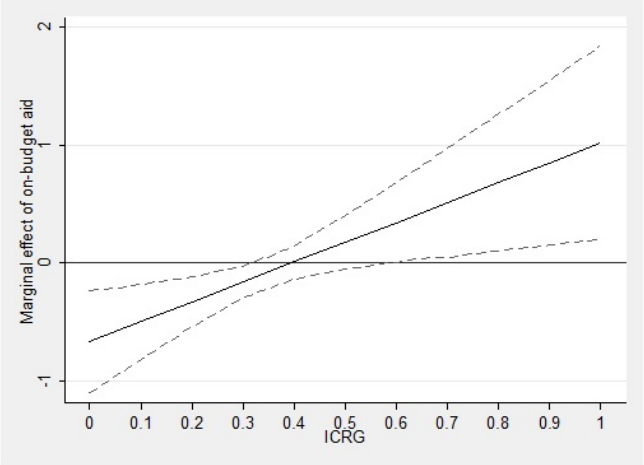
ICRG	$H_0 : \delta_{SP} \geq 1$ (1)	$H_0 : \delta_{SP} \leq 0$ (2)	$H_0 : \delta_{TC} \geq 0$ (3)	$H_0 : \delta_{TC} \leq -1$ (4)
No interaction	0.000	0.164	0.903	0.989
0	0.000	0.976	0.002	0.985
0.1	0.000	0.978	0.002	0.972
0.2	0.000	0.980	0.003	0.800
0.3	0.000	0.919	0.011	0.562
0.4	0.000	0.178	0.397	0.003
0.5	0.013	0.074	0.973	0.000
0.6	0.200	0.055	0.994	0.000
0.7	0.439	0.047	0.997	0.000
0.8	0.601	0.044	0.997	0.000
0.9	0.701	0.041	0.998	0.000
1	0.764	0.040	0.998	0.000

p-values for the one-sided fungibility tests are shown over the range of the ICRG variable. Columns (1) and (3) correspond to the test of no fungibility for on- and off-budget aid, respectively. Columns (2) and (4) correspond to the test of full fungibility for on- and off-budget aid,respectively. These tests are based on the conditional effects obtained using FE portrayed in Figure A.2.1.

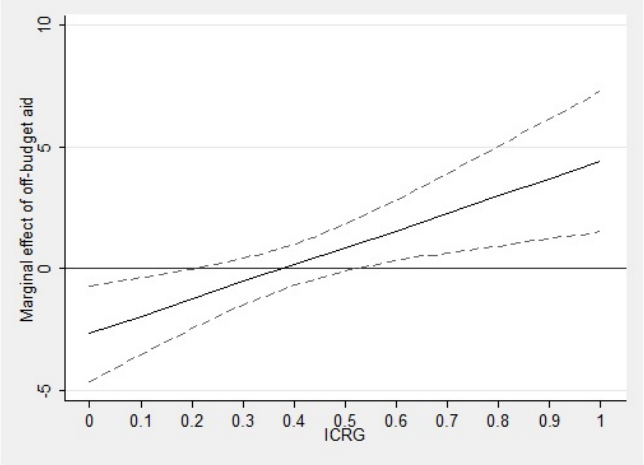
Figure A.2.2 shows the conditional effects of aid on the alternative dependent variable used (government expenses).



(a) Total aid disbursements



(b) Total on-budget aid disbursements



(c) Total off-budget aid disbursements

Figure A.2.2: The conditional effects of total aid on government expenses (Static FE)
Static models with FE are estimated with government expense as the dependent variable. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

A.3 Sectoral results

Appendix A.3 shows the detailed results on the models of sectoral expenditure: education, health and infrastructure.

Table A.3.1 shows the regression coefficients for the models of the different components of public spending: education, health and infrastructure, when considering the aggregate effect of aid disbursements. Aid corresponds to the sector-specific aid for each model, i.e. for education spending aid indicates education aid disbursements, for health spending aid indicates health aid disbursements and so on. The NGO variable indicates the sector-specific aid that is diverted to NGOs. Non-sector specific aid corresponds to aid given for other purposes apart from the sector in question, i.e. for the education model, non-sector specific aid corresponds to aid given for other purposes apart from education such as health, infrastructure and so on. Table A.3.2 shows the regression coefficients for the different models of public spending: education, health and infrastructure, when considering the different aid modalities, i.e. on-budget aid, off-budget aid, investsment aid and any other aid flows that do not fall into these categories. For the case of education the second and third lags are just used for instrumentation, while for the case of infrastructure more lags are used (second up to fifth). The lags for instrumentation are chosen based on the Hansen test for instrument validity (the requirement was that the test should not reject the null of validity) and this choice resulted in more lags than the number of countries. Different lag structures are also used with fewer instruments and the empirical results do not change. The coefficients of the LDV using GMM lie between the coefficient obtained using OLS and FE, as expected (not shown).

Total aid for the purposes of education is statistically insignificant (column (1) of Table A.3.1). These results suggest that there is some fungibility of aid for the purposes of education that is independent of institutional quality. On- and off-budget aid disbursements for the purposes of education have insignificant coefficients (column (1) of Table A.3.2). This is a cause for concern regarding on-budget aid since on-budget aid flows do not contribute in spending at all, whereas a positive one-to-one effect is expected. Off-budget aid, however, is not expected to affect spending based on its definition, thus an insignificant coefficient is not a cause for concern. The negative coefficient of investment aid is also an indication of fungibility for this aid modality since according to the literature a positive effect is expected (Van de Sijpe, 2012, Gomanee et al., 2005, Heller, 1975).

Total aid for the purposes of health is statistically insignificant in the models of public health spending (column (3) of Table A.3.1), showing some evidence of fungibility. On-budget aid is insignificant showing evidence for fungibility, whereas off-budget aid has

a positive coefficient without the interaction term (column (3) of Table A.3.2). More precisely, an increase in off-budget health aid of 1% of GDP is associated with an increase in public health spending of 1.17% of GDP, significant at 1%. This positive coefficient gives evidence against the fungibility of off-budget aid and also evidence of a flypaper effect since the coefficient of aid is higher than 1 and therefore, the associated increase in spending is higher than the aid increase (Bailey and Connolly, 1998).

For the model of public infrastructure spending it can be seen that aggregate aid as well as on- and off-budget aid flows are statistically insignificant (column (5) of Table A.3.1 and Table A.3.2), giving evidence of fungibility. These insignificant coefficients give evidence for fungibility for the case of on-budget aid. Nevertheless, the finding of fungibility is found to be independent of the level of the quality of institutions. Positive coefficients are expected for investment and other aid flows and insignificant ones could indicate fungibility (Van de Sijpe, 2012, Gomanee et al., 2005).

The ICRG variable is significant only in the model for education spending with aggregate aid disbursement (Table A.3.1), agreeing to some extent with the literature with regard to the 'allocation' effect of corruption: lower corruption (higher institutional quality) is associated with increases in spending in social sectors such as education (Delavallade, 2006, Mauro, 1998, Tanzi and Davoodi, 2000). The ICRG variable is statistically insignificant for the model of infrastructure spending, contradicting the findings of the corruption literature. The effect of corruption on total spending is likely to originate from the construction sector, which plays a significant role in this type of expenditure; however, this suggested idea is not supported by these findings (Sohail and Cavill, 2006).

Non-sector specific aid (any other aid flows apart from aid for the purposes of education does not affect public education spending, showing that there are no spillover effects of aid in the education sector. The same is found to be true for non-health aid and non-infrastructure aid. Debt relief is expected to increase spending as resources that were to be spent on repayments can now be diverted towards public spending, nevertheless, as with the case of total public spending, debt relief is not associated with public spending for the purposes of education, health or infrastructure. Aid given to NGOs is statistically insignificant for the models of spending.

Civil conflict is found to be significantly associated with reductions in public education spending, possibly due to the uncertainty such situations create and also due to the diversion of public finance towards military spending (Grigoli and Mills, 2014, Blattman and Miguel, 2010, Hendrix, 2010). As expected, HIV prevalence is found to be significantly positive for the model of health spending. This finding could possibly be driven by strate-

gies for prevention and monitoring of the virus (Lu et al., 2010, Mishra and Newhouse, 2009, Gupta et al., 2002, Schwartländer et al., 2001). Urbanisation has a significantly positive coefficient for the model of public health spending and this is to be expected since the delivery of public health services is easier to deliver in urban areas and urbanisation is likely to create economies of scale in health provision (Baqir, 1998, Kau and Rubin, 1981). Furthermore, trade has a positive and significant coefficient for infrastructure spending and the share of agriculture value-added has a significantly negative coefficient. These coefficients can be explained by the reasons explained earlier for the case of total public spending. The gains from trade could be re-distributed in the form of public spending and more precisely public infrastructure spending, thus raising the delivery of infrastructure services (Rodrik, 1998). Additionally, output from the agriculture sector is difficult to be taxed and this deprives tax revenue from being raised that could in turn be financing spending (Teera and Hudson, 2004, Slemrod, 2002, Ghura, 1998). The other variables that are included in the models are statistically insignificant.

Table A.3.3 shows the p-values for the two one-sided fungibility tests for on- and off-budget aid for the different dependent variables. The first row of the Table shows the p-values for the two fungibility tests on the coefficients of aid when the interaction terms are not included initially.

Figure A.3.1 shows the conditional effects of education aid disbursements at the range of the ICRG variable. Figure A.3.1(a) shows the effect of aggregate education aid disbursements, Figure A.3.1(b) the effect of on-budget aid for education and Figure A.3.1(c) the effect of off-budget aid for education. The conditional effect of education aid disbursements is statistically insignificant at all levels of institutional quality, giving evidence for fungibility of aid for education purposes. As institutional quality improves, the conditional effect rises. On-budget aid for the purposes of education is also found to be statistically insignificant at all values of the ICRG. Although the conditional effect of on-budget aid is statistically insignificant, as institutional quality increases, the conditional effect also increases, thus supporting the initial hypothesis of the study. The p-values for the two one-sided fungibility tests show that the hypothesis of no fungibility is rejected for the values 0 to 0.3 when institutional quality is low and not rejected as institutional quality improves (column (1)).[A.1] The hypothesis of full fungibility is rejected for the values 0.5 to 1 of the ICRG when institutional quality is higher (column (2)).[A.2] These tests suggest that full fungibility of on-budget aid for the purposes of education exists between 0 and

[A.1] Some examples of countries that take values for the ICRG between 0 and 0.3 are Bangladesh, Nigeria and Liberia. Out of the 51 countries that are included in the sample for public education spending, 11 countries take values between 0 and 0.3 for the ICRG variable.

[A.2] 32 out of the 51 countries of the education sample take values between 0.3 and 1 and some examples are Botswana, Sri Lanka, Thailand and Uganda.

0.3, whereas no fungibility exists between 0.5 and one. Although the conditional effects are insignificant, the fungibility tests show that the degree of fungibility depends on institutional quality in the anticipated direction: lower institutional quality makes on-budget aid for the purposes of education fungible. The conditional effect of off-budget aid for the purposes of education is statistically insignificant for all values of the ICRG and based on the p-values for the two fungibility tests both hypotheses are not rejected, suggesting that off-budget aid for education is non-fungible.

Figure A.3.2 shows the conditional effects of health aid disbursements at the range of the ICRG variable. Figure A.3.2(a) shows the effect of aggregate health aid disbursements, Figure A.3.2(b) the effect of on-budget aid for health and Figure A.3.2(c) the effect of off-budget aid for health. There is evidence of fungibility for aid flows for the purposes of health due to the insignificant marginal effect of health aid. As institutions get stronger, the conditional effect of aggregate aid for the purposes of health increases, although it remains statistically insignificant. On-budget aid for the purposes of health is insignificant at all values of the ICRG. According to the p-values for the two one-sided fungibility tests the hypothesis of no fungibility is rejected for the values between 0.2 - 0.5 and not rejected elsewhere (column (3)).[A.3] The hypothesis of full fungibility is not rejected at any value (column (4)). This indicates that on-budget aid for health is fully fungibility for the values between 0.2 and 0.5 and supports the hypothesis of this study that institutional quality matters for the fungibility of on-budget health aid, since at higher values of the ICRG (values of 0.6 onwards), the hypothesis of no fungibility is not rejected (column (3)).[A.4] Off-budget aid for the purposes of health is found to be insignificant when institutions are weak (ICRG values of 0 - 0.2) and as the quality of institutions improves the conditional effect becomes significantly positive.[A.5] The hypothesis of no fungibility is not rejected at any value of the ICRG and improvements in institutional quality make the effect of off-budget aid for health on public health spending significantly positive, showing that the effect of off-budget aid for health depends on institutional quality.

Figure A.3.3 shows the conditional effects of infrastructure aid disbursements at the range of the ICRG variable. Figure A.3.2(a) shows the effect of aggregate infrastructure aid disbursements, Figure A.3.3(b) the effect of on-budget aid for infrastructure and Figure A.3.3(c) the effect of off-budget aid for infrastructure. For infrastructure, the conditional effect is generally insignificant, although for some values (0.2 - 0.3) it takes sig-

[A.3] The countries that take values between 0.3 and 0.5 for the ICRG are the Democratic Republic of Congo and Niger.

[A.4] The ICRG takes values 0.6 onwards in countries such as Morocco, India, Malaysia and others.

[A.5] Out of the 70 countries in the sample, 15 countries take values between 0 and 0.2 for the ICRG and some examples are Cote d'Ivoire, Mali, Niger and the Democratic Republic of Congo.

nificantly positive values (between 0.16 and 0.12).[A.6] On-budget aid for the purposes of infrastructure is statistically insignificant at all values of the ICRG. The hypothesis of no fungibility is not rejected (column (5)). Off-budget aid for the purposes of infrastructure is found to be statistically insignificant at all values of the ICRG and based on the p-values the hypothesis of no fungibility is not rejected at any value of the ICRG.

Table A.3.1: Government spending models - Models E, H, I - Total aid disbursements

	Education		Health		Infrastructure	
	GMM	GMM	GMM	GMM	GMM	GMM
	(1)	(2)	(3)	(4)	(5)	(6)
Public spending, lagged	0.829***	0.784***	0.834***	0.837***	0.741***	0.719***
	(0.159)	(0.195)	(0.078)	(0.074)	(0.120)	(0.106)
Aid	-0.496	-0.632	0.046	-0.050	0.027	0.195
	(0.351)	(1.692)	(0.157)	(0.200)	(0.157)	(0.168)
ICRG	1.331*	1.286	0.245	0.145	0.259	0.350
	(0.738)	(0.795)	(0.215)	(0.255)	(0.362)	(0.316)
Interaction (ICRG*Aid)		0.694		0.383		-0.276
		(3.538)		(0.482)		(0.516)
Non-sector specific aid	0.009	0.009	0.005	0.004	-0.000	-0.001
	(0.008)	(0.010)	(0.006)	(0.004)	(0.005)	(0.004)
NGO aid	-0.006	-0.006	0.003	0.003	0.011	0.011*
	(0.008)	(0.007)	(0.002)	(0.002)	(0.007)	(0.006)
Debt relief	-0.013	-0.017	-0.002	0.001	-0.003	-0.006
	(0.023)	(0.020)	(0.010)	(0.008)	(0.013)	(0.009)
GDP per capita	-0.140	-0.039	-0.059	-0.055	-0.008	-0.010
	(0.169)	(0.256)	(0.057)	(0.052)	(0.140)	(0.107)
Urbanisation	0.007	0.007	0.004*	0.004*	-0.005	-0.004
	(0.004)	(0.005)	(0.002)	(0.002)	(0.004)	(0.003)
Openness	0.002	0.002	0.001	0.001	0.002	0.002**
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Civil conflict	-0.051**	-0.053**	-0.014	-0.011	-0.010	-0.009
	(0.024)	(0.026)	(0.012)	(0.012)	(0.018)	(0.015)
HIV prevalence	0.014	0.017	0.008	0.007*	0.005	0.006
	(0.015)	(0.019)	(0.005)	(0.004)	(0.006)	(0.005)
Population ages 0-14	0.008	0.010	-0.008*	-0.008*	0.000	0.002
	(0.011)	(0.014)	(0.005)	(0.005)	(0.009)	(0.007)
Agriculture value added	-0.002	-0.001	-0.001	-0.002	-0.007	-0.007*
	(0.005)	(0.005)	(0.002)	(0.002)	(0.005)	(0.004)
AR(1) test	0.001	0.004	0.000	0.000	0.002	0.003
AR(2) test	0.687	0.752	0.189	0.201	0.722	0.699
Hansen test	0.022	0.066	0.009	0.218	0.028	0.123
Diff-in Hansen test	0.027	0.104	0.674	0.474	0.066	0.133
No. of instruments	39	42	38	43	42	47
No. of countries	51	51	70	70	51	51
N	772	772	1044	1044	746	746

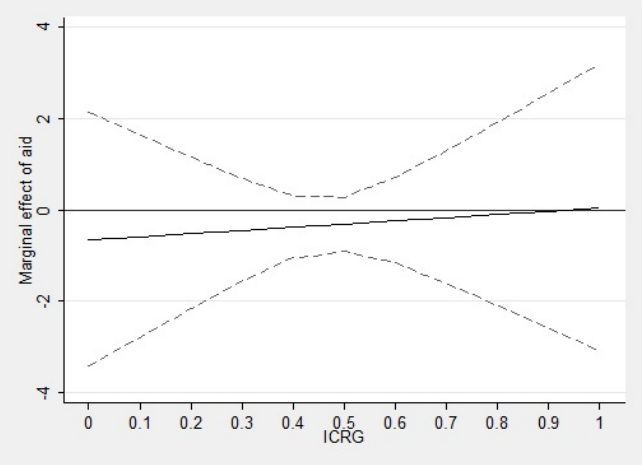
All specifications control for a full set of country and year fixed effects. The endogenous variables are instrumented by using the second up to third lags. p-values for the autocorrelation tests for the first and second lags are provided. p-values for the Hansen test of instrument validity and the difference-in Hansen test showing the validity of the additional lags used by System GMM are also provided. The fiscal variables, aid, debt relief, openness and agriculture-valued added are expressed as percentages of GDP. Urbanisation and HIV prevalence are expressed in as percentages of total. Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01.

[A.6] Countries that take these values for the ICRG are Bangladesh and Liberia.

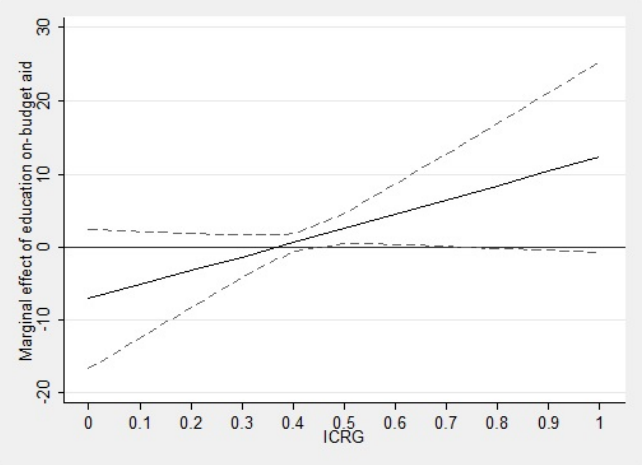
Table A.3.2: Government spending models - Models E, H, I - Aid modalities

	Education		Health		Infrastructure	
	GMM	GMM	GMM	GMM	GMM	GMM
	(1)	(2)	(3)	(4)	(5)	(6)
Public spending, lagged	0.769***	0.865***	0.832***	0.826***	0.749***	0.787***
	(0.242)	(0.232)	(0.084)	(0.089)	(0.156)	(0.147)
On-budget aid	1.745	-7.088	0.471	-0.056	0.821	2.329
	(1.104)	(5.816)	(0.530)	(1.292)	(0.903)	(1.896)
Off-budget aid	-0.261	1.023	1.174***	-3.169	1.184	-4.310
	(0.593)	(4.525)	(0.421)	(2.856)	(0.906)	(6.213)
Investment aid	-0.641	-0.906*	-0.419	-0.484	0.048	0.022
	(0.661)	(0.541)	(0.397)	(0.403)	(0.094)	(0.103)
Other non-flagged aid	0.478	0.419	0.057	0.132	0.065	-0.275
	(0.634)	(0.514)	(0.250)	(0.154)	(0.284)	(0.478)
ICRG	1.297	1.037	0.265	0.097	0.201	0.313
	(1.145)	(1.399)	(0.301)	(0.440)	(0.313)	(0.316)
Interaction (ICRG*On-budget aid)		19.416		0.203		-7.010
		(13.644)		(3.482)		(7.539)
Interaction (ICRG*Off-budget aid)		-4.026		12.628		14.052
		(10.631)		(8.244)		(16.804)
Non-sector specific aid	0.002	0.003	0.003	0.001	-0.001	-0.001
	(0.005)	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)
NGO aid	-0.005	-0.004	0.003	0.002	0.008	0.008
	(0.012)	(0.013)	(0.002)	(0.002)	(0.009)	(0.008)
Debt relief	-0.017	-0.016	0.006	0.013	-0.034	0.018
	(0.027)	(0.025)	(0.009)	(0.010)	(0.028)	(0.067)
GDP per capita	0.135	-0.049	-0.044	-0.101	-0.022	-0.059
	(0.288)	(0.242)	(0.062)	(0.112)	(0.105)	(0.100)
Urbanisation	0.006	0.006	0.005*	0.006*	-0.004	-0.004
	(0.007)	(0.007)	(0.003)	(0.003)	(0.004)	(0.004)
Openness	0.001	0.001	0.001	0.001	0.001	0.002
	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Civil conflict	-0.050	-0.046	-0.006	-0.007	-0.015	-0.017
	(0.033)	(0.032)	(0.017)	(0.020)	(0.017)	(0.018)
HIV prevalence	0.018	0.008	0.008	0.008	0.007	0.004
	(0.032)	(0.026)	(0.005)	(0.006)	(0.007)	(0.007)
Population ages 0-14	0.008	0.000	-0.010*	-0.011	0.001	-0.001
	(0.020)	(0.018)	(0.006)	(0.008)	(0.008)	(0.008)
Agriculture value added	0.000	-0.003	-0.000	-0.002	-0.007*	-0.006
	(0.007)	(0.005)	(0.003)	(0.004)	(0.004)	(0.005)
AR(1) test	0.004	0.004	0.000	0.000	0.005	0.002
AR(2) test	0.714	0.738	0.246	0.181	0.788	0.777
Hansen test	0.091	0.321	0.159	0.224	0.459	0.920
Diff-in Hansen test	0.054	0.133	0.383	0.699	0.678	0.776
No. of instruments	48	54	53	63	57	67
No. of countries	51	51	70	70	51	51
N	772	772	1044	1044	746	746

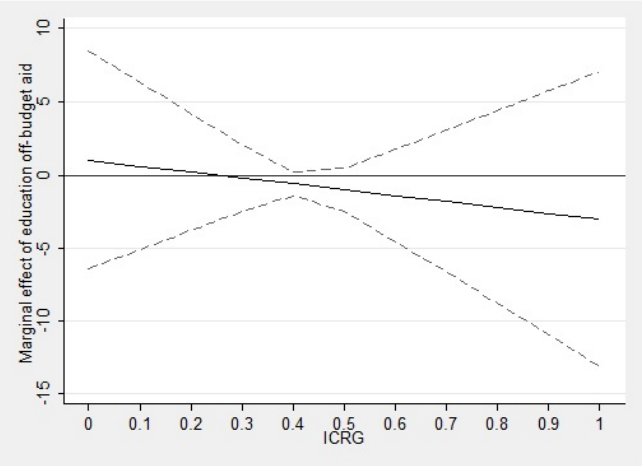
All specifications control for a full set of country and year fixed effects. The endogenous variables are instrumented by using the second up to third lags. p-values for the autocorrelation tests for the first and second lags are provided. p-values for the Hansen test of instrument validity and the difference-in Hansen test showing the validity of the additional lags used by System GMM are also provided. The fiscal variables, aid, debt relief, openness and agriculture-valued added are expressed as percentages of GDP. Urbanisation and HIV prevalence are expressed in as percentages of total. Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.



(a) Education aid disbursements

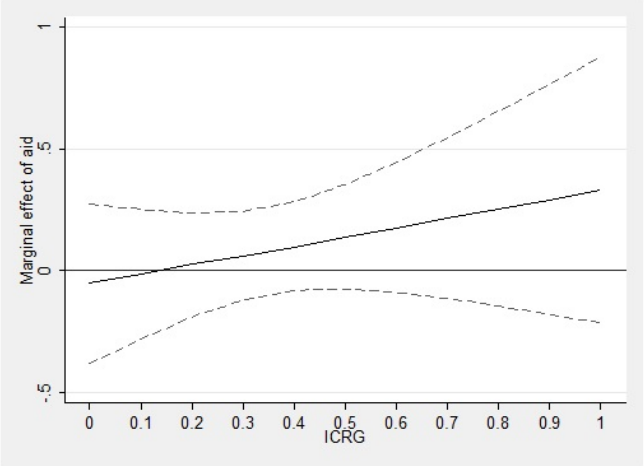


(b) Education on-budget aid disbursements

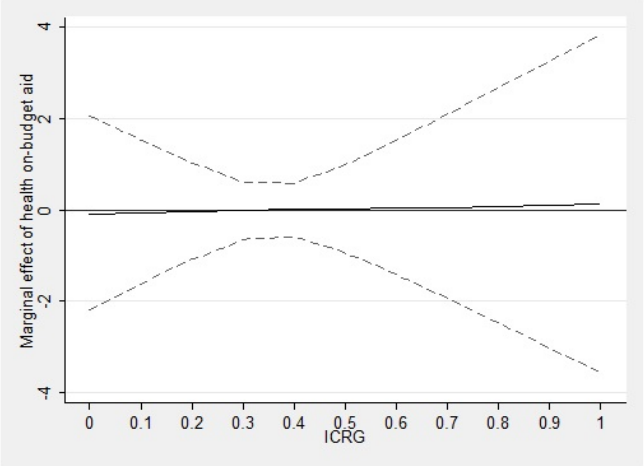


(c) Education off-budget aid disbursements

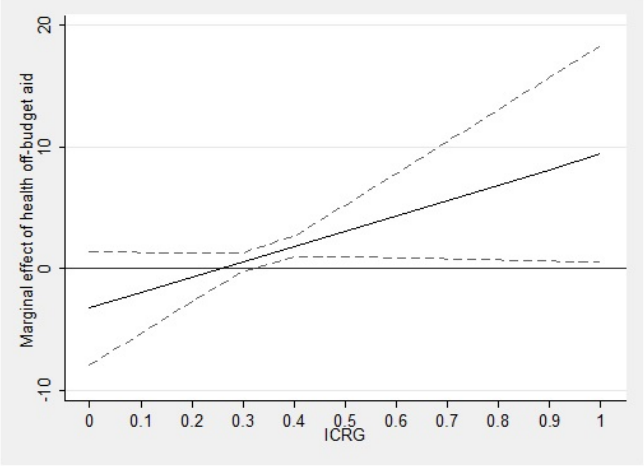
Figure A.3.1: The conditional effects of education aid
The effects are calculated from Table A.3.1 and Table A.3.2. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.



(a) Health aid disbursements

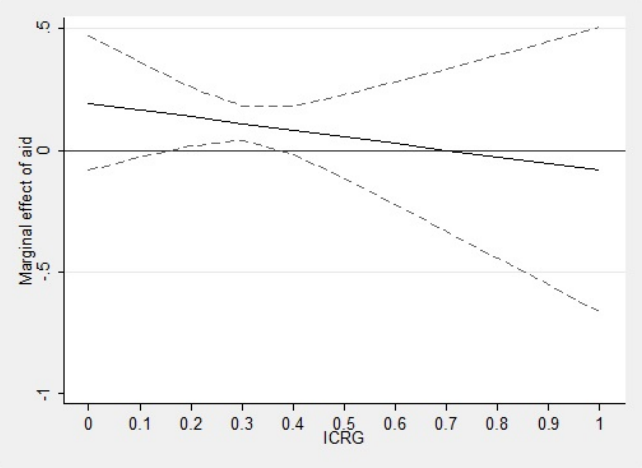


(b) Health on-budget aid disbursements

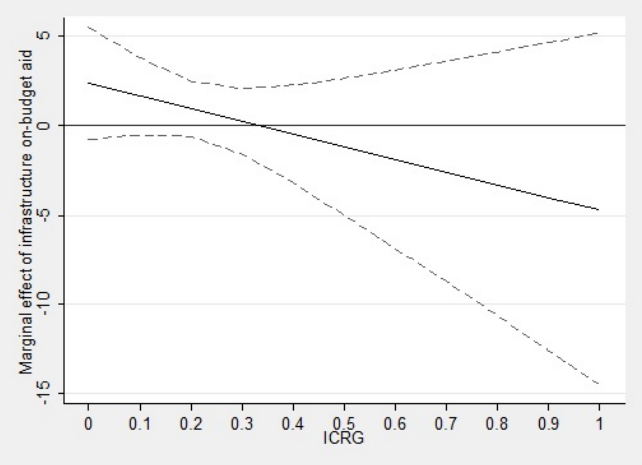


(c) Health off-budget aid disbursements

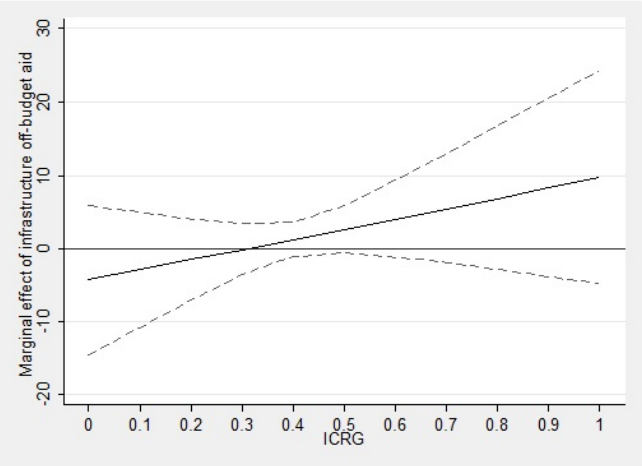
Figure A.3.2: The conditional effects of health aid
The effects are calculated from Table A.3.1 and Table A.3.2. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.



(a) Infrastructure aid disbursements



(b) Infrastructure on-budget aid disbursements



(c) Infrastructure off-budget aid disbursements

Figure A.3.3: The conditional effects of infrastructure aid
The effects are calculated from Table A.3.1 and Table A.3.2. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

Table A.3.3: Models E, H, I - Fungibility tests for on- and off-budget aid disbursements

	Model E		Model H		Model I	
ICRG	$H_0 : \delta_{SP} \geq 1$	$H_0 : \delta_{SP} \leq 0$	$H_0 : \delta_{SP} \geq 1$	$H_0 : \delta_{SP} \leq 0$	$H_0 : \delta_{SP} \geq 1$	$H_0 : \delta_{SP} \leq 0$
Table A.3.2	0.503	0.120	0.322	0.377	0.844	0.369
0	0.081	0.889	0.207	0.517	0.758	0.110
0.1	0.084	0.876	0.140	0.515	0.686	0.104
0.2	0.089	0.848	0.057	0.510	0.469	0.162
0.3	0.106	0.757	0.005	0.495	0.243	0.419
0.4	0.332	0.179	0.003	0.472	0.186	0.613
0.5	0.904	0.017	0.052	0.469	0.174	0.694
0.6	0.923	0.034	0.149	0.471	0.171	0.733
0.7	0.925	0.045	0.229	0.472	0.170	0.754
0.8	0.925	0.052	0.284	0.473	0.170	0.768
0.9	0.925	0.056	0.324	0.474	0.170	0.777
1	0.924	0.059	0.353	0.474	0.171	0.783
ICRG	$H_0 : \delta_{TC} \geq 0$ (1)	$H_0 : \delta_{TC} \leq -1$ (2)	$H_0 : \delta_{TC} \geq 0$ (3)	$H_0 : \delta_{TC} \leq -1$ (4)	$H_0 : \delta_{TC} \geq 0$ (5)	$H_0 : \delta_{TC} \leq -1$ (6)
Table A.3.2	0.661	0.219	0.007	0.000	0.198	0.020
0	0.589	0.327	0.134	0.776	0.244	0.702
0.1	0.571	0.320	0.175	0.672	0.272	0.654
0.2	0.536	0.693	0.301	0.614	0.330	0.442
0.3	0.447	0.277	0.899	0.000	0.483	0.337
0.4	0.112	0.196	1.000	0.000	0.819	0.054
0.5	0.138	0.495	0.991	0.001	0.916	0.030
0.6	0.234	0.581	0.981	0.006	0.902	0.054
0.7	0.272	0.606	0.973	0.012	0.887	0.076
0.8	0.292	0.617	0.967	0.018	0.877	0.092
0.9	0.304	0.624	0.963	0.023	0.869	0.105
1	0.312	0.628	0.960	0.027	0.863	0.114

p-values for the one-sided fungibility tests are shown over the range of the ICRG variable. Columns (1) and (3) correspond to the test of no fungibility for on- and off-budget aid, respectively. Columns (2) and (4) correspond to the test of full fungibility for on- and off-budget aid,respectively. These tests are based on the results of Table A.3.2.

A.4 Common sample results

Appendix A.4 shows the conditional effects of models T, E, H over a common sample of observations for all models. This common sample consists of 510 observations, therefore, the models are estimated using static FE, where the standard errors are clustered at the country level.

Table A.3.4 shows the regression coefficients for the models of public expenditure with the aggregate measure of aid disbursements (columns (1) and (2)) and with the different aid modalities (columns (3) and (4)). Included but not shown are the control variables mentioned earlier, namely NGO aid, debt relief, GDP per capita, urbanisation, trade openness, civil conflict, HIV prevalence, population ages 0-14 and agriculture value-added. Table A.3.5 shows the p-values for the two one-sided fungibility tests for on- and off-budget aid. The first row shows the p-values for the two fungibility tests on the coefficients of aid when the interaction terms are not included initially (columns (1) and (3)). Figure A.3.4 shows the conditional effects of total aid flows on total general public spending.

Table A.3.4: Total public expenditure model (common sample)- Model T

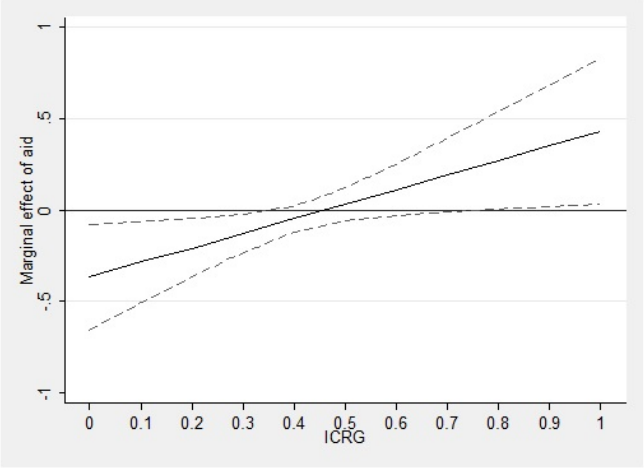
	(1)	(2)	(3)	(4)
Aid	-0.033	-0.362**		
	(0.030)	(0.176)		
On-budget aid			-0.134**	-0.397
			(0.058)	(0.438)
Off-budget aid aid			-1.687***	-3.066**
			(0.561)	(1.242)
Investment aid			0.939**	0.840**
			(0.353)	(0.417)
Other non-flagged aid			-0.025	-0.026
			(0.042)	(0.045)
ICRG	18.762	16.849	17.869	16.703
	(11.347)	(11.569)	(11.409)	(12.145)
Interaction (ICRG*Aid)		0.798*		
		(0.408)		
Interaction (ICRG*On-budget aid)				0.793
				(1.494)
Interaction (ICRG*Off-budget aid)				4.008
				(4.665)
R2	0.314	0.321	0.346	0.349
No. of countries	47	47	47	47
N	510	510	510	510

All specifications control for a full set of country and year fixed effect and variables capturing NGO aid, debt relief, GDP per capita, urbanisation, trade openness, civil conflict, HIV prevalence, population ages 0-14 and agriculture value-added. The fiscal variables, aid, debt relief, openness and agriculture-valued added are expressed as percentages of GDP. Urbanisation and HIV prevalence are expressed in as percentages of total. Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01.

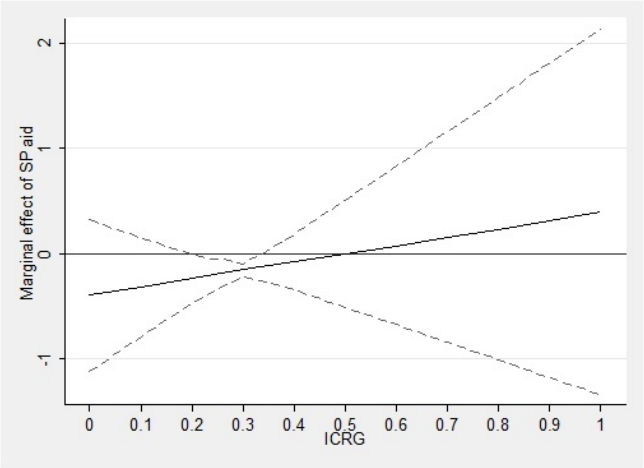
Table A.3.5: Model T (common sample) - Fungibility tests for on- and off-budget aid disbursements

ICRG	$H_0 : \delta_{SP} \geq 1$	$H_0 : \delta_{SP} \leq 0$	$H_0 : \delta_{TC} \geq 0$	$H_0 : \delta_{TC} \leq -1$
	(1)	(2)	(3)	(4)
No interaction	0.000	0.024	0.004	0.227
0	0.001	0.818	0.007	0.952
0.1	0.000	0.864	0.000	0.981
0.2	0.000	0.953	0.000	0.998
0.3	0.000	1.000	0.000	0.986
0.4	0.000	0.686	0.026	0.731
0.5	0.001	0.500	0.185	0.521
0.6	0.023	0.432	0.343	0.418
0.7	0.084	0.398	0.451	0.362
0.8	0.158	0.377	0.522	0.328
0.9	0.226	0.364	0.571	0.305
1	0.284	0.354	0.606	0.289

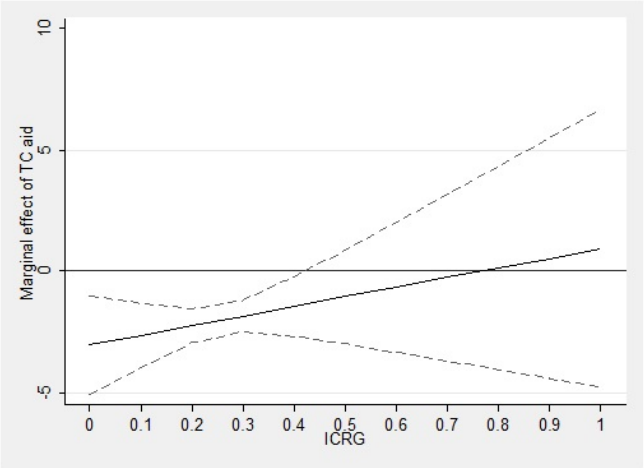
p-values for the one-sided fungibility tests are shown over the range of the ICRG variable. Columns (1) and (3) correspond to the test of no fungibility for on- and off-budget aid, respectively. Columns (2) and (4) correspond to the test of full fungibility for on- and off-budget aid,respectively. These tests are based on the conditional effects obtained using FE portrayed in Figure A.3.4.



(a) Total aid disbursements



(b) Total on-budget aid disbursements



(c) Total off-budget aid disbursements

Figure A.3.4: The conditional effects of total aid on government spending (common sample)

Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

The results of Model T on this common sample of observations agree with the FE results over the original larger sample of observations, as well as with the results obtained using system GMM. Firstly, the coefficients of the aid variables without the interaction term give evidence for fungibility, as total aid is insignificant and on- and off-budget aid are significantly negative. The conditional effects suggests that the degree of fungibility depends on institutional quality. The conditional effect of total aid is significantly negative when institutions are weak and increases as institutions improve. Furthermore, on-budget aid is found to be insignificant at all values of the ICRG, with the exception of when the ICRG takes the value of 0.3, and off-budget aid is found to have a significantly negative coefficient only when institutions are weak. The fungibility tests strengthen the findings inferred by examining the conditional effects. On-budget aid is found to be fully fungible when institutions are weak (ICRG values 0 - 0.7) and non-fungible when institutions are strong (ICRG values 0.8 - 1). Off-budget aid is found to be fully fungible when institutions are weak (ICRG values 0 - 0.4) and non-fungible when institutions are strong (ICRG values 0.5 - 1). Including an interaction term proves to be important for both on- and off-budget aid as without the interaction term the conclusion based on the fungibility tests would be that on-budget aid is partially fungible and off-budget aid is fully fungible.

Table A.3.6 shows the regression coefficients for the models of public education expenditure with the aggregate measure of aid disbursements (columns (1) and (2)) and with the different aid modalities (columns (3) and (4)). Included but not shown are the control variables mentioned earlier, namely NGO aid, debt relief, GDP per capita, urbanisation, trade openness, civil conflict, HIV prevalence, population ages 0-14 and agriculture value-added. Table A.3.7 shows the p-values for the two one-sided fungibility tests for on- and off-budget aid. The first row shows the p-values for the two fungibility tests on the coefficients of aid when the interaction terms are not included initially (columns (1) and (3)). Figure A.3.5 shows the conditional effects of education aid flows on total public education spending.

The results of Model E on this common sample of observations agree to some extent with the results obtained over the original larger sample of observations using system GMM. The conditional effects of all three aid measures remain insignificant. Nonetheless, the fungibility tests suggest that on-budget aid is non-fungible at all values of the ICRG[A.7] and off-budget aid is partially fungible at lower values of the ICRG (0 - 0.4) and non-fungible at higher values of the ICRG (0.5 - 1)[A.8]. These results albeit being different than what was obtained using system GMM, agree with the general direction of the results of

[A.7]The results using GMM suggested that on-budget aid is fully fungible at low values of the ICRG and non-fungible at higher values of the ICRG.

[A.8]The results using GMM suggested that off-budget aid is non-fungible at all values of the ICRG.

total public spending. The importance of the interaction term is highlighted for the case of off-budget aid for education since the fungibility tests suggest that aid is non-fungible (first row of Table A.3.7).

Table A.3.6: Public education expenditure model (common sample)- Model E

	(1)	(2)	(3)	(4)
Aid	0.106	-0.774		
	(0.191)	(1.343)		
On-budget aid			0.880***	8.640
			(0.318)	(8.825)
Off-budget aid			-0.640	-6.656
			(0.645)	(4.157)
Investment aid			0.278	0.109
			(0.231)	(0.258)
Other non-flagged aid			0.014	-0.177
			(0.363)	(0.394)
ICRG	0.257	-0.118	0.065	-0.399
	(1.872)	(1.875)	(1.825)	(1.835)
Interaction (ICRG*Aid)		1.883		
		(2.702)		
Interaction (ICRG*On-budget aid)				-16.093
				(17.664)
Interaction (ICRG*Off-budget aid)				13.866
				(8.734)
R2	0.173	0.177	0.182	0.203
No. of countries	47	47	47	47
N	510	510	510	510

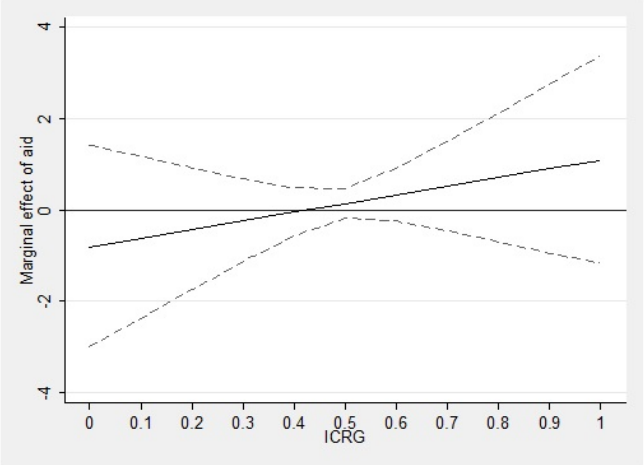
All specifications control for a full set of country and year fixed effect and variables capturing NGO aid, debt relief, GDP per capita, urbanisation, trade openness, civil conflict, HIV prevalence, population ages 0-14 and agriculture value-added. The fiscal variables, aid, debt relief, openness and agriculture-valued added are expressed as percentages of GDP. Urbanisation and HIV prevalence are expressed in as percentages of total. Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3.7: Model E (common sample) - Fungibility tests for on- and off-budget aid disbursements

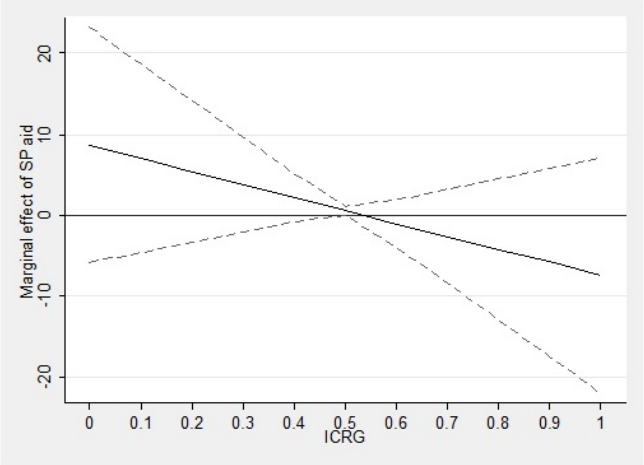
ICRG	$H_0 : \delta_{SP} \geq 1$ (1)	$H_0 : \delta_{SP} \leq 0$ (2)	$H_0 : \delta_{TC} \geq 0$ (3)	$H_0 : \delta_{TC} \leq -1$ (4)
No interaction	0.708	0.008	0.326	0.594
0	0.807	0.164	0.055	0.913
0.1	0.803	0.160	0.055	0.903
0.2	0.798	0.153	0.055	0.118
0.3	0.787	0.140	0.057	0.828
0.4	0.750	0.109	0.079	0.555
0.5	0.129	0.044	0.704	0.007
0.6	0.133	0.712	0.917	0.013
0.7	0.155	0.769	0.933	0.023
0.8	0.163	0.787	0.937	0.030
0.9	0.167	0.795	0.939	0.035
1	0.170	0.800	0.940	0.038

p-values for the one-sided fungibility tests are shown over the range of the ICRG variable. Columns (1) and (3) correspond to the test of no fungibility for on- and off-budget aid, respectively. Columns (2) and (4) correspond to the test of full fungibility for on- and off-budget aid,respectively. These tests are based on the conditional effects obtained using FE portrayed in Figure A.3.5.

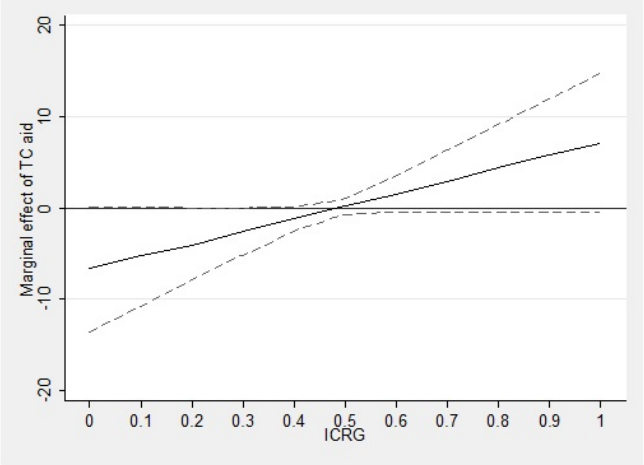
Table A.3.8 shows the regression coefficients for the models of public health expenditure with the aggregate measure of aid disbursements (columns (1) and (2)) and with the different aid modalities (columns (3) and (4)). Included but not shown are the control variables mentioned earlier, namely NGO aid, debt relief, GDP per capita, urbanisation, trade openness, civil conflict, HIV prevalence, population ages 0-14 and agriculture value-added. Table A.3.9 shows the p-values for the two one-sided fungibility tests for on- and off-budget aid. The first row shows the p-values for the two fungibility tests on the coefficients of aid when the interaction terms are not included initially (columns (1) and (3)). Figure A.3.6 shows the conditional effects of health aid flows on total public education spending.



(a) Total aid disbursements



(b) Total on-budget aid disbursements



(c) Total off-budget aid disbursements

Figure A.3.5: The conditional effects of education aid on government spending (common sample)

Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

Table A.3.8: Public health expenditure model (common sample)- Model H

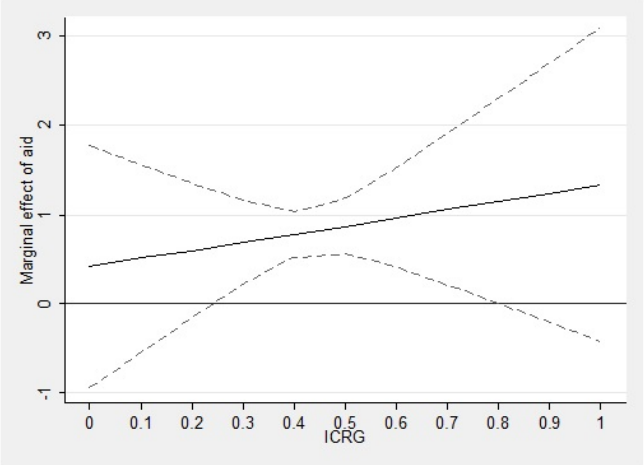
	(1)	(2)	(3)	(4)
Aid	0.792***	0.415		
	(0.162)	(0.823)		
On-budget aid			-0.190	3.747*
			(0.693)	(2.224)
Off-budget aid			0.480	-4.204***
			(0.475)	(1.325)
Investment aid			0.840**	0.815*
			(0.346)	(0.433)
Other non-flagged aid			0.948***	0.944***
			(0.233)	(0.248)
ICRG	-0.120	-0.259	-0.125	-0.337
	(0.534)	(0.520)	(0.511)	(0.511)
Interaction (ICRG*Aid)		0.918		
		(1.869)		
Interaction (ICRG*On-budget aid)				-8.436
				(5.171)
Interaction (ICRG*Off-budget aid)				13.337***
				(4.172)
R2	0.449	0.450	0.458	0.478
No. of countries	47	47	47	47
N	510	510	510	510

All specifications control for a full set of country and year fixed effect and variables capturing NGO aid, debt relief, GDP per capita, urbanisation, trade openness, civil conflict, HIV prevalence, population ages 0-14 and agriculture value-added. The fiscal variables, aid, debt relief, openness and agriculture-valued added are expressed as percentages of GDP. Urbanisation and HIV prevalence are expressed in as percentages of total. Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01.

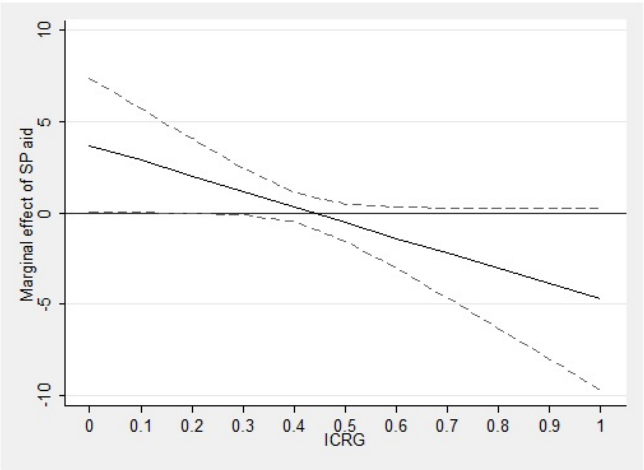
Table A.3.9: Model H (common sample) - Fungibility tests for on- and off-budget aid disbursements

ICRG	$H_0 : \delta_{SP} \geq 1$	$H_0 : \delta_{SP} \leq 0$	$H_0 : \delta_{TC} \geq 0$	$H_0 : \delta_{TC} \leq -1$
	(1)	(2)	(3)	(4)
No interaction	0.093	0.785	0.317	0.003
0	0.892	0.046	0.001	0.992
0.1	0.866	0.046	0.001	0.980
0.2	0.805	0.047	0.001	0.147
0.3	0.610	0.059	0.145	0.000
0.4	0.093	0.216	0.998	0.000
0.5	0.009	0.777	0.999	0.000
0.6	0.013	0.898	0.999	0.000
0.7	0.019	0.923	0.999	0.000
0.8	0.024	0.932	0.999	0.000
0.9	0.027	0.936	0.999	0.000
1	0.030	0.939	0.999	0.000

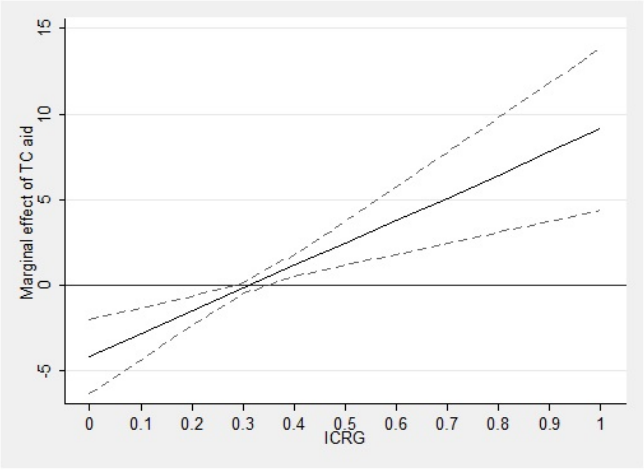
p-values for the one-sided fungibility tests are shown over the range of the ICRG variable. Columns (1) and (3) correspond to the test of no fungibility for on- and off-budget aid, respectively. Columns (2) and (4) correspond to the test of full fungibility for on- and off-budget aid,respectively. These tests are based on the conditional effects obtained using FE portrayed in Figure A.3.6.



(a) Total aid disbursements



(b) Total on-budget aid disbursements



(c) Total off-budget aid disbursements

Figure A.3.6: The conditional effects of health aid on government spending (common sample)

Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

The results of Model H on this common sample of observations agree to some extent with the results obtained over the original larger sample of observations using system GMM. The conditional effect of aid for the purposes of health is significantly positive in the middle values of the ICRG, the effect of on-budget aid is insignificant at all values of the ICRG and off-budget aid has a significantly negative effect when institutions are weak and a positive one when institutions are strong suggesting that institutional quality plays a role for the fungibility of off-budget aid[A.9]. With regard to the fungibility tests, on-budget aid is found to be non-fungible when institutions are weak and fungible when institutions are strong[A.10]. With regard to off-budget aid, the fungibility tests suggest that off-budget aid is fully fungible when institutions are weak and non-fungible when institutions are strong[A.11]. The results of off-budget aid for health are in line with the results obtained for total off-budget aid as a whole.

Table A.3.10: Public infrastructure expenditure model (common sample)- Model I

	(1)	(2)	(3)	(4)
Aid	-0.080	-0.099		
	(0.105)	(0.240)		
On-budget aid			-0.200	1.644
			(0.674)	(2.806)
Off-budget aid			0.241	1.653
			(0.972)	(3.228)
Investment aid			-0.015	-0.022
			(0.119)	(0.124)
Other non-flagged aid			-0.367	-0.348
			(0.231)	(0.289)
ICRG	0.022	0.009	-0.026	0.080
	(1.114)	(1.093)	(1.100)	(1.092)
Interaction (ICRG*Aid)		0.040		
		(0.520)		
Interaction (ICRG*On-budget aid)				-4.444
				(7.717)
Interaction (ICRG*Off-budget aid)				-3.328
				(8.138)
R2	0.251	0.251	0.255	0.256
No. of countries	47	47	47	47
N	510	510	510	510

All specifications control for a full set of country and year fixed effect and variables capturing NGO aid, debt relief, GDP per capita, urbanisation, trade openness, civil conflict, HIV prevalence, population ages 0-14 and agriculture value-added. The fiscal variables, aid, debt relief, openness and agriculture-valued added are expressed as percentages of GDP. Urbanisation and HIV prevalence are expressed in as percentages of total. Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[A.9] The conditional effect of off-budget aid for health is found to be insignificant using system GMM.

[A.10] This finding of fungibility for on-budget aid agrees with the previous findings obtained using system GMM.

[A.11] The finding of no fungibility of off-budget aid is also obtained using system GMM.

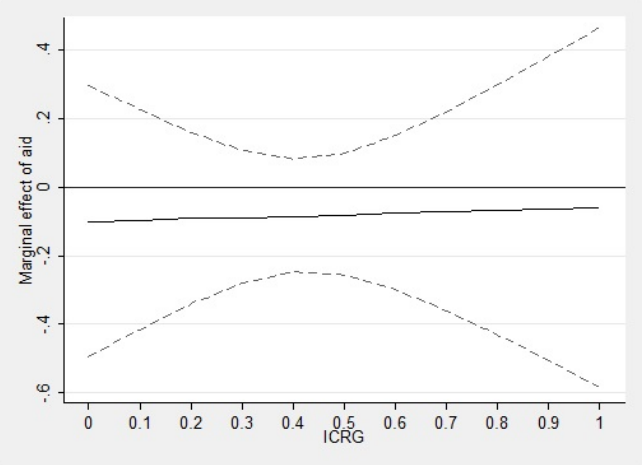
Table A.3.11: Model I (common sample) - Fungibility tests for on- and off-budget aid disbursements

ICRG	$H_0 : \delta_{SP} \geq 1$ (1)	$H_0 : \delta_{SP} \leq 0$ (2)	$H_0 : \delta_{TC} \geq 0$ (3)	$H_0 : \delta_{TC} \leq -1$ (4)
No interaction	0.082	0.768	0.805	0.208
0	0.591	0.279	0.695	0.206
0.1	0.539	0.280	0.705	0.172
0.2	0.428	0.287	0.717	0.876
0.3	0.176	0.338	0.723	0.068
0.4	0.053	0.576	0.639	0.071
0.5	0.108	0.675	0.497	0.226
0.6	0.154	0.697	0.431	0.371
0.7	0.183	0.704	0.403	0.453
0.8	0.202	0.708	0.387	0.501
0.9	0.215	0.710	0.378	0.532
1	0.224	0.712	0.372	0.553

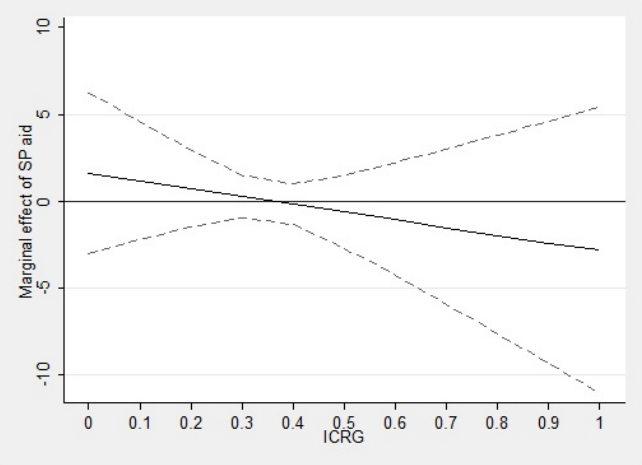
p-values for the one-sided fungibility tests are shown over the range of the ICRG variable. Columns (1) and (3) correspond to the test of no fungibility for on- and off-budget aid, respectively. Columns (2) and (4) correspond to the test of full fungibility for on- and off-budget aid,respectively. These tests are based on the conditional effects obtained using FE portrayed in Figure A.3.7.

Table A.3.10 shows the regression coefficients for the models of public infrastructure expenditure with the aggregate measure of aid disbursements (columns (1) and (2)) and with the different aid modalities (columns (3) and (4)). Included but not shown are the control variables mentioned earlier, namely NGO aid, debt relief, GDP per capita, urbanisation, trade openness, civil conflict, HIV prevalence, population ages 0-14 and agriculture value-added. Table A.3.11 shows the p-values for the two one-sided fungibility tests for on- and off-budget aid. The first row shows the p-values for the two fungibility tests on the coefficients of aid when the interaction terms are not included initially (columns (1) and (3)). Figure A.3.7 shows the conditional effects of infrastructure aid flows on total public education spending.

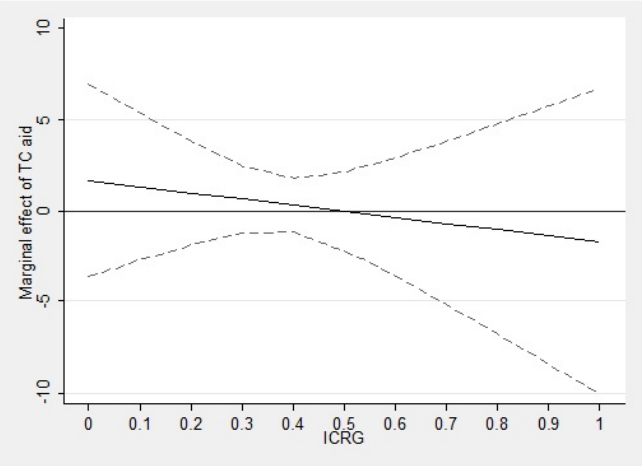
The results of Model I on this common sample of observations agree with the results obtained over the original larger sample of observations using system GMM. The conditional effects of infrastructure aid are statistically insignificant and the fungibility tests suggest that on- and off-budget aid are non-fungible at all values of the ICRG.



(a) Total aid disbursements



(b) Total on-budget aid disbursements



(c) Total off-budget aid disbursements

Figure A.3.7: The conditional effects of infrastructure aid on government spending (common sample)

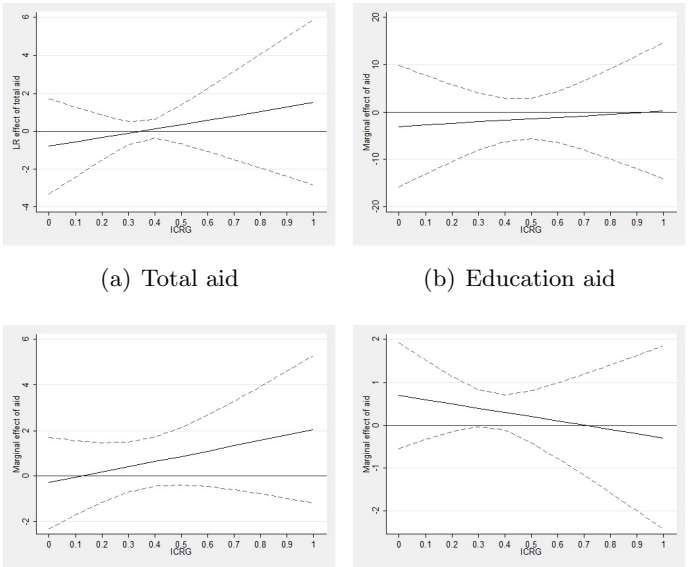
Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

All in all, the results over this common sample obtained using static FE support the

original findings that the degree of fungibility of off-budget aid depends on institutional quality in the anticipated direction. This result seems to be driven from the sectors of education and health. Additionally, the fungibility tests shows that the degree of fungibility of total on-budget aid also depends on institutional quality in the anticipated direction, however, this finding does not seem to originate from the sectoral spending examined. Furthermore, the one-sided fungibility tests in the specifications without the interaction terms show that fungibility would be over-estimated in environments of high institutional quality if the interaction term is not considered, highlighting the importance of examining fungibility by considering institutional quality.

A.5 Long-run effects

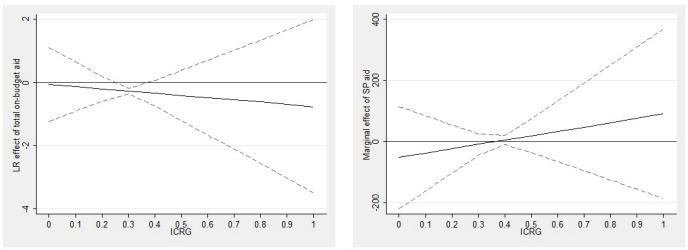
Appendix A.5 shows the long-run effects of aid disbursements on government spending.



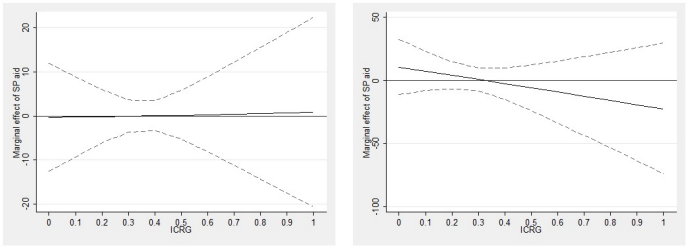
(a) Total aid (b) Education aid

(c) Health aid (d) Infrastructure aid

Figure A.4.1: The long-run effects of aggregate aid disbursements
The effects are calculated based on the dynamic models of Table 2.6 and Table A.3.1. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

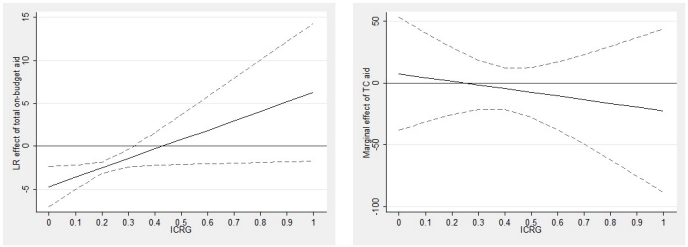


(a) Total aid (b) Education aid

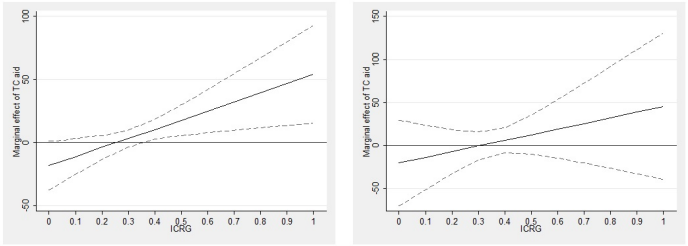


(c) Health aid (d) Infrastructure aid

Figure A.4.2: The long-run effects of on-budget aid disbursements
The effects are calculated based on the dynamic models of Table 2.6 and Table A.3.2. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.



(a) Total aid (b) Education aid



(c) Health aid (d) Infrastructure aid

Figure A.4.3: The long-run effects of off-budget aid disbursements
The effects are calculated based on the dynamic models of Table 2.6 and Table A.3.2. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown for the two-sided test of significance. The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

A.6 Sample

Appendix A.6 displays the countries included in the sample of each model (total public spending, public education spending, public health spending and public infrastructure spending).

Country	Model T	Model E	Model H	Model I
Albania	✓	✓	✓	✓
Algeria	✓	✓	✓	✓
Angola	✓	✓	✓	✓
Armenia			✓	
Azerbaijan	✓	✓	✓	✓
Bangladesh	✓	✓	✓	✓
Belarus	✓	✓	✓	✓
Bolivia	✓	✓	✓	✓
Botswana	✓	✓	✓	✓
Burkina Faso	✓		✓	
Cameroon	✓	✓	✓	✓
Colombia	✓	✓	✓	✓
Congo, Dem. Rep.			✓	✓
Congo Rep.	✓	✓	✓	✓
Costa Rica	✓	✓	✓	✓
Cote d'Ivoire	✓		✓	
Cuba			✓	
Dominican Republic	✓	✓	✓	✓
Ecuador	✓	✓	✓	✓
Egypt, Arab Rep.			✓	✓
El Salvador	✓	✓	✓	✓
Ethiopia	✓	✓	✓	✓
Ghana	✓	✓	✓	✓
Guatemala	✓	✓	✓	✓
Guinea			✓	
Guinea-Bissau	✓		✓	
Guyana			✓	
Honduras			✓	
India	✓	✓	✓	✓
Indonesia	✓	✓	✓	✓
Iran, Islamic Rep.			✓	✓
Jamaica	✓	✓	✓	✓
Kenya	✓	✓	✓	✓
Liberia	✓	✓	✓	✓
Madagascar	✓	✓	✓	✓
Malawi	✓	✓	✓	✓
Malaysia	✓	✓	✓	✓
Mali	✓		✓	
Mexico	✓	✓	✓	✓

Country	Model T	Model E	Model H	Model I
Moldova	✓	✓	✓	✓
Mongolia	✓	✓	✓	✓
Morocco	✓	✓	✓	✓
Namibia	✓	✓	✓	✓
Nicaragua			✓	
Niger	✓		✓	
Nigeria	✓	✓	✓	✓
Pakistan	✓	✓	✓	✓
Panama	✓	✓	✓	✓
Papua New Guinea	✓	✓	✓	✓
Paraguay	✓	✓	✓	✓
Peru	✓	✓	✓	✓
Senegal	✓		✓	
Serbia	✓	✓	✓	✓
Sierra Leone	✓		✓	
South Africa	✓	✓	✓	✓
Sri Lanka	✓	✓	✓	✓
Sudan	✓	✓	✓	
Suriname			✓	
Tanzania	✓	✓	✓	✓
Thailand	✓	✓	✓	✓
Togo	✓		✓	
Tunisia	✓	✓	✓	✓
Uganda	✓	✓	✓	✓
Ukraine	✓	✓	✓	✓
Venezuela, RB	✓	✓	✓	✓
Vietnam	✓	✓	✓	✓
Yemen, Rep.	✓	✓	✓	✓
Zambia	✓	✓	✓	✓
Total	59	51	70	51

A.7 Definitions and sources of variables

Appendix A.7 shows the detailed definitions and sources of the main variables of interest (expenditure, foreign aid and institutional quality) as well as the control variables used in the empirical models.

Variables	Definitions	Sources
Total public expenditure, (percentages of GDP)	Total general public expenditure consists of recurrent and capital spending from government budgets, external borrowings and grants and social health insurance funds.	SPEED Dataset (2013) of IFPRI (Original source: International Monetary Fund (IMF) Government Finance Statistics (GFS).
Expense, (percentages of GDP)	Expense is cash payments for operating activities of the government in providing goods and services. It includes compensation of employees (such as wages and salaries), interest and subsidies, grants, social benefits, and other expenses such as rent and dividends.	WDI (2015) of WB (Original source:IMF GFS and OECD GDP estimates.)
Health expenditure, public (percentages of GDP)	Public health expenditure consists of recurrent and capital spending from government budgets, external borrowings and grants and social health insurance funds.	WDI (2015) of the WB (Original source: World Health Organisation (WHO) national accounts).
Education expenditure (percentages of GDP)	Public education expenditure consists of recurrent and capital spending from government budgets, external borrowings and grants and social health insurance funds.	Clements et al. (2011) dataset for their IMF paper.
Transport & Communications expenditure (percentages of GDP)	Transport and communication expenditure consists of recurrent and capital spending from government budgets, external borrowings and grants and social health insurance funds.	SPEED Dataset (2013) of IFPRI (Original source: IMF GFS).
Total aid disbursements and aid disbursements disaggregated by sector, such as education, health and infrastructure, (percentages of GDP)	Disbursements show actual payments in each year. They show the realisation of donors' intentions and the implementation of their policies. They are required to examine the contribution of donors' actions in development achievements and they better describe aid flows from a recipient's point of view. These values are computed using aid disbursements in current USD calculated over GDP in current USD.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.

Variables	Definitions	Sources
PBAs or else SP aid (percentages of GDP)	Aid flows from different donors are flagged according to their modality. PBAs are defined as a way of engaging in development cooperation based on the principles of co-ordinated support for a locally-owned programme of development, such as a national development strategy, a sector programme, a thematic programme or a programme of a specific organisation. Aid flows flagged as PBAs are then added together for each recipient country and rescaled to reflect percentage of GDP.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.
FTC or else TC aid (percentages of GDP)	Aid flows from different donors are flagged according to their modality. FTC comprises activities financed by a donor country whose primary purpose is to augment the level of knowledge, skills, technical know-how or productive aptitudes of the population of developing countries, i.e. increasing their stock of human intellectual capital, or their capacity for more effective use of their existing factor endowment. This relates essentially to activities that either enhance or supply human resources. It includes financing of students and trainees who are nationals of developing countries; experts, teachers, and volunteers; equipment and materials for training; research; development-oriented social and cultural programmes, etc. Associated supplies are also classified as technical cooperation. Aid flows flagged as FTC are then added together for each recipient country and rescaled to reflect percentages of GDP.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.
IP aid (percentages of GDP)	Aid flows from different donors are flagged according to their modality. IP aid comprises activities primarily designed to augment the physical capital of recipient countries. It includes contributions for local and recurrent costs and investment-related technical cooperation. Aid flows flagged as IP are then added together for each recipient country and rescaled to reflect percentages of GDP.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.
ONF aid (percentages of GDP)	The remainder flows of aid that are not flagged to be PBA, FTC or IP are summed together and rescaled for each recipient country to reflect percentages of GDP.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.

Variables	Definitions	Sources
Non-sector specific aid (percentages of GDP)	Aid disbursements that are targeted for the other sectors and not the one in question. (i.e. for the model of education spending non-education aid would include aid on health, infrastructure and other sectors.).	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.
ICRG	The mean value of the ICRG variables 'Corruption', 'Law and Order' and 'Bureaucracy Quality', ranging between 0 and 1. The index has been rescaled so that higher values indicate low quality of governance. This political risk rating assesses various political components and how they are a 'threat' to foreign/international investment/business. The component of corruption assesses corruption within the political system and is mostly concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding and suspiciously close ties between politics and business. The components of law and order are assessed separately. The Law sub-component is an assessment of the strength and impartiality of the legal system, while the Order sub-component is an assessment of popular observance of the law. The bureaucracy quality component measures the institutional strength and quality of the bureaucracy and high points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services.	QoG (2015) dataset published by the University of Gothenburg (Original sources: ICRG by the Political Risk Services (PRS) Group).
Debt relief (percentages of GDP)	The sum of debt forgiveness and rescheduling, other action on debt, and offsetting entries for debt forgiveness. Groups all actions relating to debt (forgiveness, conversions, swaps, buybacks, rescheduling, refinancing) and their offsetting entries.	OECD-DAC, Table DAC2a.
NGO aid (percentages of GDP)	Aid flows having NGOs as the first implementing agent. These flows correspond to the total aid or for each sector or purpose that are given on concessional terms.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.

Variables	Definitions	Sources
GDP per capita, PPP international $	GDP per capita based on Purchasing Power Parity (PPP). GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2005 international dollars.	WDI (2015) (Original source: WB International Comparison Program database).
Total Civil Major Episodes of Political Violence (MEPV)	The total summed magnitudes of all societal MEPV, such as civil violence, civil war, ethnic violence and ethnic war. The civil violence variable measures the magnitude score of episodes of civil violence involving the state in that year. The civil war variable measures the magnitude score of episodes of civil warfare involving that state in that year. The ethnic violence variable measures the magnitude score of episodes of ethnic violence involving that state in that year. The ethnic war variable measures the magnitude score of episodes of ethnic warfare involving that state in that year. The index is scaled from 1 (lowest) to 10 (highest) and 0 denotes no episodes.	Centre for Systemic Peace (2013).
Urban population (percentages of total)	Urban population refers to people living in urban areas as defined by national statistical offices. It is calculated using WB population estimates and urban ratios from the United Nations (UN) World Urbanization Prospects.	WDI (2015) (Original source: UN, World Urbanization Prospects).
Openness (percentages of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI (2015) (Original source: WB national accounts data, and OECD National Accounts data files).
Prevalence of HIV, total (percentages of population ages 15-49)	Prevalence of HIV refers to the percentage of people ages 15-49 who are infected with HIV.	WDI (2015) (Original source: UNAIDS estimates).

Variables	Definitions	Sources
Population ages 0-14 (percentages of total)	Population between the ages 0 to 14 as a percentage of the total population. Population is based on the de facto definition of population.	WDI (2015) (Original source: The UN Population Division's World Population Prospects).
Agriculture value-added (percentages of GDP)	Agriculture corresponds to ISIC divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3. Note: For VAB countries, gross value added at factor cost is used as the denominator.	WDI (2015) (Original source: WB national accounts data, and OECD National Accounts data files).

Chapter 3

The effects of foreign aid and institutions on tax revenues

3.1 Introduction

3.1.1 Background and motivation

Taxes are an important tool for governments for collecting revenue to achieve spending targets, providing public goods, supporting markets and re-allocating resources for economic growth and development (Besley and Persson, 2014, 2009, Teera and Hudson, 2004, Migdal, 1988). Several international bodies, such as the International Monetary Fund (IMF) and the Organisation for Economic Cooperation and Development (OECD), have looked at strengthening the tax systems in developing countries because of the importance of tax collection for growth and development (Prichard et al., 2012).

Based on theoretical and empirical evidence, developing countries need tax revenues to increase the resources available for public infrastructure and human capital that are necessary for growth and developmental targets (Oto-Peralías and Romero-Ávila, 2013, Bose et al., 2007, Kneller et al., 1999, Barro, 1990). Nevertheless, tax revenues may not be sufficient in financing spending targets and promoting growth since developing countries, or 'weak states' face fiscal capacity problems, i.e. a limited capacity in enforcement and compliance structures throughout the entire economy to raise tax revenues (Besley and Persson, 2014, 2013, 2011, Besley, 2010, Besley and Persson, 2009, Acemoglu, 2005). Low fiscal capacity of 'weak states' is likely to be complemented by high reliance on natural resources and foreign aid flows (Azam et al., 1999). This is because aid dependency could hinder the collection of tax revenues since aid can be seen as a substitute for tax revenues. Recipient governments are no longer accountable to their people but are accountable to their donors (Knack, 2009, Moore, 2007, Collier, 1999). This phenomenon could also be exacerbated in environments of low institutional quality and a low absorptive capacity with regard to aid loans, which require state flows for repayments (Azam et al., 1999, Killick, 1991).

On the other hand, foreign aid is thought of as a complement to tax revenues since the theoretical literature considers it as a tool to fill the fiscal gap of developing countries (Collier, 1999, Bacha, 1990). It should be emphasised that there is no consensus in the empirical literature as to what is the effect of foreign aid on economic growth. The primary recipients of aid flows are governments. Therefore, how governments behave in

terms of their tax policy and budget allocation will in turn determine aid effectiveness (Morrissey, 2015a, McGillivray and Morrissey, 2000, Devarajan et al., 1999). Aid may not be used as intended and receiving aid flows might give opportunities for corruption and illegal activities (Bräutigam and Knack, 2004, Knack, 2001). This raises the issue of 'fungibility', which is defined as aid not being used as intended by the donors.

Fungibility can arise for a number of reasons: a difference in information and preferences between donors and recipients, aid illusion, malicious intent of recipient governments or the optimal choice of recipient governments to adjust their budgets and relieve themselves of the burden of taxation based on the external resources received (Chatterjee et al., 2012, Prichard et al., 2012, Carter, 2010, Gupta et al., 2003, McGillivray and Morrissey, 2001).

The empirical literature on fungibility yields mixed results for the effect of aid on tax revenues. On the one hand, some studies find a negative effect on tax revenues indicating that aid is fungible and pays for tax reductions rather than development (Benedek et al., 2012, Gupta et al., 2003). On the other hand, there are other studies that find either an insignificant or positive effect on taxes, providing evidence against fungibility in terms of tax revenues (Morrissey et al., 2014, Clist and Morrissey, 2011). Foreign aid can negatively affect tax revenues directly for the reasons explained earlier, but it can also affect revenues indirectly in a positive way. Examples are when aid is used for current public spending or budget support to pay for the salaries of government officials that are then taxed, or when foreign aid flows are fed into the economy's formal sector and can then also be taxed (Carter, 2010). Another example is the fact that foreign aid provides recipient economies with foreign exchange that in turn increases imports and trade taxes (Morrissey, 2015a, Bacha, 1990).

Institutions and their quality are important for aid effectiveness and aid fungibility. Countries with low quality institutions and high levels of corruption are more likely to misuse aid flows through, for example, the diversion of aid flows into private pockets by government officials (Prichard et al., 2012, Hillman, 2004). According to Kaufmann and Zoido-Lobatón (1999), governance has several dimensions and is defined as 'traditions and institutions by which authority in a country is exercised'. Generally, corruption is a significant problem in both developed and developing countries and it is viewed as a constraint to both foreign aid and growth-enhancing policies. Theobald (1990) defines corruption as 'the illegal use of public office for private gain'. The theoretical and empirical literature suggests that corruption has several economic effects; one of which is how it affects public finances. There is evidence that corruption reduces tax revenues since tax collectors can be bribed (Asongu and Jellal, 2014, Hillman, 2004, Tanzi and Davoodi, 2000). There is

also evidence that corruption distorts public spending towards areas where higher rents may be extorted, such as on military spending or infrastructure projects, and away from social sectors, such as health or education (Delavallade, 2006, Hillman, 2004, Tanzi and Davoodi, 2000, Mauro, 1998).

3.1.2 Research question

In light of the studies mentioned above, the purpose of this study is to explore the relationship between institutional quality, foreign aid and tax revenues. More precisely, to examine the effect that aid has on tax revenues under different levels of institutional quality. This relationship has important policy implications for donor countries since this will help shed light on whether aid pays for development or for tax reductions. Chapter 2 of this thesis examines the extent of fungibility with regard to government spending. This study examines the other side of the budget constraint of recipient governments, focusing on revenues raised through taxes. Based on the theoretical and empirical literature, it is expected that low institutional quality would be associated with lower tax revenues because of the administrative constrains for tax collection in weak states (Besley and Persson, 2014, Acemoglu, 2005). Aid, which is also found to be associated with a deterioration in the quality of institutions (Bräutigam and Knack, 2004, Knack, 2001), could have a negative effect on tax revenues, at least in countries with low institutional quality.

Several papers have estimated the effect of aid on tax revenues controlling for either corruption or institutional quality (Yohou et al., 2016, Benedek et al., 2012, Alonso and Garcimartín, 2011, Brun et al., 2011, Carter, 2010, Mahdavi, 2008, Gupta et al., 2003, Tanzi and Davoodi, 2000, Ghura, 1998). However, these studies did not consider that the effect of aid on tax revenues could depend on corruption or institutional quality. Exceptions are the papers of Gupta et al. (2003) and Benedek et al. (2012), who divide their samples into sub-samples of different levels of corruption. Also, the paper of Alonso and Garcimartín (2011) considers the interaction between the two variables of interest but does not estimate any conditional effects. Nevertheless, the analysis in all three papers focuses on total tax revenues. The aim of this study is to look at both total taxes, as well as the different types of taxes.

Taxes are examined to explain whether fungibility, if it exists, is caused by malicious intent in situations of low institutional quality; or if the reason behind fungibility is the optimal choice of recipient governments that consider external and internal resources for their budget allocation. Along these lines, the phenomenon of aid illusion may also be exacerbated in environments of low institutional quality, where government officials in a

large bureaucracy misperceive the government's resources and budget. This study also distinguishes between the two main types of finance for foreign aid: aid given in the form of grants and in the form of loans. The empirical literature has found that grants have a different effect than loans on tax revenues since grants are given as a gift and loans are expected to be repaid (Odedokun, 2004).

A newly constructed dataset on tax revenues is used which is published by the International Centre for Tax and Development (ICTD) (Prichard et al., 2014) that provides information on general government data for disaggregated tax data. Total tax revenue is used as a dependent variable, as are taxes on income/capital gains/profits, taxes on international trade and taxes on goods and services. Static models with Fixed Effects (FE) are estimated to control for serial correlation and heteroscedasticity. A panel sample of developing countries is used, defined by the World Bank (WB) as countries with low or middle income per capita from the regions of Eastern Europe, the Caribbean, Latin America, Sub-Saharan Africa, North Africa and the Middle East, East Asia, South Asia, South-East Asia and the Pacific, over the period of 1990 - 2013.

3.1.3 Research findings

The empirical results firstly suggest that institutional quality does not play a role for the effect of aid on tax revenues. Moreover, total aid and aid decomposed into grants and loans, is not found to have a negative effect on total tax revenue and this result holds with various alternative methods; either an insignificant effect or a positive effect is found for aid. These findings contradict the results obtained by Gupta et al. (2003) and Benedek et al. (2012) and but agree with the findings of Clist and Morrissey (2011) and Morrissey et al. (2014). Overall, foreign aid is not found to finance tax reductions and is therefore non-fungible in the context of tax revenues.

3.1.4 Structure

The next Section describes the main results of the literature. Section 3.3 shows the empirical methodology for the different models that are estimated. Section 3.4 presents the data used and Section 3.5 discusses the results obtained along with various robustness checks. Section 3.6 concludes this Chapter. The results are displayed in Section 3.7.

3.2 Literature Review

3.2.1 State capacities

The performance of tax revenues is a big concern for developing countries and the international community. Tax revenues are used to finance spending targets and the delivery of public goods that are key for economic growth, poverty reduction and financial development, as well as for redistribution policies (Besley and Persson, 2014, Prichard et al., 2012, Besley and Persson, 2009, Bird et al., 2008, Teera and Hudson, 2004).

Tax revenues are explained using economic structures or tax bases in an economy, such as the share of agriculture in an economy, the share of the manufacturing industry or how open a country is to international trade. These are the traditional determinants of tax revenue but macroeconomic factors, such as institutional quality, as well as structural reforms can not be neglected (Morrissey, 2015a, Clist and Morrissey, 2011, Ghura, 1998).

Developing countries are likely to have large informal sectors that are highly dependent on natural resources, which cannot be easily taxed (Tanzi and Zee, 2000, Chelliah, 1971, Lotz and Morss, 1967). Furthermore, low incomes and, in turn, low consumption patterns could help explain the low levels of income taxes or taxes on goods and services, and the over-reliance on certain types of taxation such as trade taxes (Bird et al., 2008, Teera and Hudson, 2004, Tanzi and Zee, 2000, Ghura, 1998). These phenomena together with the low compliance in paying taxes, political factors embedded that are historical in origin and the presence of civil wars and conflicts contribute further to the low revenue mobilisation (Besley and Persson, 2014, 2013, 2009).

The above characteristics are common in developing countries or 'weak states' according to Acemoglu (2005). Such countries face 'state capacity' problems, where state capacities consists of 'legal' and 'fiscal' capacities and is defined as the 'institutional capacity of the state to carry out various policies that deliver benefits and services to households and firms' (Besley and Persson, 2011). 'Legal capacities' provide rules and regulations and an example is the provision of property rights, whereas 'fiscal capacities' include the necessary infrastructure to administrate, monitor and enforce taxation policies to support its citizens (Besley and Persson, 2011). To promote economic growth, investment in both legal and fiscal capacities is required as the two complement each other; a sound legal system is required to attract firms to legally operate, which in turn generate income that can be taxed depending on the level of fiscal capacity (Besley and Persson, 2014, 2011)

Improvements in the state's accountability to its citizens, as well as improvements in the law and order of the state are associated with increased institutional quality (Asongu and

Jellal, 2014, Besley and Persson, 2014). Issues of transparency, monitoring and the rule of law, are particularly common in developing countries (Rauch and Evans, 2000), where corruption is a 'persistent feature' in the society (Aidt, 2009) and may be described by several scenarios, such as bribery, extortion, fraud, a weak legal system, lack of accountability and transparency (Ghura, 1998)[3.12].

The theoretical and empirical literature show that corruption has important effects on the economic performance of a country, as well as welfare costs. These are also discussed in Chapter 2 (Section 2.2.2). Corruption is found to be associated with reduced growth via public and private investment (Tanzi, 1994). There is also evidence that corruption affects public finances and alters government behaviour by reducing tax revenues since tax collectors can be bribed or distorts public expenditure towards sector where higher rents can be extorted, such as infrastructure or the military (Delavallade, 2006, Tanzi and Davoodi, 2000, Mauro, 1998). Any improvements in institutional quality, measured by the state's accountability to its citizens or the rule of law are generally associated with higher tax receipts. Weaker checks and balances within a developing country, tax policies that are not binding and courts that do not reinforce such policies could lead to higher corruption and in turn to leakage of tax funds (Besley and Persson, 2014). High institutional quality improves state capacity problems and it is found to be positively associated with tax receipts (Brun et al., 2011). Furthermore, lower institutional quality and state capacity problems could indicate that the 'absorptive capacity' of a country is low. The absorptive capacity according to Killick (1991) refers to the ability of a developing country to serve a loan and 'the ability of the economic system to put additional aid to productive use'.

3.2.2 Foreign aid

See Section 1.1.1 for a discussion on aid fungibility.

Tax receipts and policies are constrained by the lack of these capacities in developing countries, which are seen as an obstacle to economic development (Besley, 2010). Foreign aid may be given by international donors to fill in these gaps and promote growth and development (Bird et al., 2008, Teera and Hudson, 2004, Bacha, 1990). Aid flows aim to provide the necessary infrastructure for development and improve revenue mobilisation as well as the management of public finances (Fjeldstad, 2014, Moore, 2007). Nevertheless, the over-dependence on aid flows can in turn lead to a 'resource curse' and as Kaldor (1963) puts it, there is a need by developing countries to learn to tax. Receiving large volumes of aid could make an economy dependent on aid, thus giving no incentive to recipient

[3.12] See Section 2.2.2 for a discussion on corruption.

governments for improvements in accountability to its citizens or improvements in the general handling and management of aid funds (Knack, 2009, Moore, 2007). Receiving aid may alter public finance decisions (Tanzi and Davoodi, 2000), however the decision of the government with regard to their budget largely depends on the quality of institutions. Countries with high quality institutions and an accountable government are found to view aid as a complement to their domestic revenue, rather than as a substitute (Prichard et al., 2012).

Overall, the aid fungibility literature yields mixed results for the effect of aid on tax revenue (Yohou et al., 2016, Morrissey et al., 2014, Thornton, 2014, Benedek et al., 2012, Alonso and Garcimartín, 2011, Brun et al., 2011, Clist and Morrissey, 2011, Carter, 2010, Gupta, 2007, Mahdavi, 2008, Teera and Hudson, 2004, Gupta et al., 2003, Franco-Rodriguez et al., 1998, Khan and Hoshino, 1992). Foreign aid could affect tax revenues directly in a negative way, but it could also increase tax revenues indirectly when it feeds into the formal sector that can be taxed. A strand of the literature identifies a negative effect of aid on tax revenues, leading to the conclusion that aid is fungible since it finances tax reductions; nevertheless, this fungibility result may be driven by the optimal choice of governments and be welfare-optimal.

Heller (1975) developed a model of fiscal response to aid using the assumption that the public sector aims to maximise its utility by considering its spending on public investment for development, maintenance and socioeconomic expenditures, as well as revenue from taxation, borrowing and aid in the form of grants and loans. When the model is estimated using a simultaneous equation system, the results support the idea of no fungibility. Using this methodology, Khan and Hoshino (1992), Franco-Rodriguez et al. (1998) and Mahdavi (2008) find evidence of fungibility in a sample of South and South-East Asian countries, in Pakistan and in a sample of 43 developing countries, respectively. Different samples and econometric techniques are used by these papers, despite the similar theoretical framework. Nevertheless, the underlying conclusion is that fungibility exists with regard to aid: aid flows finance tax reductions. Mahdavi (2008) also looks at different tax revenue components, such as taxes on income/capital gains/profits taxes, social security/payroll taxes, property taxes, sales taxes, excise/value-added taxes and taxes on international trade. He finds that a negative coefficient of aid is only observed for total tax revenues and taxes on income, capital gains and profits, whereas for the other types of taxes aid is insignificant.

Furthermore, Gupta et al. (2003) use a sample of 107 developing countries over the period 1970 - 2000 and distinguish between grants and loans since they expect the two types of aid to have different effects on tax revenue. Grants are given as gifts, whereas loans

need to be repaid, even on concessional terms, therefore, revenue mobilisation is important for repayment. They control for the traditional variables mentioned earlier: tax bases, macroeconomic variables, income, structural reform dummies and debt. They use panel methods and panel time-series methods, such as Feasible Generalised Least Squares (FGLS) and regressions with Panel Corrected Standard Errors (PCSEs), and conclude that grants reduce revenues, whereas loans improve revenue mobilisation. Furthermore, this analysis uses sub-samples that have different levels of corruption according to the International Country Risk Guide (ICRG) variable and concludes that for countries that are more corrupt the reduction of revenues because of grants is higher than when the complete sample is considered. Benedek et al. (2012) extend this analysis to 117 countries over the period 1980 - 2009 using a dynamic model and appropriate General Method of Moments (GMM) methods. Their findings support the findings of Gupta et al. (2003) with regard to grants but not with regard to loans. Grants are associated with reduced revenues but loans are statistically insignificant for tax revenues. Additionally, they also disaggregate total tax into sub-components (VAT, excise taxes, income tax and trade taxes). They find that grants are negatively associated with VAT, excise and income taxes but positively associated with trade taxes.

On the other hand, a strand of the literature finds evidence against fungibility with regard to tax revenues by either estimating a positive effect of aid on tax receipts or an insignificant one. A positive or an insignificant coefficient of aid is not a cause for concern with regard to fungibility. A positive coefficient could indicate that foreign aid helps in improving tax collection efforts by strengthening institutions and administrative capacities. An insignificant coefficient shows that aid is not fungible with regard to taxes and that tax collection efforts are not undermined in the presence of aid flows.

Although Mahdavi (2008) estimates a negative coefficient of aid on total tax revenues and income taxes, the author estimates an insignificant effect for social security/payroll taxes, sales taxes, excise/value-added taxes and taxes on international trade and a positive one for property taxes. This finding shows that different tax policies are affected in a different way by foreign aid flows, although the author gives little explanation of the results with regard to the aid variable. Gupta (2007) finds a positive coefficient of aid for revenue using panel data methods and panel time-series data methods for a sample of developing countries.

Additionally, Carter (2010) challenges the reliability of the results in the aid-tax literature that identify a negative effect of aid on tax revenues. Carter (2010) firstly argues against using GMM techniques because of the volatility of results and he also argues that the

endogeneity of foreign aid should be considered, because any negative coefficient found could just reflect the negative correlation between aid and tax since aid is given to countries with low tax mobilisation. The author also suggests that the Pesaran and Smith (1995) estimation method would be a better-suited method to treat heterogeneous dynamics and estimating with PCSEs would better address serial correlation. Clist and Morrissey (2011) estimate the effects of grants and loans on total tax revenue for a sample of 82 developing countries over the period 1970 - 2005. The authors use static panel data methods but use lagged aid values instead of contemporaneous ones to firstly control for the endogeneity of foreign aid and secondly to address the issue of aid not having an effect on tax revenues immediately. They include controls for the tax bases of agriculture, industry and trade and income and conclude that aid has no significant effect on taxes. Although they find a negative coefficient for contemporaneous grants, this effect disappears when using lagged grants so they attribute this finding to endogeneity. Additionally, Morrissey et al. (2014) use the newly constructed dataset for taxes by the ICTD over a sample of 121 developing countries using 4-year averaged data from 1980 - 2009. They use static panel methods and panel time-series methods and find that aid, aid grants and aid loans are insignificant for tax revenues. They control for similar control variables as the previous studies.

Furthermore, Clist (2014) attempts to replicate the results of Gupta et al. (2003) and Benedek et al. (2012) using their sample and concludes that since their results cannot be replicated they can not be considered as robust. The negative association between aid grants and revenues could be driven because of the endogeneity of aid since donors might direct aid grants towards the countries that are heavily indebted to avoid adding to the existing debt (Morrissey, 2015a, Carter, 2010). Moreover, Clist (2014) not only challenges the robustness of the results of Gupta (2007) and Benedek et al. (2012), but also the construction of their dataset since in trying to construct the dependent variables the authors use a number of sources and treat missing values as inter-changeable. There is no guarantee that the different sources are measured in the same way or that the definitions used in the different sources are comparable, thus raising the measurement error in the model. Clist (2014) attempts to estimate the aid-tax model using various data sources and although he finds that the results are not consistent, he does not find a negative coefficient for aid.

Alonso and Garcimartín (2011) and Yohou et al. (2016) are two of the few papers that consider the effect of institutional quality as a tax determinant.[3.13] Alonso and Garcimartín (2011) use an unbalanced panel of both developed and developing aid-recipient countries

[3.13] Gupta et al. (2003) and Benedek et al. (2012) divide their samples according to the corruption level for the model of total taxes.

from 1990 - 2007 and consider an interaction term between foreign aid and institutional quality. They use alternative econometric techniques, such as static and dynamic panel data techniques and control for the different tax bases of agriculture, industry, trade, income, as well as income inequality captured by the Gini index. They also treat income, foreign aid and income inequality as endogenous. They find that the coefficient of aid is insignificant and that aid does not have an impact on tax revenues with and without considering institutional quality, measured by the ICRG index. Nevertheless, the interaction term included in their model is a product of two continuous variables and conditional effects are not estimated. Yohou et al. (2016) use panel time-series techniques in a sample of six African countries over the period 1986 - 2010. They treat aid as endogenous by using lagged values and control for the different tax bases mentioned above (agriculture, industry, trade, income) as well as structural reforms variables. The authors also consider the interaction term of aid and a measure of government stability, captured by the ICRG index and find evidence that the impact of aid on total tax revenues depends on government stability by plotting the conditional effects of aid for each of the six countries examined (West African Economic and Monetary Union countries). They conclude that improvements in government stability are associated with increases in tax revenues and find that government stability, or the measure of ICRG, matters for the extent of aid fungibility with regard to total tax revenues.

3.2.3 Contribution

Overall, the results described above show that there is no consensus in the literature on the effect of foreign aid on tax revenues. An established result in the literature is that weak institutions or higher corruption are associated with reductions in tax revenues (Asongu and Jellal, 2014, Thornton, 2014, Brun et al., 2011, Knack, 2009). Nevertheless, this finding might not hold when total tax is disaggregated into different types of taxes as these are collected in different ways and are subject to different bureaucratic controls, as shown by Mahdavi (2008).

In light of the studies summarised in Table 3.1, the focus of this study is to examine the effect of both foreign aid and institutional quality on total tax revenues as well as the composition of total tax revenues by looking at taxes from income/capital gains/profits, taxes from international trade and taxes on goods and services.

By using an interaction term between the aid measure and institutional quality, the effects of foreign aid and the effects of the different types of financing (grants or loans), can be estimated to examine the extent of fungibility at different levels of institutional

Table 3.1: Summary of key studies in the literature

Study	Sample	Estimation	Results
Gupta et al. (2003)	Panel (developing countries, 1970 - 2000)	FE, FGLS and PCSE	Evidence of fungibility
Alonso & Garcimartin (2011)	Panel (developed and developing countries, 1990 - 2007)	FE and GMM	No evidence for fungibility
Benedek et al. (2012)	Panel (developing countries, 1980 - 2009)	FE and GMM	Evidence of fungibility
Morrissey et al. (2014)	Panel (developing countries, 1980 - 2009)	FE and PCSE	No evidence of fungibility
Yohou et al. (2016)	Panel (6 WAEMU countries, 1986 - 2010)	FGLS	Government stability makes aid less fungible

quality. Although other researchers have controlled for either the quality of institutions or a measure of corruption in their models as a robustness check, very few studies have considered that foreign aid might have a heterogeneous effect on tax revenues conditional on the quality of institutions. For example, Gupta et al. (2003) and Benedek et al. (2012) divide their sample based on the level of corruption in each country and estimate the effect of aid on total tax revenues in countries with weak institutions or high corruption. Alonso and Garcimartín (2011) and Yohou et al. (2016) also consider the interaction term between foreign aid and a continuous measure capturing institutional quality but they do not estimate any conditional effects. Looking at the main components of taxes would show a complete picture of how tax revenues are affected by institutions and foreign aid inflows.

For the purposes of this study, the newly constructed dataset offered by the ICTD is used and the models are estimated over a panel of developing countries for the period 1990 - 2013. Studies in the literature have mostly focused on central government data. We take advantage of this new source for disaggregated tax data that considers both central and general government data on tax revenues. Considering general government data instead of central, allows us to avoid under-estimating tax revenue collection in federal states. Following the work of Morrissey et al. (2014), who also use the ICTD dataset, static panel data models and panel time-series techniques are estimated. Alternative estimation methods and samples are used to ensure the robustness of the results and to cover the limitations of each of the different estimation technique.

3.3 Methodology

The purpose of this study is to investigate the extent of aid fungibility regarding tax revenues conditional on institutional quality.

Specifically, the following static panel data model is estimated as follows:

$$Y_{it} = \beta_1 A_{it} + \beta_2 IQ_{it} + \beta_3 (A_{it}.IQ_{it}) + \gamma' X_{it} + \kappa_t + \eta_i + \epsilon_{it} \tag{3.1}$$

where the variables correspond to:

- Y_{it}: Tax revenues (total, income/capital gains/profits taxes, taxes on goods and services, taxes on international trade) in recipient country i at year t
- A_{it}: Disbursements of foreign aid in recipient country i at year t
- IQ_{it}: The institutional quality index, which in this case is the average of the rule of law, bureaucratic quality and corruption indices of the ICRG in recipient country i at year t
- $A_{it}.IQ_{it}$: The interaction term between foreign aid and institutional quality in recipient country i at year t
- X_{it}: A vector of controls in recipient country i at year t (e.g. agriculture value-added, industry value-added, trade openness, income)
- η_i: The fixed effect component/unobserved heterogeneity
- κ_t: Time fixed effects/common shocks
- ϵ_{it}: The error component

In addition to using total aid disbursements in the model (A_{it}), aid disbursements are broken down according to their type of finance: grants and loans. The procedure used to construct the different variables of aid is explained in Section 2.4. When grants and loans are used instead of total aid they are interacted with the measure of the quality of institutions (IQ_{it}) to explore any possible heterogeneous effects of aid on tax revenue.

More precisely, the model that disaggregates aid into grants and loans is estimated as follows:

$$Y_{it} = \delta_1 Grants_{it} + \delta_2 Loans_{it} + \delta_3 IQ_{it} + \\ \delta_4(Grants_{it}.IQ_{it}) + \delta_5(Loans_{it}.IQ_{it}) + \gamma' X_{it} + \kappa_t + \eta_i + \epsilon_{it} \tag{3.2}$$

where the aid variables correspond to:

- $Grants_{it}$: Disbursements of foreign aid that are given as grants in recipient country i at year t
- $Loans_{it}$: Disbursements of foreign aid that are given as loans in recipient country i at year t

Table 3.2 lists the different dependent variables of the estimated models and Table 3.3 shows the definitions of the key variables in the estimated models.

Table 3.2: Estimated models

Model	Dependent variable
TOT	Total taxes
IPC	Income, capital gains and profits taxes
GS	Taxes on goods and services
TR	Taxes on international trade

Table 3.3: Key Variables

Variable		Definition
Total tax revenue	Y_{it}	Total tax revenue consists of revenue obtained from direct and indirect taxes.
Total aid	A_{it}	Aid disbursements show the actual payments to recipients every year for all purposes.
Aid grants	$Grants_{it}$	Aid disbursements that are given as grants are transfers that the recipient does not need to repay.
Aid loans	$Loans_{it}$	Aid disbursements that are given as loans are transfers for which the recipient incurs legal debt.
Institutional quality	IQ_{it}	The average of the corruption, law and order and bureaucratic quality indices of the ICRG.

Econometric theory

Generally, panel data models include an unobserved heterogeneity component in their error

term. This unobserved component can be modelled and estimated using the FE model for panel data, or can be considered as a component of the error term using the random effects model. Dealing with this FE component usually involves taking first differences and estimating the model or demeaning the variables and estimating a Within-Group (WG) estimator. When using the FE or WG estimators, terms that have no variation over time are removed together with the unobservable component. To account for the heteroscedasticity and the serial correlation that makes Ordinary Least Squares (OLS) inconsistent, static models with country and time FE are estimated, where standard errors are clustered by country. This method guarantees that our estimates are not contaminated by aggregate shocks and trends common to all countries or by time invariant country-specific characteristics.

Identification strategy

The issue of aid endogeneity discussed in the previous study is a concern for this study as well. Reverse causality may be an issue since countries with low revenue mobilisation are likely to receive more aid to cover for their inadequate domestic resources. Therefore, to mitigate concerns of endogeneity of foreign aid and be able to identify a causal effect, lagged values of aid are used instead of contemporaneous values, following the empirical literature (Morrissey et al., 2014, Gupta et al., 2003). With regard to institutional quality, the variable is assumed to be exogenous, although this is a limiting assumption. This assumption is relaxed in a robustness check where lagged institutional quality is considered instead of contemporaneous ones.

In the presence of an interaction term between the foreign aid variable and a continuous measure of institutional quality, the conditional effects of foreign aid need to be calculated and then plotted against institutional quality (Brambor et al., 2006, Blalock, 2005, Friedrich, 1982). The standard errors of the conditional effects of aid are then computed by using the Delta method (Oehlert, 1992).

The interaction term between foreign aid and institutional quality is included in the models to investigate whether the effects of aid on tax revenues or on the components of the budget constraint depend on the level of institutional quality. It is expected that low institutional quality would make aid fungible or more fungible. What fungibility means in terms of tax revenues is a reduction in tax collected meaning that aid resources finance tax reductions and are treated as a substitute to tax revenues. An insignificant marginal effect of aid indicating that receiving aid has no effect on tax collection effort, and a significantly positive marginal effect would give evidence against fungibility. The empirical literature suggests that corruption is associated with reductions in tax revenues directly

and indirectly (Tanzi and Davoodi, 2000, Ghura, 1998) and looking at the coefficient of institutional quality could shed light on how bureaucratic quality, the rule of law and corruption affect tax collection. Nevertheless, fungibility in the context of tax revenues due to the optimal choice of recipient government could be optimal from a welfare perspective (Carter, 2010).

Regarding the additional control variables, debt relief, which is a form of aid itself, is used to reduce the level of a country's indebtedness. Having a large external debt would require more government revenue to be collected for the purpose of debt repayments and it can, therefore, be expected that debt relief and a lower level of external debt would reduce tax collection efforts for the purposes of repayments. Aid diverted towards Non-Governmental Organisations (NGOs) is not expected to impact tax collection decisions made by the recipient government. Income or GDP per capita is expected to enter the model positively since the expected revenue that would be obtained is higher in a richer economy (Besley and Persson, 2014, Lotz and Morss, 1967). Agriculture and industry value-added measure the share of agriculture and industry in an economy. Since agriculture or subsistence farming falls under the informal sector of an economy, it is expected that it will enter the tax revenue model negatively (Teera and Hudson, 2004, Slemrod, 2002, Ghura, 1998, Chelliah, 1971). The opposite holds for the share of industry since tax collection would be easier. Trade openness is used to capture the contribution of trade taxes for economies, as well as the level of protectionism in recipient countries. Trade openness is expected to have a positive coefficient, especially for taxes on international trade since lower protectionism measure would facilitate trade and raise trade taxes (Lotz and Morss, 1967, Rodrik, 1998).

Robustness checks

Dynamic models are also considered for this analysis, however, the relevant tests for instrument validity are not passed. Furthermore, as Carter (2010) points out, dynamic models estimated using appropriate GMM techniques are extremely sensitive to the choice of parameters.[3.14] Following the literature (Morrissey et al., 2014), the models for tax revenues (models TOT, IPC, GS, TR) are estimated using panel time-series techniques as a robustness check. To account for serial correlation first order autocorrelation (AR(1)) or panel specific first order autocorrelation (PSAR(1)) can be specified for the estimated model. When using FGLS the full variance-covariance matrix is estimated and the model estimates rely on the parameter estimates of the variance-covariance matrix. PCSE produces identical results to OLS if no autocorrelation structure is specified but if AR(1) or PSAR(1) are specified Prais-Winstren regressions are used. Both methods are consistent and should yield similar point estimates but the FGLS method is found to under-estimate

[3.14] GMM models are estimated for the first study of this thesis and the results proved to be sensitive.

standard errors (Beck and Katz, 2011, 1996, 1995). For the purposes of this study, the method of PCSE using Prais-Winsten regressions is used with a correlation of AR(1) is specified for the models, following Beck and Katz (1995).

Alternatively, as Carter (2010) points out, the Pesaran and Smith (1995) Mean Group Estimator can be used to identify the slopes for each country i and then averaging the coefficients for each group. Such an estimator can prove to be useful using the panel dataset used for the purposes of this chapter. This estimation techniques provides unbiased coefficients in the presence of heterogeneity and consistent coefficients in the presence of autocorrelation, as opposed to other panel data techniques. Nevertheless, the assumption of strict exogeneity of foreign aid and institutional quality would still have to be made using the Mean Group Estimator.

3.4 Data

3.4.1 Sources

The sample used consists of developing countries from the regions of Eastern Europe, the Caribbean, Latin America, North Africa and the Middle East, Sub-Saharan Africa, South Asia, South East Asia, East Asia and the Pacific, over the period of 1990 - 2013. The sample used for the model of total tax revenues (model TOT) consists of 926 observations for 59 countries. The sample for the model of income, capital gains and profits taxes (model IPC) consists of 1045 observations and 69 countries. For the model of taxes on goods and services (model GS) the sample consists of 1093 observations over 70 countries. The sample for model of taxes on international trade (model TR) consists of 1107 observations for 69 countries. See Appendix B.3 for the full list of countries in each specification

Data for total tax revenue are obtained from the ICTD that collects tax revenue data from various sources, such as various international databases and country reports (Prichard et al., 2014). This dataset offers data for various other types of tax revenues, as well as non-tax revenues and resource revenues. Comparing data from various sources reduces errors and increases the availability of taxation data that suffer from low coverage.

The measure of institutional quality used for this study is the ICRG measure obtained from the Quality of Governance (QoG) dataset published by the University of Gothenburg (Dahlberg et al., 2015). The PRS Group publishes the ICRG index, which consists of economic, financial and political risk factors. The institutional quality index used for the purposes of this study includes three components of the political risk factors averaged together: the extent of corruption, bureaucratic control and law and order. This measure of

corruption focuses mostly on political corruption in the form of patronage, favours, secret funding of parties in power, nepotism and ties between politicians and businesses (Howell, 2011). The component of bureaucratic quality focuses on interruptions in government services due to bureaucratic reasons. High-risk countries are those where the bureaucracy is embedded in the political system and government services. The component on law and order focuses on the strength of the legal system. High-risk countries suffer from a high crime rate with weak sanctions. The index has been rescaled and normalised to range between 0 and 1 so that higher values indicate higher quality of governance.

The ICRG index of corruption is one of the most widespread measures for corruption and has been available since 1985 for a large number of countries. Nevertheless, it is based on the opinion of country experts on how political corruption is expected to affect international investment and businesses. According to its methodology, political data are collected and then transferred into risk points on the basis of the analysis of pre-set questions for each sub-component of the political risk component (i.e. corruption, law and order, bureaucratic quality). These pre-set questions are not made public and, therefore, cannot be challenged. Measuring corruption and the quality of institutions in general, is usually based on individuals' perceptions of corruption in any given country. Measuring perceptions introduces some measurement error in the models since what certain people perceive as corruption is not uniform across the population or between countries. Nevertheless, individuals make decisions and behave accordingly based on such perceptions, so the perception of corruption could be equally important (Razafindrakoto and Roubaud, 2010). Another issue is the fact that perceptions may be easily affected by either the current situation of a country and its economic performance, by the respondent's experiences or by the cultural and societal values of each country (Rothstein and Torsello, 2013). For example, business experts and locals do not experience corruption at the same level and their responses are expected to differ.

Data for foreign aid disbursements are obtained from the Creditor Reporting System (CRS) of the Development Assistance Committee of the OECD (OECD-DAC) that offers disaggregated aid data according to donors, types of foreign aid and sectors (OECD, 2013). The CRS database offers data for disbursements and commitments and the differences between the two variables from year to year are attributed to the fact that commitments may actually be disbursed in a later year. For this reason, disbursements were chosen to best reflect foreign aid from the point of view of recipient countries. Aid disbursements are defined as the actual payments in each year and show the realisation of donors' intentions and previous commitments. Data for aid disbursements are available since 1990 from the CRS database although the availability of aid disbursements is low in the years prior to

2002. Data for debt relief are obtained from the DAC2a Table of the CRS for net debt relief. All of the aid variables have been rescaled to reflect percentages to GDP.

The CRS database classifies flows according to their type and their purpose and this feature was used to construct the measure for aid disbursements. The database also classifies the channel of delivery for each of the flows, which is the 'first implementing partner' that is responsible for the subsequent allocation of the ODA resources. We focused on concessional flows of resources according to the definition for ODA having the public sector as their channel for delivery and more precisely ODA grants (flow code 11), ODA loans (flow code 13) and private concessional loans (flow code 30) that include flows from both bilateral and multilateral donors. The flow codes allowed the construction of the aid grants and aid loans variables. Flows according to channels of delivery and aid modalities was obtained. Data for flows that have as their first implementing partner NGOs were used to construct the 'NGO aid' variable that is included in the regressions and measures the aid disbursements that are directed to NGOs.

The World Development Indicators (2015) (WDI) of the WB are used to obtain data for a number of other variables used in the models, such as GDP per capita, agricultural and industry value-added, trade openness and GDP in current terms for the rescaling of the aid measures (World Bank, 2015).

Detailed definitions of each variable and their sources can be found in Appendix B.4.

3.4.2 Descriptive statistics

Table 3.4 shows the descriptive statistics of the key variables. The sample of each model changes because of data availability; the sample used is based on developing countries that have available information for institutional quality (ICRG) and on tax revenues. Such data for developing countries are not always available and there is a large number of missing values in these samples. Most of the countries included in this sample come from the region of Sub-Saharan Africa.

Tax revenue excluding external grants constitute around 74% of total government revenue and the rest falls under non-tax revenue. Total tax revenue consists of direct and indirect taxes and direct taxes can be broken down to income, capital and profit taxes and property taxes. Indirect taxes are broken down into trade taxes, taxes on goods and services and other taxes. Income/capital/profit taxes constitute around a third of total tax revenue, trade taxes around a fourth of total tax revenue, taxes on goods and services around 40% of total tax, and the rest are property and other taxes. It can be seen that most

of the aid disbursed is in the form of grants rather than loans. Negative values for debt relief refer to the accumulation of more debt offsetting debt forgiveness. The mean of total tax revenue is higher in upper-middle income countries than low income countries, explaining the need of foreign aid resources to fill the gaps. This correlation is also true for institutional quality and income, as expected based on the empirical literature since improved institutional capacities are correlated with higher collected tax revenues. The difference between total aid disbursements and the aggregation of aid grants and aid loans is attributed to aid flows in the form of private concessional loans that are not considered for the purposes of this study.

3.5 Results

3.5.1 Empirical models

This Section discusses the results for the models of total tax revenues and its components estimated using static models with FE. Several robustness checks are also shown, such as the results obtained using PCSEs with an AR(1) component and with dynamic FE.

Table 3.5 shows the results for the different models of tax revenues using aggregate aid disbursements. The first column of each model shows the results of the model without including the interaction term. Aid disbursements are found to have a statistically insignificant effect for all models of tax revenues, except for the case of taxes on international trade where aid has a significantly positive coefficient. Insignificant or positive coefficients give evidence against fungibility since tax revenues do not fall with aid. Institutional quality is not found to be significant for tax revenues, although the coefficients are positive.

Table 3.6 shows the regression coefficients for the different models of tax revenues when total aid disbursements are disaggregated into the two types of finance: aid grants and aid loans. The first column of each model shows the results of the model without including the interaction term. Aid grants are statistically insignificant for all models of tax revenues. Aid loans are significantly positive only for the model GS (column (8)). This positive coefficient can be explained because of the structure of aid: loans, even on concessional terms, need to be repaid either after a longer time period or with a lower interest rate, and tax revenues need to be raised to cover the repayments (Odedokun, 2004).

NGO aid and debt relief are statistically insignificant. An insignificant effect for NGO aid suggests that aid to NGOs does not contribute to raising taxes. An insignificant effect for debt relief suggests that this form of aid does not relief recipient economies from the burden of taxation. Per capita income is statistically insignificant. Trade openness is significantly

positive, as expected, since the growth of trade and the demand for imports and exports generates revenue for the economy (Rodrik, 1998). The share of agriculture value-added for the economy is associated with reductions for tax revenues, agreeing with the empirical literature (Chelliah, 1971). Agriculture is an informal sector where subsistence farming is very common, especially in developing countries. Such an informal sector is difficult to be taxed and this deprives developing countries of potential resources in the form of tax revenues, thus explaining the negative coefficient. Industry value-added, on the other hand, is expected to have a positive coefficient since activities in the industrial sector are easier to be taxed and are likely to generate incomes that are part of the recorded output of the economy that can be taxed (Ghura, 1998). Nevertheless, a significantly negative coefficient is found.

Figure 3.1 shows the conditional effects of total aid disbursements for the different models of tax revenues at the range of the ICRG variable. The conditional effects of total aid for all types of tax revenues, except for the case of taxes on international trade are insignificant and this finding holds at all levels of institutional quality. The conditional effect of aggregate aid on taxes on international trade is generally statistically insignificant and significantly positive in low to middle levels of institutional quality (ICRG values 0.2 - 0.4). Although an insignificant effect is an indication against fungibility, a positive marginal effect indicates that aid is definitely not fungible as it is associated with increases in tax revenue collected from trade, possibly because foreign aid provides resources in foreign currency that can be used for buying imported goods (Bacha, 1990). These results suggest that total aid is not associated with tax reductions and there is no evidence for fungibility with regard to tax revenues.

Figure 3.2 shows the conditional effect of total aid grants for the different models of tax revenues at the range of the ICRG variable. The conditional effects of aid grants follow a similar pattern with aggregate aid: aid grants leave tax revenues unaffected. This finding holds for all levels of institutional quality and for all types of tax revenues.

Figure 3.3 shows the conditional effect of total aid loans for the different models of tax revenues at the range of the ICRG variable. The conditional effect of aid loans is insignificant at all values of the ICRG for all four models, except for taxes on international trade. The conditional effect of aid loans on taxes on international trade is significantly positive at low levels of institutional quality (ICRG values of 0 - 0.3).[3.15]. Loans are generally expected to have a significantly positive effect on tax revenues since they are expected to be repaid (Gupta et al., 2003). Nevertheless, this positive effect is present only for taxes on international trade and at low values of institutional quality, contradicting the

[3.15]Some examples of countries that take such values are Liberia, Mali and Nigeria.

initial hypothesis of this study that improvements in institutional quality are expected to increase the fiscal capacity of countries and raise tax revenues.

Based on the results described above, total aid disbursements, as well as aid decomposed into types of finance, are not associated with tax reductions. This finding holds for total taxes as well as for important sub-components of total taxes (income/capital gains/profits taxes, taxes on goods and services, taxes on international trade). Institutional quality is generally not found to be important for these results as we observe no evidence for fungibility for all levels of institutional quality. Surprisingly, at lower values of the ICRG, aggregate aid disbursements and aid in the form of loans are associated with increases in taxes on international trade, contradicting the initial hypothesis. Another surprising finding of this study is that institutional quality is not important for taxes in the regressions. Overall, these findings agree with Clist and Morrissey (2011) and Morrissey et al. (2014), who find either an insignificant or a positive effect of aid on taxes.

3.5.2 Robustness checks

To ensure that the results are robust, alternative estimation methods and samples are used. Panel time-series techniques are used and the models are estimated with PCSEs with an AR(1) component. Appendix B.2 displays the conditional effects of these specifications. Secondly, dynamic panel data models with FE are estimated. Furthermore, to extend the FE analysis lagged values for the aid variables are also considered to capture the issue of endogeneity of aid in revenue models. Also, lagged values of the ICRG variable are used to correct for the potential endogeneity between institutional quality or corruption and tax revenue. Additionally, the institutional quality measure is replaced with the average of the six Worldwide Governance Indicators developed by Kaufmann and Zoido-Lobatón (1999) (World Bank, 2014). These results are not shown but are available upon request.

These results results remain mostly robust to these alternative econometric techniques. Although the significance of the coefficients changes in some instances: for example, aid grants have a significantly positive effect on total taxes and on taxes on goods services at high levels of institutional quality, the inference of the results does not chance. Overall, we find no evidence of fungibility in the context of tax revenues at any level of institutional quality: aid flows are not found to finance tax reductions.

3.6 Conclusion

Following the results of Chapter 1, where aid is found to be fungible in the context of public spending, the aim of this study was to examine aid fungibility with regard to tax revenues, by looking at total tax revenues and some of its important sub-components, such as income/capital gains/profits taxes, taxes on goods and services and taxes on international trade. The hypothesis of this study was that institutional quality plays a role for fungibility and more precisely, higher institutional quality was expected to be associated with a higher conditional effect of aid since improvements in institutional quality are found to increase tax revenues in the empirical literature.

Fungibility can arise for a number of reasons. It could arise due to the optimal choice of recipient governments that consider their total revenue - including domestic and external resources - when allocating funds across their budget. According to this explanation, aid could impact revenue negatively. Aid could finance tax reductions since fungibility could also arise due to malicious intent, possibly when institutions are weak as characterised by environments of high corruption, a large and cumbersome bureaucracy and a weak rule of law, or due to aid illusion.

A new dataset on tax revenues was used that considers both central and general government data. Most studies in the literature use central tax revenues and this could underestimate tax revenue collection efforts in federal states. Following the empirical literature (Yohou et al., 2016, Morrissey et al., 2014, Benedek et al., 2012, Alonso and Garcimartín, 2011, Gupta et al., 2003) several estimation techniques were employed considering the serial correlation that exists in such models. Static, dynamic and panel time-series models were estimated for several dependent variables of tax revenues. Aggregate aid and aid disaggregated into the two types of finance: aid grants and aid loans. According to the literature, the various types of aid were expected to impact tax revenues in a different way.

With regard to tax revenues, the hypothesis that institutional quality plays a role for fungibility is not supported for either aggregate or disaggregated aid into types of finance. Total aid disbursements, aid grants and aid loans are found to leave tax revenues unaffected. In some cases a positive conditional effect is found. The fact that the effect of aid is either statistically insignificant or significantly positive provides evidence against fungibility with regard to tax revenue since aid is not found to finance tax reductions.

The results are largely based on the ICRG measure of institutional quality. As discussed previously, measures of institutional quality are highly subjective as they involve percep-

tions and the assessment of country experts, who can easily be affected by a number of factors. The conditional effects of aid were estimated over the range of this institutional quality measure and this could be problematic for the values estimated at the extremes, although looking at the descriptive statistics indicates that extreme values of the ICRG are not present in these samples. Furthermore, the measure capturing institutional quality is an average of three political components: bureaucratic quality, the extent of corruption and law and order. It is unclear which component drives these results. Furthermore, alternative estimation techniques can be used, for example the Mean Group Estimator proposed by Pesaran and Smith (1995) and suggested by Carter (2010).

Moreover, this analysis of tax revenues can be extended by looking at the different aid modalities as off-budget aid, which is given as technical cooperation and training, would be expected to affect tax revenues positively by building the necessary state capacities for tax collection.

Chatterjee et al. (2012) explain that aid fungibility could arise due to the optimal choice of recipient governments, where they adjust another component of their budget constraint. For example, the recipient government may react to changes in aid by adjusting spending, tax revenues, external borrowing or by deciding to run a public surplus. So far this thesis has examined the effects of aid on government spending and tax revenues. An alternative method of examining the extent of fungibility would be to consider all components of the budget constraint over a common sample. This method could explain how recipients behave with aid receipts and how they adjust their public finances. Looking at the complete component of the budget constraint could also shed light on the cause behind fungibility. The results of Chapter 2 suggest that aid does not have the anticipated effect on expenditures, especially in environments of low institutional quality. Examining the components of the budget constraint will allow us to understand if governments are behaving optimally and adjusting borrowing or the fiscal balance upon receiving aid flows, or if aid is leaked out of the budget.

3.7 Figures and Tables

Table 3.4: Descriptive statistics, 1990 - 2013

Variable	Mean	Std. Dev.	Min	Max
Total taxes: 926 observations (59 countries for 1990 - 2013, unbalanced)				
Total tax revenue	13.057	5.453	2.166	29.627
Total aid disbursements	4.206	10.878	0	184.863
Aid grants	2.460	5.424	0	97.370
Aid loans	0.946	1.803	0	39.829
ICRG	0.446	0.122	0.097	0.900
Debt relief	0.483	2.786	-0.907	63.899
NGO share of aid	0.210	0.909	0	12.595
Income, capital gains and profits taxes: 1045 observations (69 countries for 1990 - 2013, unbalanced)				
Income, capital gains and profits taxes	4.885	3.828	0.092	31.469
Total aid disbursements	4.421	10.112	0	184.863
Aid grants	2.718	5.045	0	53.910
Aid loans	1.043	1.970	0	39.829
ICRG	0.442	0.125	0.083	0.898
Debt relief	0.581	3.231	-0.907	63.898
NGO share of aid	0.243	0.845	0	11.280
Taxes on goods and services: 1093 observations (70 countries for 1990 - 2013, unbalanced)				
Taxes on goods and services	5.936	3.891	0	29.088
Total aid disbursements	4.420	9.929	0	184.863
Aid grants	2.702	4.968	0	53.910
Aid loans	1.043	1.925	0	39.829
ICRG	0.445	0.121	0.083	0.898
Debt relief	0.613	3.249	-0.907	63.900
NGO share of aid	0.242	0.831	0	11.286
Taxes on international trade: 1107 observations (69 countries for 1990 - 2013, unbalanced)				
Taxes on international trade	2.645	2.059	0	13.129
Total aid disbursements	4.364	9.892	0	184.863
Aid grants	2.652	4.922	0	53.910
Aid loans	1.024	1.905	0	39.829
ICRG	0.442	0.123	0.083	0.898
Debt relief	0.616	3.239	-0.907	63.900
NGO share of aid	0.235	0.825	0	11.280

The variables are expressed in percentages of GDP, with the exception of the ICRG variable. The sample of each model changes due to data limitations, leaving an unbalanced panel dataset from 1990 - 2013.

Table 3.5: Static FE: Tax revenue models - Total aid disbursements

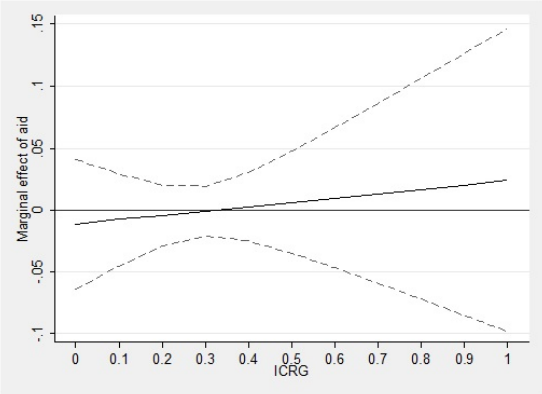
	Model TOT		Model IPC		Model GS		Model TR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total aid disbursements	0.005	-0.011	0.007	0.039	-0.004	-0.041	0.020**	0.067**
	(0.013)	(0.033)	(0.015)	(0.043)	(0.014)	(0.047)	(0.009)	(0.034)
Interaction (ICRG*Total aid)		0.044		-0.090		0.102		-0.132
		(0.100)		(0.095)		(0.104)		(0.080)
ICRG	0.847	0.768	1.683	1.842	0.113	-0.068	-0.435	-0.224
	(1.619)	(1.631)	(1.806)	(1.800)	(1.401)	(1.432)	(1.075)	(1.055)
NGO aid	0.031	0.031	-0.023	-0.023	-0.022	-0.021	0.005	0.004
	(0.027)	(0.027)	(0.040)	(0.039)	(0.019)	(0.019)	(0.018)	(0.018)
Debt relief	-0.005	0.003	-0.030	-0.048	-0.007	0.011	-0.002	-0.025
	(0.031)	(0.031)	(0.033)	(0.039)	(0.022)	(0.037)	(0.017)	(0.028)
GDP per capita	-0.345	-0.355	0.999	1.050	0.090	0.036	-0.313	-0.224
	(1.027)	(1.026)	(1.282)	(1.282)	(0.594)	(0.594)	(0.613)	(0.565)
Openness	0.029***	0.030***	0.021***	0.021***	0.014*	0.014**	0.006	0.006
	(0.008)	(0.008)	(0.006)	(0.006)	(0.007)	(0.007)	(0.005)	(0.005)
Agriculture value-added	-0.077***	-0.077***	-0.023	-0.021	-0.059***	-0.061***	-0.019	-0.015
	(0.029)	(0.029)	(0.029)	(0.030)	(0.021)	(0.021)	(0.019)	(0.018)
Industry value-added	-0.150***	-0.150***	0.041	0.042	-0.067***	-0.068***	0.001	0.002
	(0.031)	(0.031)	(0.053)	(0.053)	(0.022)	(0.021)	(0.019)	(0.019)
R-squared	0.339	0.339	0.116	0.116	0.291	0.293	0.157	0.163
F-test	17.887	16.938	8.791	9.742	4.505	4.420	10.159	11.188
No. of countries	59	59	69	69	70	70	69	69
N	926	926	1045	1045	1093	1093	1107	1107

All specifications control for a full set of country and year fixed effects. Column titles refer to the dependent variable (TOT: total taxes; IPC: Income, Profits and Capital gains taxes, GS: Goods and Services taxes; and TR: Trade taxes. The fiscal variables, aid, debt relief, openness, agriculture and industry value-added are expressed as percentages of GDP. Robust standard errors, clustered by country are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

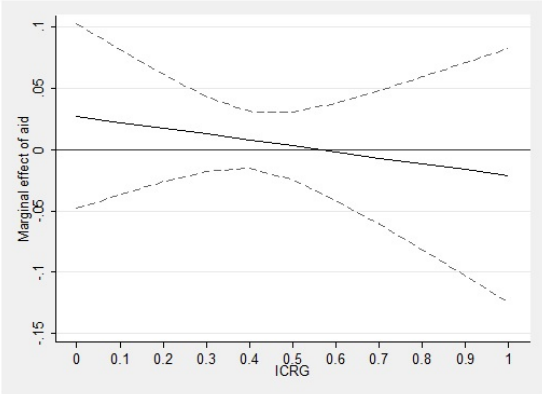
Table 3.6: Static FE: Tax revenue models - Disaggregated aid disbursements into grants and loans

	Model TOT		Model IPC		Model GS		Model TR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Aid grants	0.021	-0.071	0.030	0.045	-0.014	-0.046	0.017	0.021
	(0.017)	(0.083)	(0.034)	(0.052)	(0.030)	(0.055)	(0.021)	(0.030)
Aid loans	0.078	0.042	0.015	0.114	0.051	-0.038	0.032	0.172**
	(0.057)	(0.161)	(0.033)	(0.094)	(0.034)	(0.086)	(0.027)	(0.079)
Interaction (ICRG*Aid grants)		0.301		-0.038		0.088		-0.003
		(0.295)		(0.103)		(0.111)		(0.074)
Interaction(ICRG*Aid loans)		0.071		-0.276		0.237		-0.396*
		(0.478)		(0.295)		(0.260)		(0.225)
ICRG	0.599	0.190	1.566	1.805	0.059	-0.231	-0.363	-0.039
	(1.580)	(1.707)	(1.804)	(1.881)	(1.387)	(1.439)	(1.097)	(1.099)
NGO aid	0.027	0.027	-0.025	-0.025	-0.020	-0.020	0.001	0.001
	(0.026)	(0.026)	(0.038)	(0.037)	(0.019)	(0.019)	(0.017)	(0.017)
Debt relief	-0.033	-0.025	-0.040	-0.053*	-0.020	-0.005	0.012	-0.000
	(0.029)	(0.032)	(0.027)	(0.029)	(0.022)	(0.025)	(0.018)	(0.019)
GDP per capita	-0.279	-0.254	1.097	1.141	0.080	0.019	-0.375	-0.332
	(1.031)	(1.033)	(1.266)	(1.267)	(0.603)	(0.603)	(0.614)	(0.604)
Openness	0.027***	0.027***	0.020***	0.020***	0.012*	0.012*	0.007	0.007
	(0.009)	(0.008)	(0.006)	(0.006)	(0.007)	(0.007)	(0.005)	(0.005)
Agriculture value-added	-0.075**	-0.071**	-0.020	-0.018	-0.060***	-0.062***	-0.021	-0.019
	(0.030)	(0.029)	(0.029)	(0.030)	(0.021)	(0.021)	(0.020)	(0.020)
Industry value-added	-0.147***	-0.145***	0.044	0.043	-0.067***	-0.067***	-0.001	-0.001
	(0.031)	(0.032)	(0.052)	(0.052)	(0.021)	(0.021)	(0.019)	(0.019)
R2	0.342	0.344	0.117	0.117	0.294	0.296	0.151	0.155
F-test	20.934	18.482	8.315	9.422	4.634	4.376	5.522	7.167
No. of countries	59	59	69	69	70	70	69	69
N	926	926	1045	1045.000	1093	1093	1107	1107

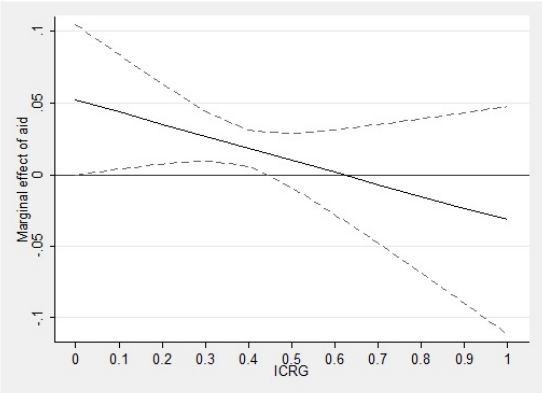
All specifications control for a full set of country and year fixed effects. Column titles refer to the dependent variable (TOT: total taxes; IPC: Income, Profits and Capital gains taxes, GS: Goods and Services taxes; and TR: Trade taxes. The fiscal variables, aid, debt relief, openness, agriculture and industry value-added are expressed as percentages of GDP. Robust standard errors, clustered by country are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.



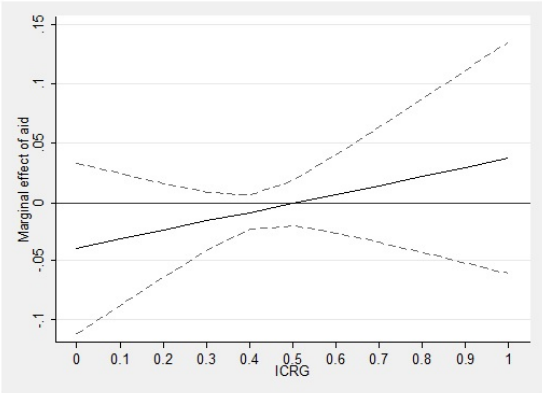
(a) Total taxes



(b) Income, profits and capital gains taxes

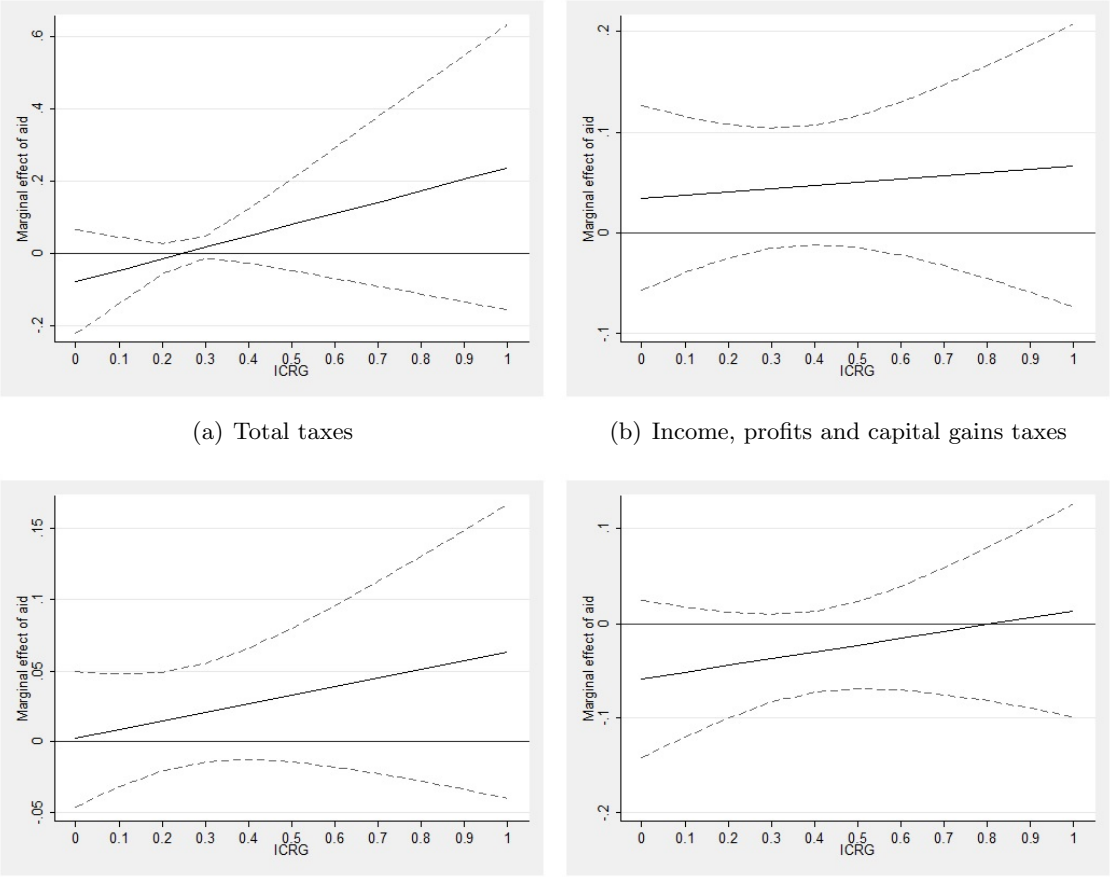


(c) International trade taxes



(d) Taxes on goods and services

Figure 3.1: The conditional effects of total aid disbursements
The effects are calculated from Table 3.5. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown.The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.



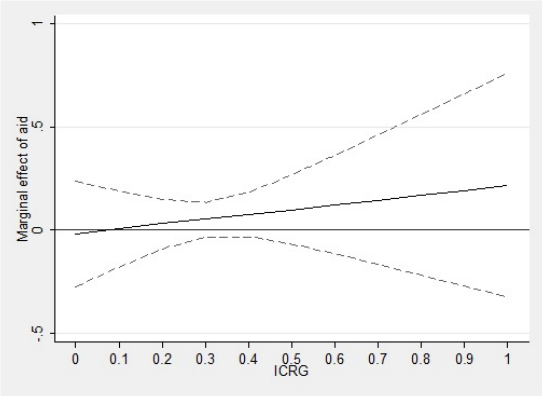
(a) Total taxes

(b) Income, profits and capital gains taxes

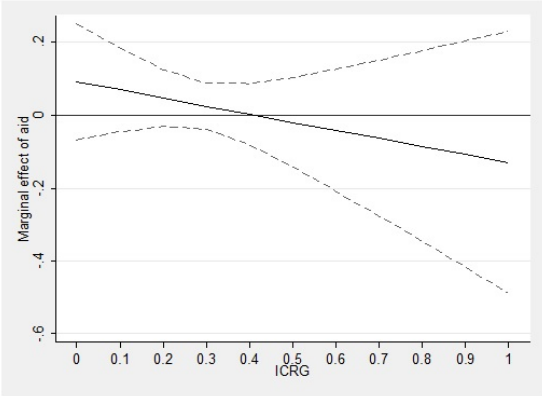
(c) International trade taxes

(d) Taxes on goods and services

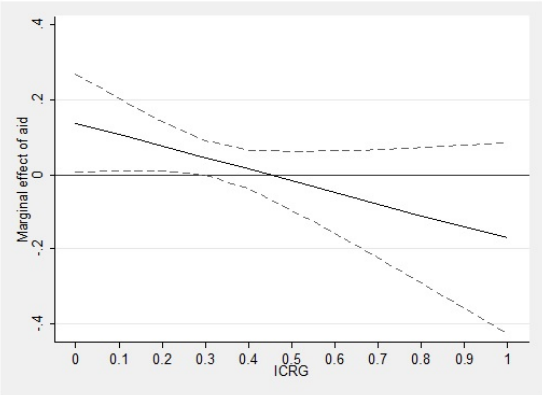
Figure 3.2: The conditional effects of total aid grants
The effects are calculated from Table 3.6. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown.The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.



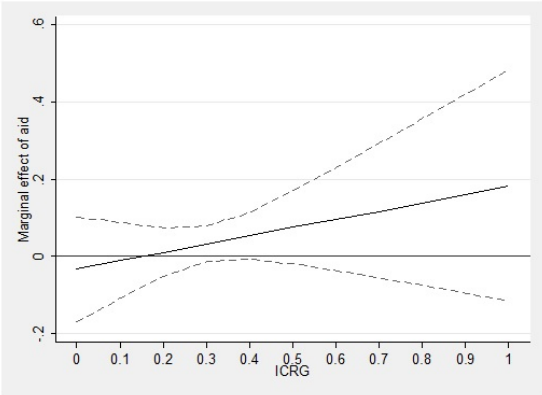
(a) Total taxes



(b) Income, profits and capital gains taxes



(c) International trade taxes



(d) Taxes on goods and services

Figure 3.3: The conditional effects of total aid loans
The effects are calculated from Table 3.6. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown.The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

Appendix B:

B.1 Descriptive statistics

Appendix B.1 contains information on the variables used for the analysis.

Figure B.1.1 shows the normal distribution of the ICRG variable used.

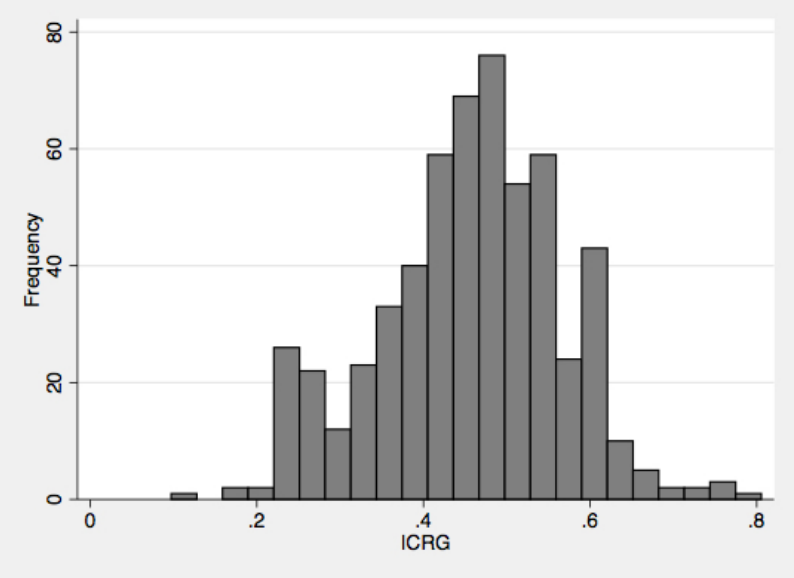
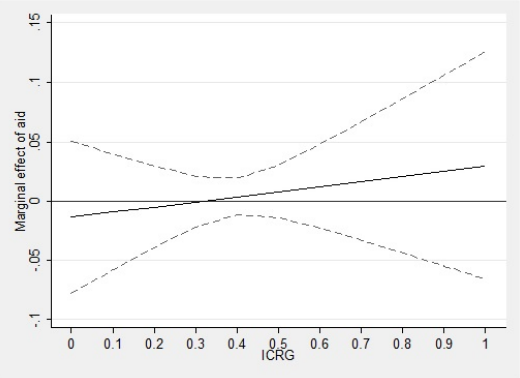


Figure B.1.1: ICRG distribution

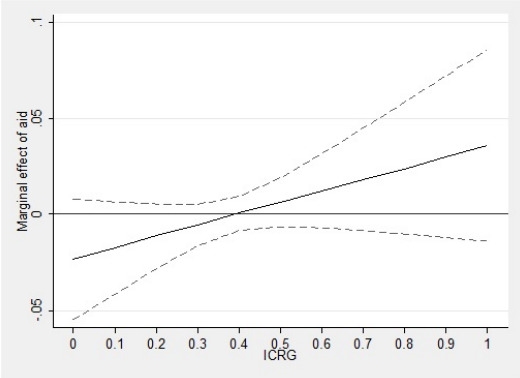
B.2 Empirical results: Robustness checks

Appendix B.2 displays the conditional effects of aggregate aid, aid grants and aid loans using panel time-series techniques using PCSEs regressions with an AR(1) component.

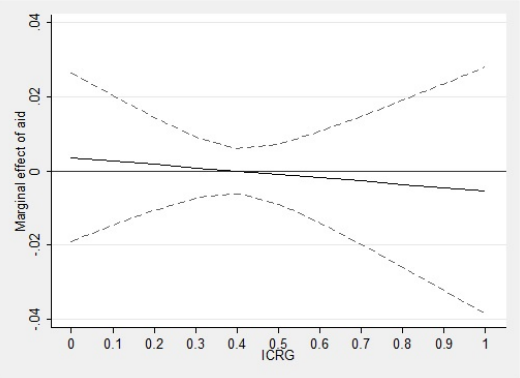
Figure B.2.1 shows the conditional effects of total aid disbursements for the different models of tax revenues at the range of the ICRG variable. Figures B.2.2 and B.2.3 shows the conditional effect of total aid grants and aid loans, respectively.



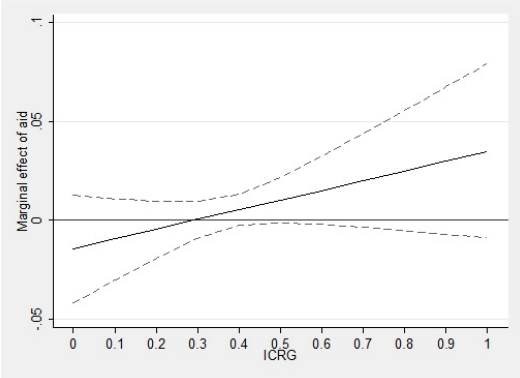
(a) Total taxes



(b) Income, profits and capital gains taxes

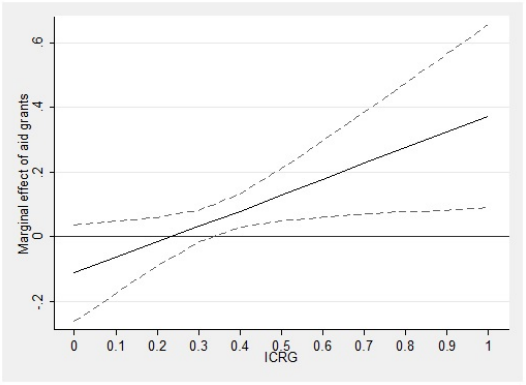


(c) International trade taxes

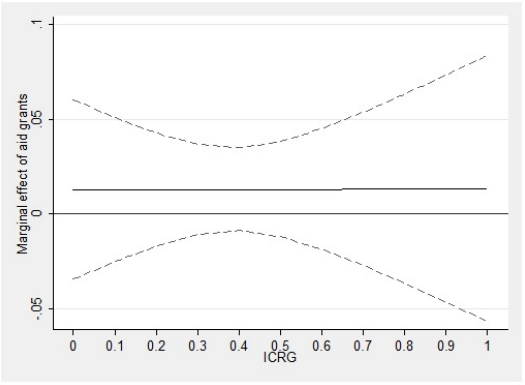


(d) Taxes on goods and services

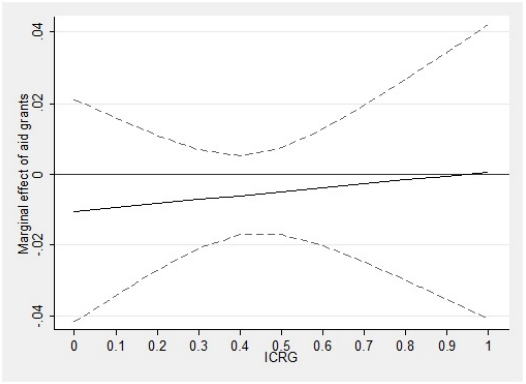
Figure B.2.1: The conditional effects of total aid disbursements
PCSEs regressions are estimated with an AR(1) component. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown.The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.



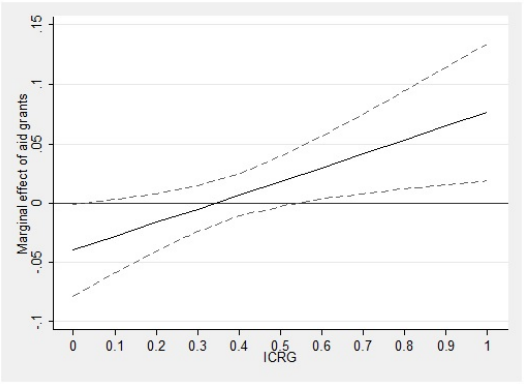
(a) Total taxes



(b) Income, profits and capital gains taxes

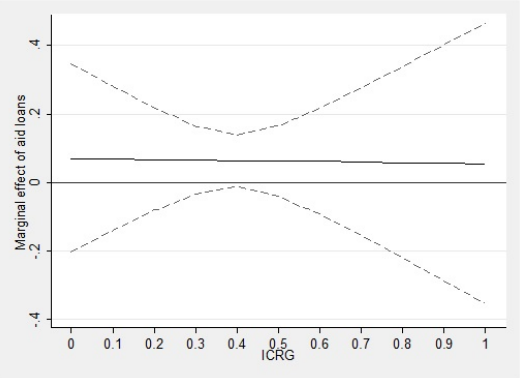


(c) International trade taxes

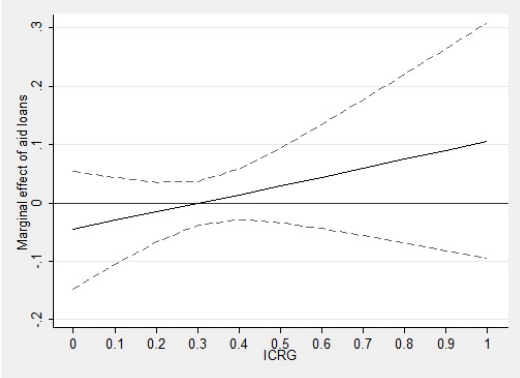


(d) Taxes on goods and services

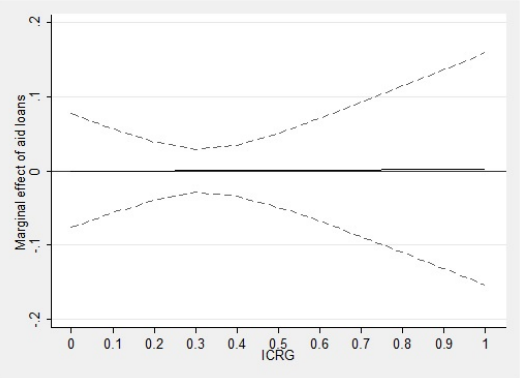
Figure B.2.2: The conditional effects of total aid grants
PCSEs regressions are estimated with an AR(1) component. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown.The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.



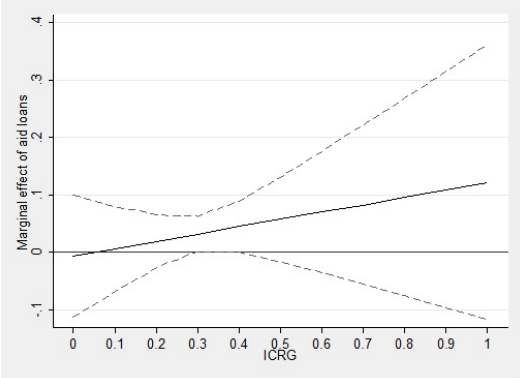
(a) Total taxes



(b) Income, profits and capital gains taxes



(c) International trade taxes



(d) Taxes on goods and services

Figure B.2.3: The conditional effects of total aid loans
PCSEs regressions are estimated with an AR(1) component. Standard errors are calculated using the Delta method. Confidence intervals at the 95% level are shown.The conditional effect is estimated over the range of the ICRG variable, where higher values indicate higher institutional quality.

B.3 Sample

Appendix B.3 displays the countries included in the empirical estimations.

Country	Model TOT	Model IPC	Model GS	Model TR
Albania	✓	✓	✓	✓
Algeria	✓	✓	✓	✓
Angola	✓	✓	✓	✓
Armenia		✓	✓	✓
Azerbaijan	✓	✓	✓	✓
Bangladesh	✓	✓	✓	✓
Belarus	✓	✓	✓	✓
Bolivia	✓	✓	✓	✓
Botswana	✓	✓	✓	✓
Burkina Faso	✓	✓	✓	✓
Cameroon	✓	✓	✓	✓
Colombia	✓			
Congo, Dem. Rep.		✓	✓	✓
Congo Rep.	✓	✓	✓	✓
Costa Rica	✓	✓	✓	✓
Cote d'Ivoire	✓		✓	✓
Cuba		✓	✓	✓
Dominican Republic	✓	✓	✓	✓
Ecuador	✓	✓	✓	✓
Egypt, Arab Rep.		✓	✓	✓
El Salvador	✓	✓	✓	✓
Ethiopia	✓	✓	✓	
Gabon		✓	✓	✓
Ghana	✓	✓	✓	✓
Guatemala	✓	✓	✓	✓
Guinea		✓	✓	✓
Guinea-Bissau	✓	✓	✓	✓
Guyana		✓	✓	✓
Honduras		✓	✓	✓
India	✓	✓	✓	✓
Indonesia	✓	✓	✓	✓
Iran, Islamic Rep.		✓	✓	✓
Jamaica	✓	✓	✓	✓
Kenya	✓	✓	✓	✓
Liberia	✓	✓	✓	✓
Madagascar	✓	✓	✓	✓
Malawi	✓	✓	✓	✓
Malaysia	✓	✓	✓	✓
Mali	✓	✓	✓	✓
Mexico	✓	✓	✓	✓
Moldova	✓	✓	✓	✓

Country	Model TOT	Model IPC	Model GS	Model TR
Mongolia	✓	✓	✓	✓
Morocco	✓	✓	✓	✓
Mozambique	✓	✓	✓	✓
Namibia	✓	✓	✓	✓
Nicaragua		✓	✓	✓
Niger	✓	✓	✓	✓
Nigeria	✓	✓	✓	✓
Pakistan	✓	✓	✓	✓
Panama	✓	✓	✓	✓
Papua New Guinea	✓	✓	✓	✓
Paraguay	✓	✓	✓	✓
Peru	✓	✓	✓	✓
Senegal	✓	✓	✓	✓
Serbia	✓	✓	✓	✓
Sierra Leone	✓	✓	✓	✓
South Africa	✓	✓	✓	✓
Sri Lanka	✓	✓	✓	✓
Sudan	✓	✓	✓	✓
Suriname		✓	✓	✓
Tanzania	✓	✓	✓	✓
Thailand	✓	✓	✓	✓
Togo	✓	✓	✓	✓
Tunisia	✓	✓	✓	✓
Uganda	✓	✓	✓	✓
Ukraine	✓	✓	✓	✓
Venezuela, RB	✓	✓	✓	✓
Vietnam	✓	✓	✓	✓
Yemen, Rep.	✓	✓	✓	✓
Zambia	✓	✓	✓	✓
Zimbabwe		✓	✓	✓
Total	71	69	70	69

B.4 Definitions and sources of variables

Appendix B.4 shows detailed definitions and sources of the main variables of interest (taxation revenue, foreign aid and institutional quality), as well as the control variables used in the empirical models.

Variables	Definitions	Sources
Total tax revenue, (percentages of GDP)	Total revenue from direct and indirect taxes. Direct taxes include taxes on income, profits and capital gains and property taxes. Indirect taxes include taxes on goods and services, taxes on international trade and other taxes. Tax revenue refers to compulsory transfers to the central government for public purposes. Certain compulsory transfers such as fines, penalties, and most social security contributions are excluded. Refunds and corrections of erroneously collected tax revenue are treated as negative revenue.	Government Revenue Dataset (GRD), developed by the ICTD. The dataset meticulously combines data from several major international databases, as well as drawing on data compiled from all available IMF Article IV reports.
Income, profits and capital gains tax revenue, (percentages of GDP)	Revenue from income, profits and capital gains tax revenue that constitute taxes on individuals and on corporations. Taxes on income, profits, and capital gains are levied on the actual or presumptive net income of individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets. Intragovernmental payments are eliminated in consolidation.	GRD developed by the ICTD.
International trade tax, (percentages of GDP)	Revenue from international trade taxes on exports and imports. Taxes on international trade include import duties, export duties, profits of export or import monopolies, exchange profits, and exchange taxes.	GRD developed by the ICTD.
Taxes on goods and services, (percentages of GDP)	Taxes on goods and services include general sales and turnover or value added taxes, selective excises on goods, selective taxes on services, taxes on the use of goods or property, taxes on extraction and production of minerals, and profits of fiscal monopolies.	GRD developed by the ICTD.
Total aid disbursements (percentages of GDP)	Disbursements show actual payments in each year. They show the realisation of donors' intentions and the implementation of their policies. They are required to examine the contribution of donors' actions in development achievements and they better describe aid flows from a recipient's point of view. These values are computed using aid disbursements in current USD calculated over GDP in current USD.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.

Variables	Definitions	Sources
Aid grants, (percentages of GDP)	Grants are transfers in cash or in kind for which no legal debt is incurred by the recipient. The grant element in the ODA definition is a mathematical assessment of the financial terms of a transaction or set of transactions. It is the difference between the face value of a loan and the present value (calculated at a rate of discount of 10 per cent) of the service payments the borrower will make over the lifetime of the loan, expressed as a percentage of the face value. Three factors determine the grant element: interest rate (per cent per annum), grace period, i.e. the interval from commitment date to the date of the first payment of amortisation, maturity, i.e. the interval from commitment date to the date of the last payment of amortisation.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.
Aid loans, (percentages of GDP)	Loans are transfers in cash or in kind for which the recipient incurs a legal debt. Official loans are those with fixed maturities made by governments (central and local) or official (non-monetary) agencies, for which repayment is to be made by the recipient country. This includes loans repayable in the borrowers currency whether the lender intends to repatriate the repayments or to use them in the borrowing country.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.

Variables	Definitions	Sources
ICRG	The mean value of the ICRG variables 'Corruption', 'Law and Order' and 'Bureaucracy Quality', ranging between 0 and 1. The index has been rescaled so that higher values indicate low quality of governance. This political risk rating assesses various political components and how they are a 'threat' to foreign/international investment/business. The component of corruption assesses corruption within the political system and is mostly concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding and suspiciously close ties between politics and business. The components of law and order are assessed separately. The Law sub-component is an assessment of the strength and impartiality of the legal system, while the Order sub-component is an assessment of popular observance of the law. The bureaucracy quality component measures the institutional strength and quality of the bureaucracy and high points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services.	QoG (2015) dataset published by the University of Gothenburg (Original sources: ICRG by the Political Risk Services (PRS) Group).
Debt relief (percentages of GDP)	The sum of debt forgiveness and rescheduling, other action on debt, and offsetting entries for debt forgiveness. Groups all actions relating to debt (forgiveness, conversions, swaps, buybacks, rescheduling, refinancing) and their offsetting entries.	OECD-DAC, Table DAC2a.
NGO aid (percentages of GDP)	Aid flows having NGOs as the first implementing agent. These flows correspond to the total aid or for each sector or purpose that are given on concessional terms.	Author's calculations using WDI (2015) and CRS data of the OECD-DAC.
GDP per capita, PPP international $	GDP per capita based on Purchasing Power Parity (PPP). GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2005 international dollars.	WDI (2015) (Original source: WB International Comparison Program database).

Variables	Definitions	Sources
Agriculture value-added (percentages of GDP)	Agriculture corresponds to ISIC divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3. Note: For VAB countries, gross value added at factor cost is used as the denominator.	WDI (2015) (Original source: WB national accounts data, and OECD National Accounts data files).
Industry value-added, (percentages of GDP)	Industry corresponds to ISIC divisions 10-45 and includes manufacturing (ISIC divisions 15-37). It comprises value added in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3. Note: For VAB countries, gross value added at factor cost is used as the denominator.	WDI (2015) (Original source: WB national accounts data, and OECD National Accounts data files.).
Openness (percentages of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI (2015) (Original source: WB national accounts data, and OECD National Accounts data files).
Population ages 0-14 (percentages of total)	Population between the ages 0 to 14 as a percentage of the total population. Population is based on the de facto definition of population.	WDI (2015) (Original source: The UN Population Division's World Population Prospects).

Chapter 4

Foreign aid, political incentives and favouritism

4.1 Introduction

4.1.1 Background and motivation

It is evident from the literature that foreign aid may not be used by recipient countries the way it was intended by the donors. This issue of aid fungibility, identified in the findings of Chapter 2, is exacerbated in environments of poor quality institutions, weak rule of law, lack of transparency in transactions and poor management of public funds (Bräutigam and Knack, 2004). The primary recipients of foreign aid flows are the recipient governments. Given that they have more information than the donors, it can be assumed that the recipient governments in power have the discretion to handle and distribute the allocated aid flows (Wright and Winters, 2010).

This creates incentives for political leaders to distribute foreign aid in a way that is beneficial to them, i.e. in exchange for political support and to maximise their vote share and tenure in office (Masaki, 2015, Licht, 2010). The literature on distributive politics offers two theories about how political leaders allocate public resources for electoral purposes: the 'core vote hypothesis' and the 'swing voter hypothesis' (Lindbeck and Weibull, 1987). Core voters are considered those that continuously support the incumbent unconditionally (Cox and McCubbins, 1986). Swing voters are considered those that have 'weak party preferences', are indifferent to voting for a specific political leader and can be easily swayed into favouring the incumbent (Lindbeck and Weibull, 1987). In the context of Africa, however, ethnicity plays a vital role in politics since the voting patterns in Africa are based on ethnic cleavages (Weghorst and Lindberg, 2013, Posner, 2007).[4.1] Along these lines, political leaders might favour co-ethnic regions and distribute resources to members of their own ethnic group or to their home region (Kasara, 2007).

Ethnic or political favouritism can be achieved through various ways: by providing jobs, goods and services, investment, favourable taxation or in the context of foreign aid by diverting aid projects to regions where voters of 'high returns' would benefit from (Robinson and Verdier, 2013, Kasara, 2007). Targeting a specific group of voters can be considered as an investment on behalf of the political leaders and 'high-returns' in terms of voters

[4.1] Ethnicity in Africa can be defined in various ways: for example, it can be based on religion, language or tribal affiliation (Posner, 2007).

corresponds to a higher number of votes received by the incumbent (Cox and McCubbins, 1986). This process refers to patronage, defined by Weingrod (1968) as 'the ways in which party politicians distribute public jobs or special favours in exchange for electoral support'.

The literature on foreign aid has mostly focused on the allocation of foreign aid at the donor level and identified that different donors have various motives behind aid giving. For example, the French are more likely to allocate aid to their former colonies (McKinlay and Little, 1979). Multilateral agencies such as the World Bank (WB) reward high institutional quality and good policies. Bilateral donors such as the United Kingdom or the Scandinavian countries focus on recipient need, whereas strategic interests, such as access to natural resources or former colonies are also found to be important for bilateral donors such as the United States (Nunnenkamp and Thiele, 2006, Alesina and Dollar, 2000, Frey and Schneider, 1986). The recent collection of sub-national data from different donors and different recipient countries allows us to examine aid allocation at the recipient level. More precisely, how aid projects are allocated to different provinces and districts within recipient countries (Dreher et al., 2016, Briggs, 2014, Jablonski, 2014, Briggs, 2012). This study aims to explore how political leaders allocate foreign aid across districts, naming in which cases ethnic or political economy motives prevail.

Foreign aid flows have been increasing in recent years, particularly from non-traditional 'new' donors, who are not part of the Development Assistance Committee of the Organisation for Economic Cooperation and Development (OECD-DAC) (Dreher et al., 2011, Woods, 2008, Manning, 2006). Aid from donors such as China, Saudi Arabia and Venezuela has been referred to as 'rogue' aid, which is defined to be non-democratic and non-transparent that undermines development policies set by the traditional Western donors (Naím, 2007). The motives behind aid allocation from these 'new' and 'emerging' donors are found to follow somewhat different patterns than that of the traditional and 'established' ones (Dreher and Fuchs, 2015, Dreher et al., 2011, Woods, 2008, Villanger, 2007). For example, recipient need or good institutional quality is not rewarded by new donors, whereas strategic or political interests are not found to be more important (Dreher et al., 2011).

Along these lines, Chinese aid is found to be shaped by motives relating to trade partnerships and natural resources in recipient countries (Dreher et al., 2011, Tull, 2006). One of the principles of Chinese aid is 'respect for sovereignty with no conditions attached' (Bräutigam, 2011). It is mainly given to promote and forge a partnership between China and Africa for trade and investment (Nissanke and Söderberg, 2011). It is generally given without much monitoring, lack of transparency and no conditions and its sub-national

allocation is, therefore, up to the discretion of the recipient governments. These characteristics make such flows more vulnerable to political capture, thus serving the interests and agendas of political leaders (Manning, 2006). On the other hand, aid from traditional and 'established' Western donors such as the WB or the OECD-DAC can be characterised as aid targeted for specific projects where there is greater monitoring, thus making such flows more difficult to be used for political purposes (Dreher et al., 2016, Winters, 2010). Nevertheless, Masaki (2015) and Jablonski (2014) find evidence that the allocation of WB aid is also driven by political motives.

4.1.2 Research question and data

The purpose of this study is to investigate the possibility of ethnic and/or political economy motives in the sub-national allocation of foreign aid in a panel of 17 African countries. Political leaders might allocate resources towards their own constituencies and to their core voters that support the incumbent unconditionally. On the other hand, leaders might target swing voters, whose 'political support for opposition parties can be swayed depending on the government's development awards' (Masaki, 2015). Alternatively, political leaders might find optimal to divert resources towards their co-ethnic or birth regions. This study focuses mainly on aid commitments from the WB, which are subsequently aggregated with aid commitments from China to examine if the degree of electoral competitiveness makes political leaders to distribute aid flows differently amongst regions for political economy reasons, i.e. to get re-elected, or towards co-ethnic regions to favour members of their own ethnic group. Chinese aid is not considered independently since there is lower variability than for the case of WB aid due to the large number of zeros in the dataset.

Foreign aid allocation is examined at the donor level and few country-specific studies focus on the point of view of the recipient and explore their political motives (Dreher et al., 2016, Jablonski, 2014, Masaki, 2015, Dionne et al., 2013, Briggs, 2012). For example, Jablonski (2014) examines the sub-national allocation of multilateral aid together with electoral strategies across Kenyan constituencies and finds evidence to support the 'core voter hypothesis' and ethnic favouritism, whereas in a similar context Masaki (2015) focuses on Zambia and finds evidence to support the 'swing voter hypothesis'. Dreher et al. (2016) focus on a large number of African countries and examines the sub-national allocation of aid across birth regions, however, electoral incentives are beyond the scope of their paper. For the purposes of this study, the econometric framework and methodology of Dreher et al. (2016) is followed and a specification similar to Jablonski (2014) is adopted in terms of the political variables used. The studies that investigate the electoral incen-

tives of leaders focus on specific countries and yield mixed empirical results as to which electoral strategies leaders adopt. This study aims to bridge the gap in the literature by exploring both electoral incentives and regional favouritism using a sample of 17 African countries. To this end, this study uses a newly constructed dataset for African districts. Established geo-referenced data are merged together from various sources matched at the district and province levels, such as foreign aid commitments from China and the WB, night-time light intensity and population measures. The electoral data used are geo-coded for the purposes of this study from the constituency level to districts and provinces based on their geographical coordinates using ArcGIS.

4.1.3 Research findings

At a first glimpse, the empirical results suggest that aid is not used for political purposes. However, when the competitiveness of elections is considered, WB aid is targeted away from districts with core supporters of the incumbent and co-ethnic districts. In contrast, when elections are not competitive aid is targeted only to co-ethnic districts. At a second stage, the aggregate allocation of both WB and Chinese aid is considered. The fact that political leaders have higher discretion to manipulation Chinese aid makes these results even stronger.

Interestingly, findings in competitive political environments contradict both the 'core' and 'swing' voter hypotheses. However, political motives are found, since evidence suggests that political leaders seek to maximise their vote share by targeting districts that would otherwise support the opposition. Such districts would yield higher electoral returns if the aid targeting is successful. These results in competitive environments agree with the findings of Masaki (2015) for Zambia, but contradict those of Jablonski (2014) for Kenya. In non-competitive electoral environments without strong political incentives leaders prefer to target their co-ethnic regions and all political variables are statistically insignificant. These results are robust to alternative specifications, econometric methods and samples.

4.1.4 Structure

The next Section describes the main theories and results of the literature. Section 4.3 shows the empirical methodology for the different models that are estimated. Section 4.4 describes the data used and Section 4.5 discusses the results obtained along with various robustness checks. Lastly, Section 4.6 concludes. The results are presented in Section 4.7.

4.2 Literature Review

4.2.1 Distributive politics

The literature on comparative politics suggests that political leaders are 'self-centered', where they care only about their own political agenda and getting re-elected (Persson and Tabellini, 1999, Nordhaus, 1975). The 'Political Business Cycle' model suggests that politicians engage in manipulating policies and increase spending patterns just before elections to maximise votes and achieve re-election (Nordhaus, 1975). Although the timing of elections is not relevant for the purposes of this study, the theoretical and empirical results of the literature show that political leaders manipulate policy instruments and government revenue for political purposes (Shi and Svensson, 2006, Block, 2002).

Political favouritism and the targeting of voters can be achieved through various ways: by providing jobs, goods and services, investment and spending, biased taxation, redistributive transfers or in the context of foreign aid by diverting aid projects to certain regions (Robinson and Verdier, 2013, Persson and Tabellini, 1999). This process refers to patronage, defined by Weingrod (1968) as 'the ways in which party politicians distribute public jobs or special favours in exchange for electoral support'. A study on Ghana gives several examples for patronage practices, including paying for school fees, electricity and water bills or personal assistance in dealing with the authorities (Lindberg and Morrison, 2008).

This concept of clientelist exchange between politicians and voters might be more relevant in highly competitive elections (Hicken, 2011, Lindberg and Morrison, 2008). Although it is expected that political competition would limit corrupt or clientelistic practices (Persson et al., 2003), participating in a competitive election under low institutional quality gives politicians the incentive to engage in such activities and apply clientelistic and patronage practices (Nyblade and Reed, 2008). This study does not focus on corrupt or illegal activities, rather than it focuses on the favours and resources provided by political leaders in return for votes.

The literature on distributive politics offers two theories about political leaders targeting voters for electoral purposes: the 'core voter hypothesis' and the 'swing voter hypothesis' (Dixit and Londregan, 1996, Lindbeck and Weibull, 1987, Cox and McCubbins, 1986). Core voters are considered those that continuously support the incumbent unconditionally (Cox and McCubbins, 1986). Political leaders, particularly those that are risk-averse, can target their core and loyal voters and reward them for their support by distributing resources to them (Cox and McCubbins, 1986). On the other hand, core voters may

support a specific candidate or party for other reasons beyond the benefits provided to them. For example, the political preferences of voters might be aligned with the positions of the party or the candidate (Lindbeck and Weibull, 1987). Such voters are likely to keep voting even without receiving favours (Moser, 2008).

By targeting districts of the political base of the incumbent, resources might be considered as wasted (Stokes, 2005). Instead, core voters could be taken for granted and leaders could target the groups of voters who are not attached to any political preferences and party ideologies and who could be easily swayed using patronage (Masaki, 2015, Dixit and Londregan, 1996). Swing voters are those that give the highest rate of electoral returns and are considered the voters who weakly support the opposition but can change their vote depending on the benefits they receive (Masaki, 2015, Weghorst and Lindberg, 2013, Persson and Tabellini, 1999, Dixit and Londregan, 1996, Cox and McCubbins, 1986). There is evidence for Africa to suggest that engaging in clientelist practices, swing voters are influenced and swayed towards the incumbent (Weghorst and Lindberg, 2013).

Empirical evidence is mixed, giving support to both theories. A possible explanation could be that leaders in different countries and regimes with heterogeneous characteristics adopt alternative electoral strategies. For example, Miguel and Zaidi (2003) examine federal government funds and Weinstein (2011) examines spending and finding evidence for the 'core voter hypothesis' for Ghana and Tanzania, respectively. Jablonski (2014) investigates aid flows and finds evidence to support the 'core voter hypothesis' in Kenya. On the other hand, Banful (2011) finds that leaders in Ghana targeted districts with voucher allocations for a subsidy, which they lost in the last election, providing evidence against the 'core voter hypothesis'. Casas (2012) finds evidence in favour of the 'swing voter hypothesis' in Argentina using government spending measures.

Birth and ethnic favouritism also plays a significant role in African politics since voting patterns are largely based on ethnic cleavages (Weghorst and Lindberg, 2013, Kasara, 2007). Ethnic identity in Africa can take many forms and can be based on religion, language or tribal affiliation and these different ethnic identities in Africa allow voters to identify with several ethnic groups (Posner, 2007). Leaders might favour specific regions by spending more resources in areas of their own ethnic group or to their home base (Franck and Rainer, 2012). In competitive electoral environments, the theory of ethnic favouritism largely relates to the 'core voter hypothesis' of Cox and McCubbins (1986) and Dixit and Londregan (1996), where core voters can be thought of as the voters that belong to the same ethnic group of the political leaders. As explained earlier, some of the core voters have political preferences that are aligned with the candidate's or party's

positions and such voters would vote for a candidate or a party unconditionally because of these positions. Chandra (2007) describes as 'psychic benefits' the benefit that voters receive by electing a co-ethnic in office. Co-ethnic voters receiving these 'psychic benefits' and co-ethnic voters with aligned political preferences to the leader can be thought as voters that are voting for co-ethnic leaders unconditionally (Kasara, 2007).

Evidence in the literature suggests that night-time light intensity is higher in the leaders' birth and co-ethnic regions (De Luca et al., 2015, Hodler and Raschky, 2014). Night-time light intensity acts as a proxy of economic performance as it measures man-made light of large-scale infrastructure projects such as roads, bridges or buildings (Henderson et al., 2012). Burgess et al. (2015) finds evidence of ethnic favouritism in Kenya with regard to paved roads. On the other hand, Kramon and Posner (2013) test for ethnic favouritism over different outcomes in six African countries and find evidence for ethnic favouritism for some of the outcomes in different countries, suggesting that ethnic favouritism can not be generalised for all outcomes or for all of the countries in Africa.

4.2.2 The political economy of aid

In the same way that political leaders use policy instruments for their own political benefits in the face of elections, foreign aid can be used for political purposes. This use of aid by recipient countries relates to the issue of 'fungibility', where foreign aid is used in a different way than was intended by the donors. We assume that the recipient government or else the executive leaders to be responsible for the allocation of aid flows across districts, firstly because they have more information than the donor, and secondly because they are the first channel of delivery of aid and are responsible for the handling of funds (Wright and Winters, 2010).

The literature on foreign aid has identified various motives behind aid allocation of different donors. This study focuses on two types of aid: multilateral WB aid and aid from China, which is considered a 'new' and 'emerging' donor (Naím, 2007). Multilateral WB aid is generally found to respond to good policies to ensure aid is used for development purposes (Winters, 2010, Nunnenkamp and Thiele, 2006, Alesina and Dollar, 2000). WB aid is characterised by aid for specific projects with monitoring. Aid from 'new' and 'emerging' donors is considered as 'rogue' aid, which is given to recipient countries to serve the donors' political and strategic interests, rather than to promote growth and development (Dreher et al., 2011, Naím, 2007, Tull, 2006). Chinese aid is important in this context since its characteristics make such flows more vulnerable to political capture to serve the leaders' political interests (Manning, 2006). Although WB aid can be thought as being less

vulnerable to political capture, based on the assumption that the sub-national allocation of all aid flows are at the discretion of the executive leaders, aid flows from both donors are expected to be captured.

De Mesquita and Smith (2009) developed a theoretical model and show that foreign aid can be used as a political tool to reward the core constituents of political leaders. Foreign aid can be used in exchange for political support, for example to maximise the leaders' vote share, their tenure in office or to decrease the risk of not getting re-elected (Licht, 2010). Patronage practices regarding foreign aid can occur when leaders allocate aid in specific districts, where a small group of voters are going to benefit and this allocation would be independent of need. Political leaders have the incentive to use aid strategically based on the electoral strategy they choose to use and channel it to the districts that results in the highest electoral and political returns (Werker, 2012).

The empirical literature on the electoral strategies used by political leaders yields mixed results. Some studies show that leaders target aid to core voters (Jablonski, 2014, Dionne et al., 2013, Briggs, 2012), whereas there is also evidence of targeting away from core voters and towards swing and opposition voters (Masaki, 2015).

In a case study of the 2000 election in Ghana and a regional WB-funded electrification project, Briggs (2012) reports that leaders strategically targeted core voters. Nevertheless, this paper focuses on a single aid project across the ten provinces. Evidence for the 'core voter hypothesis' is identified in a study for Malawi by Dionne et al. (2013). The scope of this paper is aid effectiveness, which could be affected by the allocation of aid across districts in Malawi. Their results, based on Tobit estimations, suggest that the sub-national allocation depends on district need as well as on co-ethnicity to the executive leader. The authors also differentiate aid by different sectors and find that need does not play a robust role in the targeting of education aid, but plays a role in the case of health aid. On the other hand, aid for education purposes is found to be targeted to districts that support the incumbent based on electoral vote shares, whereas aid for the purposes of health is not found to be allocated based on political purposes. Jablonski (2014) focuses on Kenyan districts between the period of 1993 - 2010 using Fixed Effects (FE). Jablonski (2014) estimates models for multilateral aid per capita at the constituency level to investigate which electoral strategy leaders adopt. The findings suggest that leaders in Kenya target aid towards their core voters, for example constituencies with higher victory margins and higher vote shares for the incumbent. Core voters that strongly support the incumbent, as captured by a polynomial of the victory margin, are also rewarded, whereas core voters of the opposition receive less aid.

Contradicting the above results, Masaki (2015) focuses on districts in Zambia between the period 1991 - 2010. This paper estimates the allocation of multilateral aid from three donor organisations using Poisson regressions and also replicates the empirical methodology and results of Jablonski (2014). The results of this paper, however, contradict the 'core voter hypothesis' and the findings of Jablonski (2014). The results suggest that leaders allocate multilateral aid to districts with core voters of the opposition and away from districts with core voters of the incumbent to sway opposition voters towards voting for them.

There are also some mixed results regarding ethnic favouritism. Dionne et al. (2013) and Jablonski (2014) also examine ethnic favouritism and find evidence that co-ethnic districts are favoured. On the other hand, Masaki (2015) finds evidence that co-ethnic districts are treated as core voter districts and less aid is targeted to such districts.

Dreher et al. (2016) investigate whether Chinese and WB aid are subject to political capture by investigating whether or not aid is targeted to the birth districts of leaders. Based on the characteristics of Chinese aid, the authors expect just Chinese aid to be captured and their empirical findings agree with their hypothesis. The authors use the geo-coded aid dataset that is used for the purposes of this study for Chinese and WB aid in a sample of 47 African countries. They estimate their empirical models on aid flows in levels using Ordinary Least Squares (OLS) with country-year fixed effects. As a robustness check, they include district fixed effects but by doing so they point out that they lose significant variation of time-invariant variables. Dreher et al. (2016) also extend this analysis on ethnic favouritism and their findings somewhat agree with De Luca et al. (2015) and Dionne et al. (2013): they find weak evidence for ethnic favouritism with regard to Chinese aid.

4.2.3 Contribution

In light of the studies mentioned, the focus of this study is to identify firstly whether or not political leaders use aid for political purposes and secondly, which strategy they adopt with regard to the sub-national allocation of foreign aid. Multilateral WB aid is considered at first, which is assumed to be allocated at the discretion of the executive leader. Aid from China and the WB aggregated together is considered further, where we expect that any use for political purpose would be even stronger based on the characteristics of Chinese foreign aid mentioned previously.

Political leaders can either target districts of their political base, or else core voters, which can be also thought of as co-ethnic regions in the context of ethnic identities, to reward them for their loyalty and political support. On the other hand, if leaders believe that

their core voters are going to vote for them unconditionally and do not wish to waste resources on securing their already secure votes, they could target districts that support the opposition in an attempt to sway them towards voting for them.

In addition to looking at the pooled regressions to understand how aid is used, the effect of competitive elections is also examined. The way political leaders target aid flows could depend on their certainty of getting re-elected, which stems from the degree of competitiveness. Leaders are likely to respond differently in environments of low or no electoral competition, where they know that getting re-elected is almost certain, compared to environments of stiff competition, where every vote counts (Hicken, 2011).

As evident by the studies mentioned earlier, political leaders in different circumstances use aid in different ways. Dionne et al. (2013) find evidence of ethnic favouritism in the context of Malawian districts. Jablonski (2014) also finds evidence to support the 'core voter hypothesis' in the context of Kenyan constituencies. Masaki (2015), however, finds evidence against the 'core voter hypothesis' in the context of Zambian constituencies. Dreher et al. (2016) find evidence of ethnic and regional favourism with regard to Chinese aid in Africa. Table 4.1 lists the key studies of the literature.

Table 4.1: Summary of key studies in the literature

Study	Sample	Estimation	Results
Jablonski (2014)	Kenya	FE	Core-voter hypothesis with multilateral aid
Masaki (2015)	Zambia	Poisson regressions	Against core voter hypothesis and ethnic favouritism with multilateral aid
Dreher et al. (2016)	47 African countries	OLS (country-year fixed effects)	Regional favouritism with Chinese aid

Overall, examining the allocation of foreign aid from the recipients' perspectives has mostly focused on single-countries studies, with the exception of Dreher et al. (2016) who investigate ethnic and regional favouritism, however, electoral and political incentives are beyond the scope of the paper. This study attempts to bridge the gap in the literature on the sub-national allocation of foreign aid in a sample of different countries that have different political characteristics and different levels of electoral competitiveness.

We focus on a panel of 17 African countries using a newly constructed dataset combining geographical data from various sources as well as electoral data at the constituency level, which have been geo-coded for the purposes of this study from constituencies to districts based on their geographical coordinates. The sample studied consists of 645 districts

over the period 2000 - 2011. These 17 countries are chosen provided they had elections during the time period examined and received foreign aid from both donors. The political variables used follow the specification of Jablonski (2014) and the econometric framework and methodology used follows Dreher et al. (2016) with appropriate country-year fixed effects to allow for the estimation of time-invariant variables that could prove important for the empirical analysis, such as ethnicity and the birth region of the leader.[4.2]

Despite the data availability for two donors, namely China and the WB, we focus independently on WB flows and then sum together aid from both donors. This is because the variability of Chinese aid is very small, compared to the WB, with most observations taking zero values. To exploit the variability of WB aid flows, we sum aid flows from both donors to examine whether the characteristics of Chinese aid make aggregate aid flows subject to more political capture.

4.3 Methodology

The purpose of this study is to investigate the sub-national allocation of foreign aid to identify whether political leaders use foreign aid for political purposes and what electoral strategies they adopt.

To answer these questions the empirical methodology of Dreher et al. (2016) is followed, where empirical models are estimated as follows:

$$log(Aid/population)_{cit} = \alpha_{ct} + \beta_1 VictoryMargin_{cit} + \beta_2 Favouritism_{cit} + \phi X_{cit} + \epsilon_{cit} \quad (4.1)$$

where the variables correspond to:

- $Aid/population_{cit}$: Per capita foreign aid flows (WB or aggregate) in country c, region i and year t
- $VictoryMargin_{cit}$: Percentage of votes obtained by the incumbent party minus percentage of votes obtained by the leading opposition party in country c, region i and year t
- $Favouritism_{cit}$: Dummy variables capturing regional favouritism: Co-ethnic regions dummy (full co-ethnicity) or birth region dummy in country c, region i and year t

[4.2] This also applied for countries that only have one election or no change in the regime elected, since the political variables change slowly (Beck, 2001).

- X_{cit}: A vector of regional controls (e.g. other aid, night-time light intensity, population, capital region dummy, mineral facilities dummy, petroleum dummy) in country c, region i and year t:
- α_{ct}: Country-year fixed effect
- ϵ_{cit}: The error component

These models are estimated with several variations to test for the different electoral strategies at the district (ADM2) level. A polynomial of the victory margin is also included. The variable capturing the victory margin is replaced firstly by a variable capturing the vote share of the incumbent where the same sign is expected as with the victory margin variable, and secondly by a variable capturing the vote share of the opposition where an opposite effect is expected as with the victory margin or incumbent vote share variables.

The hypothesis derived from the literature and tested are as follows:

1. Core-voter hypothesis: We examine whether or not districts that support the incumbent are rewarded for their loyalty and electoral support. We expect a positive coefficient on the victory margin or on the incumbent vote share. This hypothesis can be reinforced by a positive coefficient on the polynomial of the victory margin.
2. Swing-voter hypothesis: We examine whether or not swing districts that can be easily swayed are targeted. We expect a negative coefficient on the polynomial of the victory margin.
3. Opposition: We examine whether or not districts that support the opposition are targeted. We expect a negative coefficient on the victory margin or a positive coefficient on the opposition vote share.
4. Regional favouritism: The dummy variables capturing favouritism (birth region and co-ethnicity) are also included in the specification to explore whether political leaders favour their birth region or co-ethnic regions. Positive coefficients on these dummies show that leaders favour their co-ethnic or home bases.

The sample studied includes countries whose executive leader in power or party in power span a long period of time. For example, the president of Angola, Jos Eduardo dos Santos of the People's Movement for the Liberation of Angola (MPLA) was elected in 1979 and served until 2017, during which the executive elections were thought to not be competitive. The competitiveness of elections can prove to be important in these contexts. Political leaders that know they are going to be elected are likely to target aid in a different way than leaders who aim to maximise votes to achieve getting elected.

Model 4.1 is extended to include interaction terms between the political and co-ethnic variables and the $Competitiveness_{ct}$ variable, which is defined as an indicator of executive electoral competitiveness based on the Database of Political Institutions (DPI) 2015 (Keefer, 2015, Beck et al., 2001). In the econometric specification of model 4.2, two dummies are included to identify the marginal effects . The first one when elections are considered competitive ($Competitiveness_{ct}$) and a second one in all the remaining cases when elections are not considered competitive ($1 - Competitiveness_{ct}$).

$$log(Aid/population)_{cit} = \alpha_{ct} + \beta_1 VictoryMargin_{cit} * (1 - Competitiveness_{ct})$$
$$+\beta_2 VictoryMargin_{cit} * Competitiveness_{ct} + \beta_3 Favouritism_{cit} * (1 - Competitiveness_{ct})$$
$$+\beta_4 Favouritism_{cit} * Competitiveness_{ct}) + \beta_5 Competiveness_{ct} + \phi X_{cit} + \epsilon_{cit} \quad (4.2)$$

The β_1 coefficient corresponds to the marginal effect of the victory margin in environments of non-competitive elections and β_2 in environments of competitive elections. β_3 corresponds to the marginal effect of ethnic favouritism in environments of non-competitive elections and β_4 in environments of competitive elections. Model 4.2 is extended in the same way as model 4.1: the victory margin is replaced firstly with the incumbent vote share and secondly with the opposition vote share.[4.3]

These models allow us to identify which electoral strategy politicians adopt. If politicians favour their core constituents and want to reward them for their loyalty, the effect of the victory margin or the vote share of the incumbent would be positive (Jablonski, 2014, Dixit and Londregan, 1996, Cox and McCubbins, 1986). In the case where political leaders strongly favour their core voters, the coefficient of the polynomial of the victory margin would also be positive (Jablonski, 2014). On the other hand, political leaders might believe that their core constituencies are going to vote for them unconditionally so they prefer to divert their election resources towards swing or opposition voters in an attempt to maximise their vote share (Licht, 2010, Moser, 2008). Swing voters are the voters that weakly support the opposition but can easily change their vote depending on the rewards the patron offers (Masaki, 2015, Weghorst and Lindberg, 2013, Lindbeck and Weibull, 1987). Politicians might target swing voters or core voters of the opposition by allocating resources to them with the purpose of enticing them to vote for them rather than a rival. In such cases, either the polynomial of the victory margin would be negative or the vote share of the opposition would be positive, respectively (Stokes, 2005). Leaders might also

[4.3]The polynomial of the victory margin is also considered.

regionally favour a specific location by diverting aid projects towards that administrative district either because it is their region of birth or because it is populated by members of their own ethnic group. In cases where political leaders favour specific regions, it is expected that the dummy capturing regional favouritism would be positive (Dreher et al., 2016, Jablonski, 2014).

In competitive environments, the probability of getting re-elected is lower than in non-competitive environments and this uncertainty could result in leaders targeting opposition or swing districts. Following this hypothesis, leaders could divert aid away from core districts, since they know that their loyal voters are supporting them unconditionally. We would, therefore, expect that the coefficient on the victory margin and the incumbent vote share to be negative in competitive environments. These hypotheses can be extended in the context of ethnicity, as co-ethnic districts can be considered as districts of core voters and thus, we expect that the coefficient on co-ethnicity would be negative in competitive environments. Nevertheless, in environments of low electoral competition, leaders might have the flexibility to deviate from electoral strategies, thus targeting their co-ethnic regions.

Table 4.2 shows the definitions of the key variables in the estimated models.

Table 4.2: Key Variables

Variable		Definition
Aid per capita	$Aid/population_{cit}$	Foreign aid commitments
Victory margin	$VictoryMargin_{cit}$	Percentage of votes obtained by the incumbent minus the percentage of votes obtained by the opposition.
Incumbent	$Incumbent_{cit}$	Percentage of votes obtained by the incumbent party.
Opposition	$Incumbent_{cit}$	Percentage of votes obtained by the two main opposition party.
Birth regions	$Favouritism_{cit}$	Dummy variable taking the value of 1 for the birth regions of political leaders.
Fully co-ethnic regions	$Favouritism_{cit}$	Dummy variable taking the value of 1 for regions populated only by members of the leaders' ethnic group.
Executive electoral competitiveness	$Competitiveness_{ct}$	Dummy variable taking the value of 1 for elections that are considered to have high levels of electoral competition.

The vector of control variables included in the models consists of variables at the district level, namely population size (log) and night-time light intensity (log). Population size is included based on studies that find that a large population size might help explain higher aid allocation (Öhler and Nunnenkamp, 2014). Also, following the literature, night-time light intensity is used as a proxy for economic activity at the regional level (Dreher

et al., 2016, Hodler and Raschky, 2014, Henderson et al., 2012). Public infrastructure, for example roads or bridges are lit during the night, which can be captured by this variable. Furthermore, night-time light intensity can proxy for consumption based on personal incomes. In some specifications where WB aid is the dependent variable, aid flows from China are also controlled for.[4.4] This is because aid allocation by political leaders may depend on alternative sources of revenue, in this case aid from different donors. Also, donors' decisions on how much aid to allocate to each recipient country could depend on the decision of other donors (Tierney et al., 2011).

Following Dreher et al. (2016), the area of districts (log) as well as a dummy variable taking the value of 1 for the capital regions are included. Finally, mine facilities and petroleum fields dummies are included so as to capture the effects of natural resources in aid allocation and to test whether donors allocate more aid in resource-rich regions to satisfy their own interests (Dreher and Fuchs, 2015, Dreher et al., 2016, Mthembu-Salter, 2012).

We follow Dreher et al. (2016) to include country-year FE, which allows us to capture the effect of core independent variables that do not depict significant regional variation over time; namely, the co-ethnic and birth region dummies. Moreover, within region variation of our dependent variable is limited since the political variables consist of 'slowly changing variables' (Beck, 2001). In the sample used, some countries have only one election or no change in the regime elected. Thus, including district FE, as Masaki (2015) and Jablonski (2014) do in the empirical literature, would not be appropriate as the FE would capture most of the variation of these variables, thus making the control variables statistically insignificant in the regressions (Beck, 2001). Masaki (2015) and Jablonski (2014), who include regional FE, examine a longer time period with more than one election as well as a change in the regime for the countries studied. Standard errors are clustered at the district level to account for any autocorrelation within regions. The vote shares are assumed to be exogenous in the model for the geographical allocation of foreign aid by the construction of the vote share variables and the way the election data are forwarded. Reverse causality is not an issue in the model since past election results do not depend on future values of aid. Furthermore, this model assumes that the country level electoral competitiveness is exogenous to the district level allocation of foreign aid.

[4.4] Undoubtedly, countries receive aid from other donors as well but these aid flows are either not geo-coded or not available to the public.

4.4 Data

4.4.1 Sources

Administrative boundaries

The database of Global Administrative Areas (GADM) (version 2.8, November 2015) offers information on the names and the area of the first (ADM1) and second (ADM2) levels of administrative areas that refer to provinces (ADM1) and districts (ADM2) within recipient countries. There are 221 ADM1 regions that include 645 ADM2 regions in the sample of the 17 countries. These countries are: Angola, Botswana, Cameroon, Cape Verde, the Gambia, Ghana, Lesotho, Liberia, Malawi, Mauritius, Mozambique, Sierra Leone, South Africa, Tanzania, Togo, Zambia and Zimbabwe. Out of the 645 ADM2 regions of the sample, the 119 correspond to ADM1 regions due to limitations in the political variables. When the CLEA dataset has election information only up to the first administrative level, only the ADM1 regions are considered in constructing the dataset, even if the GADM database provides information on the ADM2 regions.

See Appendix C.1 for more details.

Foreign aid

Aid data are obtained from the AidData project website that offers geocoded information on aid flows from different donor agencies. Data for WB projects (version 1.4.1) are freely available from AidData for the period 1995 - 2014, where 5684 aid projects are geocoded for 61243 locations across the world (AidData, 2016). Dreher et al. (2016) geocoded Chinese flows for 49 African countries for the period 2000 - 2012 based on AidData's Tracking Underreported Financial Flows (TUFF) methodology (version 1.1.1) (Strange et al., 2017). Overall, there are 1898 project-locations at the ADM1 level and 1585 project-locations at the ADM2 level in this version. The aid dataset includes information on each aid project given to recipient countries, such as the title of the project, its purpose, the type of aid flow and the amount of aid committed to a specific geographical location. We focus on the period 2000 - 2011 since the series on aid flows for 2012 is incomplete (Dreher et al., 2016).

The aid datasets also include information on the precision of each geocoded aid flow. These can be exact geographical coordinates that correspond to the exact location of the aid flow (precision 1); coordinates that correspond to a known location within 25km of the specific location of aid (precision 2); a district or second-order administrative division (ADM2) where the aid flow was received (precision 3); a province or first-order administrative

division (ADM1) (precision 4); estimated coordinates of a large feature (precision 5); coordinates that correspond to the whole country and the exact location is not known (precision 6); and lastly when coordinates correspond to the whole country since the aid flow is given to a government agency (precision 8).

Aid project flows are classified by different flow types in the ways they were given from the donor to the recipient for the data for Chinese projects. To follow the definitions of Official Development Assistance (ODA) and Other Official Flows (OOF) used by the OECD-DAC, we focus on aid commitment flows that correspond to ODA-like flows, OOF-like flows and vague official finance. ODA is defined as 'flows provided by official agencies, including state and local governments, or by their executive agencies; and each transaction is administered with the promotion of economic development and welfare of developing countries as its main objective; and is concessional in character and conveys a grant element of at least 25 per cent'. OOF comprises of 'loans from the government sector which are for development and welfare but not sufficiently concessional to quality as ODA; and grants and loans from the government sector not specifically directed to development or welfare purposes' (OECD, 2010).

Following Jablonski (2014), flows of up to precision 5 are considered. For flows where the precision is only up to an ADM1 (precision 4) or estimated coordinates (precision 5) that are mapped to an ADM1 region, we scale the value of the project to the population share of each province within each district.

To construct the aid variable from each donor, the values of aid projects for each donor are summed together based on the following equation:

$$Aid_{it} = \sum(P1_{it} + P2_{it} + P3_{it}) + \sum([P4_{it} + P5_{it}] * \frac{PopulationADM2}{PopulationADM1}) \tag{4.3}$$

where $P1_{it}$ corresponds to flows of precision 1, $P2_{it}$ corresponds to flows of precision 2, and so on. This equation is based on the assumption that the projects allocated at the province level benefit the entire population equally.[4.5]

Based on how the aid variables are constructed in our analysis, some missing values correspond to zeros because of no available projects in such regions. Therefore, the missing values for Chinese and WB aid are changed to be zero, unless we know that there is a specific project in a specific administrative region whose project value is unknown. The AidData project website includes a list of ongoing projects for Chinese aid and the obser-

[4.5] Alternative measures of aid are constructed based on scaling by area instead of population size and are used as a robustness check.

vations for aid at these locations of such projects are listed as missing in our dataset.

To obtain information on the total amount of commitments for each region, we add the values of all projects within each region. There are cases where one aid project is allocated to more than one location. In such cases, we assume that the project benefits each region equally. Aid variables are converted to constant 2009USD. Per capita variables are constructed by dividing the amount of aid for each region with the population of each region. Aggregate foreign aid corresponds to the sum of Chinese and WB aid flows received in each district. Chinese aid is not considered independently due to the low variability, compared to WB aid. More precisely, out of the 4999 observations of the sample only 625 observations correspond to non-zero values for Chinese aid, whereas 1882 observations correspond to non-zero values for WB aid.

Appendix C.2 gives detailed information on the definitions of variables and how they were constructed.

Political variables

The Constituency Level Elections Archive (CLEA) (16th edition, version October, 2016) offers detailed elections results at the constituency level for different countries (Kollman et al., 2016). Some of the information the dataset offers is the number of total eligible voters, the total votes cast, the total valid votes cast, the votes received by each party and each candidate in each constituency for legislative elections around the world.[4.6] Each constituency in CLEA is matched with the first and second administrative divisison of the GADM database based on their name or with geographical coordinates relative to the GADM shapefile. In cases where the constituency name did not match an ADM1 or ADM2 name of GADM, the geographical coordinates of the constituency are used to identify its location on the GADM shapefile on ArcGIS. The number of votes are added for all constituencies in each province and district.

Several problems arose with the matching of constituencies to administrative units and these are outlined in Appendix C.2.

We forward the observations for the election years to non-election years to have a complete panel. We use two alternative measures of forwarding: forward the election data up to and including the year of the next election or forward the election data based on the month of the election. For example, if the election occurs during the first semester, we forward

[4.6] Although the majority of countries in our sample are presidential regimes, CLEA provides data only for legislative elections. However, in the vast majority of cases both elections take place in the same year, where the same parties compete. Executive and legislative elections occur in the same year for 15 out of the 18 countries of the sample. Moreover, following Jablonski (2014), we qualify presidential countries in our sample only if results between the two elections at the national level are consistent about the winner and the victory margin.

the election data up to and including the year of the next election. If the election occurs during the second semester, we forward the election data up to and including the year after the next election. The results presented are based on the sample of the first method and the second method of forwarding is used as a robustness check.

Political leaders

We use the Archigos dataset by Goemans et al. (2009) to identify the effective leaders of each country in the sample. The dataset gives information on political leaders, when they came to power and how, their birth region and their ethnicity. An effective leader is identified as 'the person that de facto exercised power in a country' (Goemans et al., 2009). In parliamentary regimes, the effective leader is the prime minister, whereas in presidential systems the effective leader is the president. Using the Archigos dataset we identify the district and province each political leader was born in and identify the ethnic group that they belong to.

Ethnic groups

The Geo-referencing Ethnic Power Relations (GeoEPR) Dataset 2014 constructed by Vogt et al. (2015) is used to identify the location across the administrative boundaries of the leaders' ethnic group. The authors follow Weber (1978) and define ethnicity as 'a subjectively experienced sense of commonality based on a belief in common ancestry and shared culture', where commonalities can be described by language, faith or physical features (Cederman et al., 2010). The GeoEPR dataset geocodes the ethnic groups from the Ethnic Power Relations (EPR) Core Dataset 2014, which identifies 'all politically relevant ethnic groups' as well as their access to state power. The authors identify an ethnic group as politically relevant 'if at least one political organisation has claimed to represent its interests at the national level or if its members are subjected to state-led political discrimination, where discrimination is defined as 'political exclusion directly targeted at an ethnic community' (Cederman et al., 2010). The original version of the EPR dataset was composed based on an online survey of one hundred country and regional experts to identify the politically relevant ethnic group. This is a dynamic dataset, compared to the commonly used by the literature (De Luca et al., 2015, Dreher et al., 2016) Geo-referencing of Ethnic Groups (GREG) dataset constructed by Weidmann et al. (2010) since it identifies ethnic groups throughout time (1946 - 2013) instead of providing an 'one-time snapshot' of the ethnic group landscape, which is likely to be outdated (Wucherpfennig et al., 2011). The location of ethnic groups is identified with respect to the administrative boundaries pictured in Figure C.1.1, allowing us to identify in which province or district the leaders' ethnic groups are located as well as the number of ethnic groups in each administrative

region.

A dummy variable taking the value of 1 is constructed when an administrative region is occupied by the ethnic group of the political leader and 0 otherwise. Some cases of administrative regions have more than one ethnic group. The limitation of using the dummy variable of ethnicity is that we do not know the share of the population of the different ethnic groups residing in regions with more than one ethnic group. For this reason, a dummy variable of full co-ethnicity is constructed. Full co-ethnicity corresponds to cases where the administrative region is occupied by only one ethnic group and it is that of the political leader. In the empirical models, full co-ethnicity is considered and the original dummy variable of ethnicity is used as a robustness check.

Other control variables

The DMSP-OLS Night-time Lights Time Series dataset (version 4) by the National Oceanic and Atmospheric Administration (NOAA) is used to capture night-time light intensity. Georeferenced images are available for different satellites and different years to capture the 'average visible, stable lights and cloud free coverages'. The images are 30 arc second grids, spanning -180 to 180 degrees longitude and -65 to 75 degrees latitude. For cases where two satellites report night time light intensity the average of the two satellite is used. Each pixel of the image takes a value between 0 - 63, where higher values indicate higher light intensity. The average of the variable is measured for each administrative polygon and following the literature, we add 0.01 when taking the log (Henderson et al., 2012).

The Gridded Population of the World (GPW) dataset (version 4) by the Center for International Earth Science Information Network (CIESIN) is used and more specifically the UN-Adjusted population count variable that is available for 2000, 2005, 2010 and 2015. Interpolation is used to fill out the missing values for each country (CIESIN, 2016).

The Mineral Resources Data System (MRDS) of the United States Geological Survey (USGS, 2005) is used to obtain information on the number and location of mineral facitilies, which is time-invariant in our sample. The Petroleum Dataset (PETRODATA) is used to obtain information on the location of onshore and offshore oil and gas fields across the administrative boundaries, which are time-invariant for the sample of this analysis (Lujala et al., 2007).

Some variables at the country-level are used to characterise countries, such as variables from the DPI 2015 (Keefer, 2015, Beck et al., 2001). The DPI 2015 dataset contains an executive index of electoral competitiveness, where competitive elections are defined as

those whose largest party or elected executive received less than 75% of the votes (values of 7 in the DPI dataset). This scale defines executive as those who are 'either elected directly by the population or elected by an electoral college that is elected by the people and has the sole purpose of electing the executive'. Values below 7 in the DPI dataset can correspond to environments of no competition, for example when there is only one party competing in the elections, or environments of low competition, where although multiple parties compete and win votes in the election the largest party receives more than 75% of the votes. The dummy variable of electoral competitiveness used in the empirical models takes the value of 1 in cases where the DPI measure of competitiveness classifies elections are competitive (value of 7). When the dummy variable takes the value of 0, it corresponds to cases of low or no electoral competition.

4.4.2 Descriptive statistics

Figure 4.1 shows the allocation of WB aid flows. Ghana, Sierra Leone and some districts of Cameroon and Tanzania are among the largest recipients of WB aid (darker shades on the map). Appendix C.3 shows the sub-national allocation of Chinese aid flows to Africa as well as the pattern of co-ethnic regions.

Table 4.3 shows the summary statistics for the variables of interest over the sample of 4999 observations at the district level. As can be seen from the Table, WB aid is larger in levels and in per capita terms than Chinese aid. Aggregate aid flows correspond to the addition of Chinese and WB aid. Based on some calculations using the countries' GDP figures as well as their spending (World Bank, 2015), WB aid is of larger importance than Chinese aid. Around 3% of the districts of the sample correspond to birth regions of political leaders and around 40% of the districts correspond to districts occupied by the ethnic group of political leaders of which around 11% corresponds to fully co-ethnic regions. Around 65% of the districts have competitive elections. For districts that have environments of competitive elections, the mean (median) duration that the executive party is in power is 10 (7) years, whereas for non-competitive elections the mean (median) duration is 25 (28). As expected, these statistics indicate the higher possibility of re-election of an executive party in power in environments of non-competitive elections. The incumbent vote share has a minimum value of 0, due to the construction of the variable. To construct the incumbent vote share, we considered the first three parties in terms of vote share (See Appendix C.2). There are 160 regions in the sample, where the executive is not one of the top three parties, therefore, the incumbent vote share takes the value of

0.[4.7]

4.5 Results

4.5.1 Empirical models

Table 4.4 shows the empirical results of model 4.1, which includes country-year fixed effects and per capita WB aid as the dependent variable. The regressions in column (1) only includes country-year FE and the vote share (victory margin/incumbent/opposition). Geographical controls at the district level are added in column (2), namely a variable capturing the capital region, two resource variables and area. District level controls are added in column (3), namely population and night-time light intensity. The regressions in column (4) control for the variables testing regional favouritism: birth regions and co-ethnic regions and column (5) adds a measure of Chinese aid as an additional source of aid flows.

The different panels of the Tables test the hypotheses for the different electoral strategies. Overall, the variables of the victory margin, the incumbent vote share, the opposition vote share and the dummy capturing full co-ethnicity are all statistically insignificant. The coefficients on the victory margin, the incumbent vote share and fully co-ethnic regions are negative, whereas the coefficient on the opposition vote share is positive. The polynomial of the victory margin is significantly positive in columns (4) and (5) with a coefficient of 0.168. These results suggest that political leaders do not allocate WB aid in response to their political agendas or to ethnic favouritism: core voters, opposition voters and co-ethnic regions do not receive higher aid than other voters. Both measures of the opposition vote share yield the same results.

Out of the variables that are controlled for but not shown, the dummy capturing mineral facilities at the district level is significantly positive at the 1% level for WB aid per capita. Additionally, the variable capturing petroleum fields is positively significant at the 10% level, although this finding is not robust. These results shows that districts with mineral facilities receive more aid than regions without such facilities, giving some evidence that WB aid allocation is driven by the motive to gain access to natural resources. Night-time light intensity is also significantly positive at 1%, suggesting that regions with higher economic performance as proxied by night-time lights receive more aid.

Table 4.5 shows the marginal effects of model 4.2, where the political variables and the co-ethnicity dummy are interacted with the two dummies of electoral competitiveness. It can

[4.7] We remove these 160 observations from the sample as a robustness check.

be observed that the insignificant effects of Table 4.4 are driven mostly by non-competitive elections.

The effects of the victory margin, incumbent vote share and opposition vote share in non-competitive elections are statistically insignificant.[4.8] The coefficients on the victory margin and the incumbent vote share is positive, whereas the coefficient on the opposition vote share is negative. In competitive elections, however, we find some different results. The marginal effects of the victory margin and the opposition vote share continue to be insignificant. The opposition vote share consists of the vote shares of the two leading parties. As a robustness check, the vote share of the leading opposition party is considered and the results are the same. The significantly negative marginal effect of the incumbent vote share suggests that political leaders allocate less aid to the districts of their core voters in competitive environments. These results indicate that political leaders take their core voters for granted since they are certain of their loyalty and could be targeting other regions to maximise their vote shares. This idea is also supported by the signs on the insignificant marginal effects of the victory margin and the opposition vote share in competitive elections, which are negative and positive, respectively.

With regard to ethnicity, consistent with the findings for incumbent support, in competitive environments, political leaders seem to divert aid away from fully co-ethnic regions. In contrast, in non-competitive electoral environments without strong political incentives leaders prefer to target and favour their co-ethnic regions. Although in these regions core voters of the incumbent potentially can be targeted, this cannot be seen as evidence in favour of the 'core voter hypothesis' since in non-competitive elections the re-election motives are weaker than in the case of competitive environments. The full regression coefficients and marginal effects when the victory margin is controlled for, including the additional control variables, are depicted in Table C.4.1 of Appendix C.4.

So far the empirical analysis has focused on WB aid, a traditional Western donor. The finding that WB aid is used for political purposes to advance the political aspirations of leaders is not surprising based on the literature. Both Jablonski (2014) and Masaki (2015) assume that executive leaders have the discretion to allocate all aid receipts as they see fit. Nevertheless, 'rogue' aid by 'new' and 'emerging' donors, such as China, would generally be expected to raise the significance of the above results since based on its characteristics, it can enable the use of aid for political purposes (Naím, 2007). For this reason, the same empirical analysis is carried out for aggregate aid per capita as a dependent variable, where aggregate aid is defined as the addition of WB aid and Chinese aid. Table 4.6 displays the

[4.8] The polynomial of the victory margin is also considered and the results remain insignificant at different environments of electoral competitiveness for each specification.

marginal effects of the vote shares in competitive and non-competitive elections. The full regression coefficients of the models with aggregate aid per capita as a dependent variable are shown in Table C.4.2 of Appendix C.4.

The results with aggregate aid as a dependent variable agree with the previous findings, but are somewhat stronger. In particular, the findings indicate a negative association between the victory margin and aggregate aid in competitive elections. Additionally, the marginal effect of the opposition vote share becomes significantly positive in competitive elections. This positive effect suggests that political leaders aim to maximise their vote share by targeting districts of the opposition in an attempt to sway such voters towards them (Kasara, 2007, Stokes, 2005). In non-competitive elections, the marginal effects remain statistically insignificant and follow the same patterns as with WB aid.

With regard to ethnicity, the significantly negative effect of fully co-ethnic districts on WB aid in environments of competitive elections disappears when aggregate aid is examined. The fact that significance disappears could be an indication that Chinese aid is targeted towards fully co-ethnic districts in competitive environments, whereas WB aid is found to be targeted away from fully co-ethnic districts. The significantly positive effect of fully co-ethnic districts in non-competitive elections, however, still holds. Ethnic favouritism is observed in our sample and is found to occur in non-competitive elections, where political leaders know that they are going to be re-elected; therefore, they can allocate resources to members of their own ethnic group instead of attempting to gather votes elsewhere. Thus, the ethnic favouritism result identified in the empirical literature is supported in these findings only when elections are non-competitive.

Overall, these result contradict the 'core' or 'swing' voter hypothesis (Lindbeck and Weibull, 1987, Cox and McCubbins, 1986) as well as results of ethnic favouritism found in the literature in the context of competitive elections. A possible explanation for these results in competitive environments is that political leaders do not want to waste their resources by targeting districts that are loyal and are going to vote for them unconditionally, such as regions with their core voters or members of their own ethnic group (Kasara, 2007). In such competitive elections, political leaders seem to be targeting aid to supporters of the opposition to sway them to vote for them and maximise their vote share, since the core and co-ethnic voters are certain votes. In contrast, in non-competitive electoral environments without strong re-election incentives leaders prefer to target their co-ethnic regions.

4.5.2 Robustness checks

Alternative specifications and estimation techniques are considered. The results remain robust to these alternative specifications.

Firstly, a different way of forwarding the election vote shares variables is used. More precisely, if the election took place in the first semester of the year, then it is assumed that the new party in power takes office a year after the year of election, whereas if the election took place in the second semester, then the new party takes power two years after the election year. See Table C.4.3 in Appendix C.4 for the results with the alternative method of forwarding using aggregate aid flows as a dependent variable.

Secondly, the empirical models are estimated over a sample of countries in which the countries that received the least aid were removed to ensure that we investigate the strategies of leaders in countries where aid can be used as a political tool due to its volume. These countries are Cape Verde, the Gambia, Mauritius and Zimbabwe. See Table C.4.4 in Appendix C.4 for the results when the four countries that receive the least aid are removed from the sample.[4.9]

Thirdly, models for aggregate aid flows in levels are estimated as in the study of Dreher et al. (2016). Using the reduced sample that removes countries that received the least aid, aggregate aid in levels is used as a dependent variable and the results become stronger (See Table C.4.5 of Appendix C.4).

Furthermore, the dependent variables in the results shown are scaled based on the population share (Appendix C.2), alternatively, the models are estimated with the dependent variables being scaled based on area instead of population share for the cases of aid flows having precision 4 and 5. It is also worth noting that when the 160 observations where the incumbent vote share takes the value of 0 are also removed from the sample the results remain robust. Using the alternative measure of ethnicity, the results remain robust. Including the dummy of co-ethnicity that does not distinguish between partial or full co-ethnicity leaves the results the same. These results are not shown but are available upon request.

Overall, these findings agree with the previous results, which show that in competitive electoral environments, political leaders divert aid flows away from their strong supporters and away from co-ethnic districts, but towards districts of core supporters of the opposition party. These findings suggest that political leaders attempt to reward opposition voters that would otherwise not vote for them to achieve 'high electoral returns' and maximise

[4.9] The number of observations fall from 4999 in 645 districts to 4511 in 551 districts.

their vote share relative to the opposing candidate, rather than waste aid resources in districts where they enjoy strong support and electoral loyalty (Masaki, 2015, Kasara, 2007). This finding, however, only holds when elections are competitive and political leaders are uncertain about whether they will be getting elected and therefore, use aid for political purposes to achieve re-election. When elections are not competitive, leaders are found to only use aid to favour their ethnic network.

4.6 Conclusion

Chapters 2 and 3 examined the effect of institutional quality and corruption on how aid is spent across the budget of recipient countries in an attempt to investigate whether aid is used as intended. This study examined whether the political agenda of leaders plays a role for the allocation of foreign aid across administrative regions. The aim of this study was to investigate the sub-national allocation of foreign aid per capita, in an attempt to identify whether and how foreign aid is used by political leaders for political purposes. Multilateral WB foreign aid flows as well as aggregated aid flows received from both the WB and China were considered and were expected to be used by leaders to advance their own political agendas. Although the characteristics of Chinese aid enable political leaders to use it for their own interests, as the allocation does not respond to need and its effectiveness is not monitored, aid from both donors was expected to be manipulated for political purposes since the executive leader is responsible for the sub-national allocation of flows between districts. Several electoral strategies were investigated: the 'core voter hypothesis', the 'swing voter hypothesis' as well as ethnic favouritism and how it relates to these models. The 'core voter hypothesis' suggests that political leaders target their loyal voters and reward them for their support, whereas the 'swing voter hypothesis' suggests that leaders target weak supporters of the opposition that can be easily swayed towards voting for them (Lindbeck and Weibull, 1987, Cox and McCubbins, 1986). Investigating the sub-national allocation of aid shows which strategies leaders use and why. The literature on electoral strategies yields mixed results and different countries under different regimes could target either core voters or swing voters. Following studies that focus on single countries, such as Jablonski (2014) for Kenya and Masaki (2015) for Zambia, as well as a multi-country study using the newly geo-coded aid data used (Dreher et al., 2016), static panel data models were estimated for aid per capita at the district level using country-year fixed effects.

The initial results found no aid targeting towards specific districts, which indicated that aid is not used for political purposes. Upon considering executive electoral competitiveness the results suggest that political leaders use aid targeting in the face of competition. WB

aid is found to be targeted away from districts of core voters and away from co-ethnic districts in competitive environments. This result is not surprising, since co-ethnic voters can be thought as core voters, who will vote for the co-ethnic leader unconditionally since they receive 'psychic benefits' (Chandra, 2007). In this sample of 17 African countries, political leaders prefer not to waste their resources on their base. In environments of non-competitive elections, however, the ethnic favouritism result identified in the literature prevails.

When aggregate aid flows are considered, it was expected that the results would become stronger due to Chinese aid being vulnerable to strong political capture. This hypothesis is supported by our results, which become stronger in terms of significance. Political leaders are found to target more aid towards districts of core voters of the opposition, possibly because they prefer to target aid in regions that would yield them high electoral returns by swaying opposition voters towards their side. The finding that opposition and not swing districts are targeted could be explained by electoral rules. In our sample, the majority of countries have a presidential system and in all cases the president is elected by direct popular vote; i.e. only the national vote matters. Therefore, the executive may find it optimal to target a larger number of districts based on their opposition shares, rather than targeting a small number of marginal/swing districts (which could be the optimal strategy when the regional vote plays an important role for the election of the executive). These results remain robust to alternative specifications, different econometric methods and different samples. Electoral competitiveness is found to play a significant role in aid targeting. Political leaders are found to favour their core co-ethnic voters only in environment of no or low electoral competition without strong political incentives.

The results are focused on 17 heterogeneous countries that have different characteristics in terms of regimes, electoral systems and electoral rules. For example, in this sample there are countries that experienced a change in the regime throughout the time period (Ghana and Mauritius). Investigating the allocation of aid under the different regimes using appropriate econometric techniques could prove beneficial in identifying how specific countries and regimes used the aid received. This might prove particularly interesting for the case of Ghana, which is one of the largest recipients of foreign aid flows from China. Furthermore, investigating the different characteristics of these countries and their roles in aid targeting is another important potential development of this study.

For the purposes of this study, ethnic identity is captured by the identification of ethnic groups and their geographical allocation across districts. Nevertheless, as pointed out by Posner (2007), ethnic identity can be based on other factors, one of which is language.

Exploiting language data and family ties between languages is another interesting potential development. Furthermore, the fact that political leaders use aid for the purposes of getting re-elected does not indicate that it achieves the desired outcome. Examining whether the electoral strategies and the aid targeting techniques used as successful is another interesting expansion.

With regard to the 'new' and 'emerging' donors discussed, data on aid flows have just recently started being geo-coded. The AidData project intends to geo-code and publicise aid data from other 'emerging' donors such as India and Saudi Arabia. The extensive literature on the models of aid allocation identifies different reasons behind the motives of various donors and also different characteristics of aid from these donors. Examining the allocation from both the donor and the recipient perspective of aid from various 'emerging' donors could have important policy implications for international donors as a whole as it could help identify the reasons behind the initial allocation and whether such flows are used, abused or leaked into private pockets. The results of this study contradict the literature that distinguishes between multilateral and bilateral 'emerging' donors and finds similar results: aid from both donors is used for political purposes.

4.7 Figures and Tables

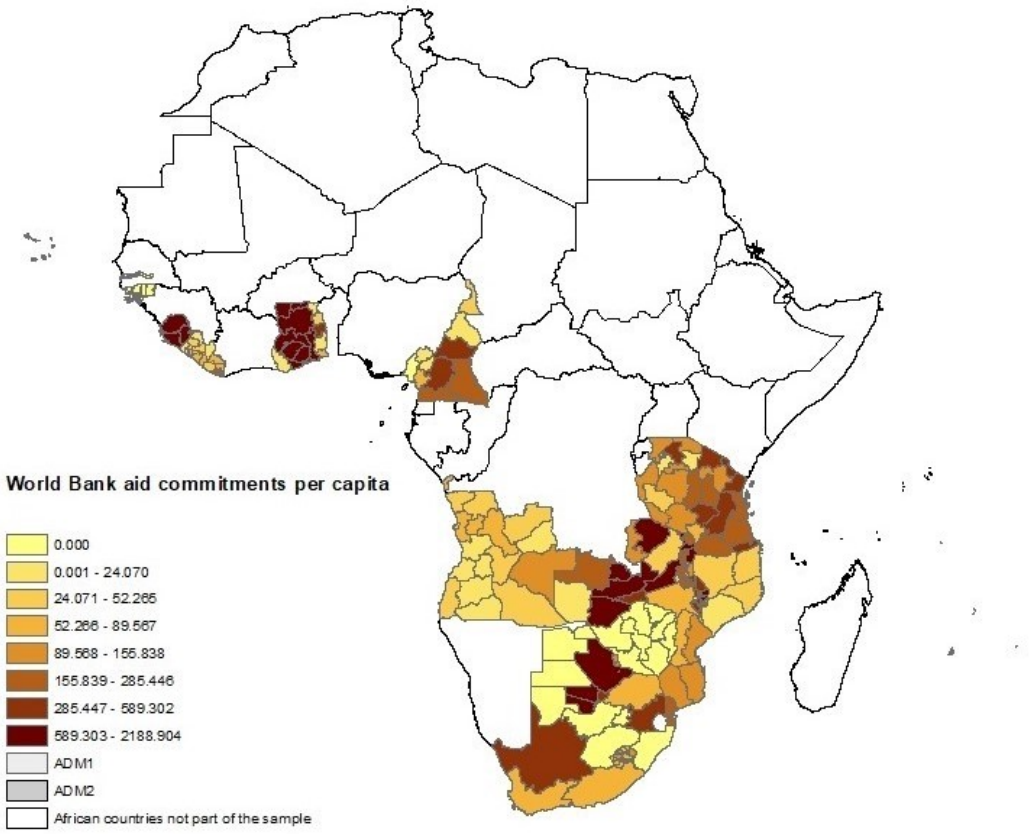


Figure 4.1: World Bank aid commitments per district in Africa (per capita in constant 2009USD, 2000 - 2011)

Table 4.3: Descriptive statistics, 2000 - 2011

Variable	Mean	Std. Dev.	Min	Max
Chinese aid flows (levels)	234707.900	4087960	0	1.21e+08
Chinese aid per capita	1.106	19.151	0	777.819
World Bank aid flows (levels)	2981549	3.23e+07	0	2.05e+09
World Bank aid per capita	8.777	39.159	0	1395.164
Aggregate aid flows (levels)	3216257	3.26e+07	0	2.05e+09
Aggregate aid per capita	9.884	43.599	0	1395.164
Victory margin	0.118	0.435	-0.995	0.957
Incumbent vote share	0.502	0.232	0	0.969
Opposition vote share (two parties)	0.447	0.217	0.015	0.998
Birth regions	0.027	0.161	0	1
Full co-ethnicity	0.110	0.312	0	1
Partial co-ethnicity	0.293	0.455	0	1
Competitiveness	0.647	0.478	0	1
Night-time light intensity	4.894	5.784	1.678	61.951
Population (levels)	404284.900	981593.100	0.031	1.24e+07
Area	13173.870	31969.390	7.178	372916.500
Capital regions	0.033	0.178	0	1
Mineral facilities dummy	0.320	0.466	0	1
Petroleum dummy	0.030	0.171	0	1

These descriptive statistics are based on the sample of the 4999 observations used in the regressions for the ADM2 regions in the 17 countries. Foreign aid is measured in constant 2009USD.

Table 4.4: World Bank aid per capita (log) models: District-level

	(1)	(2)	(3)	(4)	(5)
Victory margin	-0.003	-0.014	-0.023	-0.022	-0.022
	(0.044)	(0.043)	(0.044)	(0.044)	(0.044)
Fully co-ethnic regions dummy				-0.062	-0.061
				(0.065)	(0.065)
R-squared	0.336	0.344	0.346	0.347	0.347
Victory margin	-0.004	-0.015	-0.024	-0.021	-0.022
	(0.044)	(0.043)	(0.043)	(0.044)	(0.043)
Victory margin squared	0.095	0.100	0.138	0.168*	0.168*
	(0.089)	(0.088)	(0.086)	(0.086)	(0.086)
Fully co-ethnic regions dummy				-0.093	-0.092
				(0.064)	(0.064)
R-squared	0.337	0.344	0.347	0.347	0.347
Incumbent vote share	-0.088	-0.102	-0.110	-0.105	-0.107
	(0.088)	(0.086)	(0.087)	(0.088)	(0.088)
Fully co-ethnic regions dummy				-0.058	-0.057
				(0.065)	(0.065)
R-squared	0.337	0.344	0.347	0.347	0.347
Opposition vote share (two parties)	0.006	0.027	0.046	0.042	0.043
	(0.087)	(0.085)	(0.087)	(0.088)	(0.087)
Fully co-ethnic regions dummy				-0.062	-0.061
				(0.065)	(0.065)
R-squared	0.336	0.344	0.346	0.347	0.347
Country-year fixed effects	Yes	Yes	Yes	Yes	Yes
Geographical controls	No	Yes	Yes	Yes	Yes
District controls	No	No	Yes	Yes	Yes
Regional favouritism	No	No	No	Yes	Yes
Other aid	No	No	No	No	Yes
No. of districts	645	645	645	645	645
N	4999	4999	4999	4999	4999

Standard errors clustered at the district level in parentheses. * p <0.10, ** p <0.05, *** p <0.01. Country-year fixed effects are included. Geographical controls include the capital region dummy, the area of the district (log), the mineral facility dummy and the petroleum field dummy. District controls include night-time light intensity (log) and the population of the district (log). Regional favouritism corresponds to the birth region dummy and the full co-ethnicity dummy. Other aid corresponds to Chinese aid per capita flows.

Table 4.5: World Bank aid per capita (log) models - Marginal effects of electoral competitiveness: District-level

	(1)	(2)	(3)	(4)	(5)
Victory margin*No competition	0.055	0.089	0.079	0.053	0.053
	(0.079)	(0.073)	(0.076)	(0.080)	(0.080)
Victory margin*Competition	-0.028	-0.058	-0.067	-0.070	-0.071
	(0.054)	(0.054)	(0.054)	(0.054)	(0.053)
Fully co-ethnic regions*No competition				0.201*	0.200*
				(0.111)	(0.111)
Fully co-ethnic regions*Competition				-0.175**	-0.173**
				(0.070)	(0.070)
R-squared	0.337	0.344	0.347	0.348	0.348
Incumbent vote share*No competition	0.103	0.182	0.171	0.114	0.115
	(0.154)	(0.142)	(0.148)	(0.157)	(0.157)
Incumbent vote share*Competition	-0.173	-0.227**	-0.235**	-0.234**	-0.236**
	(0.108)	(0.107)	(0.108)	(0.108)	(0.107)
Fully co-ethnic regions*No competition				0.195*	0.195*
				(0.113)	(0.112)
Fully co-ethnic regions*Competition				-0.172**	-0.171**
				(0.069)	(0.070)
R-squared	0.337	0.344	0.347	0.349	0.349
Opposition vote share*No competition	-0.104	-0.185	-0.165	-0.108	-0.109
	(0.153)	(0.143)	(0.149)	(0.158)	(0.158)
Opposition vote share*Competition	0.054	0.118	0.136	0.142	0.144
	(0.108)	(0.107)	(0.108)	(0.107)	(0.107)
Fully co-ethnic regions*No competition				0.199*	0.198*
				(0.113)	(0.113)
Fully co-ethnic region*Competition				-0.174**	-0.173**
				(0.070)	(0.070)
R-squared	0.337	0.344	0.347	0.348	0.348
Country-year fixed effects	Yes	Yes	Yes	Yes	Yes
Geographical controls	No	Yes	Yes	Yes	Yes
District controls	No	No	Yes	Yes	Yes
Regional favouritism	No	No	No	Yes	Yes
Other aid	No	No	No	No	Yes
No. of districts	645	645	645	645	645
N	4999	4999	4999	4999	4999

Standard errors clustered at the district level in parentheses. * p <0.10, ** p <0.05, *** p <0.01. Country-year fixed effects are included. Geographical controls include the capital region dummy, the area of the district (log), the mineral facility dummy and the petroleum field dummy. District controls include night-time light intensity (log) and the population of the district (log). Regional favouritism corresponds to the birth region dummy and the full co-ethnicity dummy. Other aid corresponds to Chinese aid per capita flows.

Table 4.6: Aggregate aid per capita (log) models - Marginal effects of electoral competitiveness: District-level

	(1)	(2)	(3)	(4)
Victory margin*No competition	0.073	0.104	0.092	0.065
	(0.085)	(0.077)	(0.079)	(0.083)
Victory margin*Competition	-0.071	-0.101*	-0.110*	-0.112**
	(0.057)	(0.056)	(0.057)	(0.056)
Fully co-ethnic regions*No competition				0.202*
				(0.112)
Fully co-ethnic regions*Competition				-0.114
				(0.080)
R-squared	0.358	0.365	0.368	0.369
Incumbent vote share*No competition	0.139	0.214	0.199	0.142
	(0.168)	(0.150)	(0.155)	(0.165)
Incumbent vote share*Competition	-0.262**	-0.317***	-0.325***	-0.322***
	(0.112)	(0.111)	(0.112)	(0.112)
Fully co-ethnic regions*No competition				0.195*
				(0.114)
Fully co-ethnic regions*Competition				-0.109
				(0.079)
R-squared	0.358	0.365	0.369	0.370
Opposition vote share*No competition	-0.137	-0.212	-0.188	-0.130
	(0.166)	(0.150)	(0.155)	(0.165)
Opposition vote share*Competition	0.138	0.203*	0.223*	0.225**
	(0.113)	(0.113)	(0.114)	(0.113)
Fully co-ethnic regions*No competition				0.199*
				(0.114)
Fully co-ethnic regions*Competition				-0.113
				(0.080)
R-squared	0.358	0.365	0.368	0.369
Country-year fixed effects	Yes	Yes	Yes	Yes
Geographical controls	No	Yes	Yes	Yes
District controls	No	No	Yes	Yes
Regional favouritism	No	No	No	Yes
No. of districts	645	645	645	645
N	4999	4999	4999	4999

Standard errors clustered at the district level in parentheses. * p <0.10, ** p <0.05, *** p <0.01. Country-year fixed effects are included. Geographical controls include the capital region dummy, the area of the district (log), the mineral facility dummy and the petroleum field dummy. District controls include night-time light intensity (log) and the population of the district (log). Regional favouritism corresponds to the birth region dummy and the full co-ethnicity dummy.

Appendix C:

C.1 Sample

17 countries are selected provided they had elections between the period 2000 - 2012 (and provided there is available information in the CLEA dataset), when geocoded aid data are available from both donors. These countries are: Angola, Botswana, Cameroon, Cape Verde, the Gambia (only available for WB aid), Ghana, Lesotho, Liberia, Malawi, Mauritius, Mozambique, Sierra Leone, South Africa, Tanzania, Togo, Zambia and Zimbabwe (only available for Chinese aid).

Benin is excluded from the sample although there is available information in the CLEA dataset due to the fact that it only has six aid observations for its 12 ADM1 units over the 12-year time period. Nepal is excluded from the sample although there is available information in the CLEA dataset since it does not have any information for Chinese aid and very few observations for WB aid. Nigeria is excluded from the sample, although it receives aid from both donors, because the constituencies in the CLEA dataset could not be matched to administrative regions (numerical codes were given instead of names in the CLEA dataset). Rwanda is also excluded from the sample as there is no information available on its administrative boundaries in the GADM database. Guinea-Bissau is also excluded from the sample due to inconsistent electoral results, which are explained in Appendix C.2. Jablonski (2014) examines districts in Kenya, which is not included in the sample because the CLEA dataset did not have any information on its elections during the time period examined.

A more recent version of CLEA (16th edition, May 2017) includes more countries that could be used in future analysis: Ivory Coast, Ethiopia, Niger, Senegal and Uganda.

Figure C.1.1 shows the spatial map of Africa and the administrative boundaries of the 17 countries included in the sample.

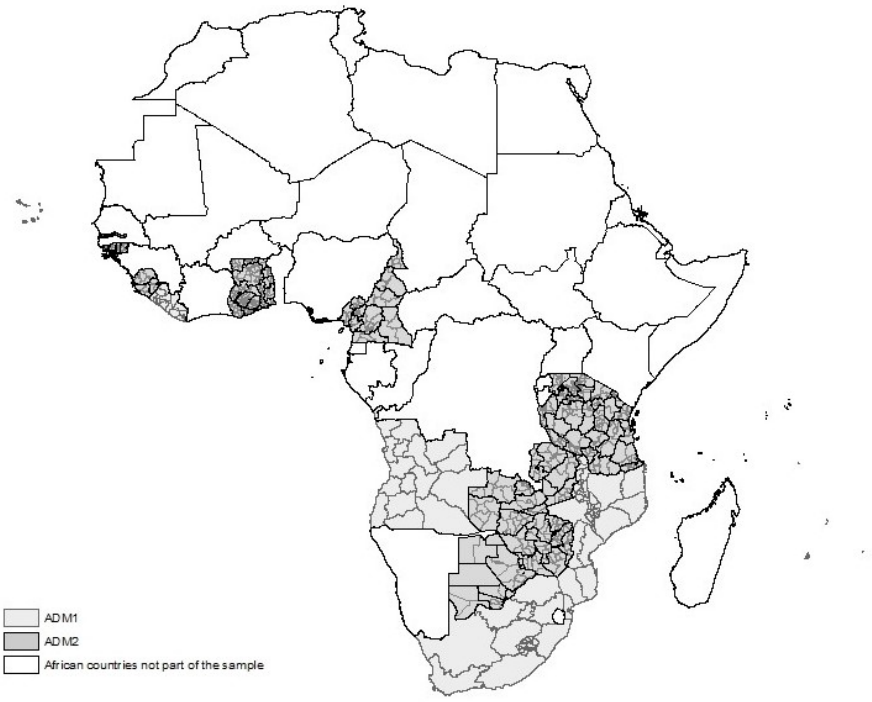


Figure C.1.1: Administrative boundaries in Africa

C.2 Construction of dataset

Appendix C.2 describes any issues with regard to the data, a detailed construction method of some of the variables and gives the definitions and sources of the variables of interest.

Administrative boundaries

The GADM database only has information for the 137 old districts of Ghana and not the 170 new ones, therefore, for the purposes of this analysis the data are matched to the 137 districts of GADM.

Foreign aid

Following the definition of the OECD for ODA, we focus on aid commitment flows that correspond to ODA-like flows, OOF-like flows and vague official finance. This is done to follow the definitions of ODA and OOF used by the OECD-DAC. Commitments are defined by the OECD-DAC as 'a firm obligation, expressed in writing and backed by

the necessary funds, undertaken by an official donor to provide specified assistance to a recipient country or a multilateral organisation'. Commmitments are 'recorded in the full amount of expected transfer, irrespective of the time required for the completion of disbursements' (Stewart and Russell, 2015).

ODA-like flows correspond to 'flows of official financing administered by a non-DAC donor which meets the standards of official development assistance; the promotion of the economic development and welfare of developing countries as its main objective, and a perceived to be concessional in character with a grant element of at least 25 percent (using a fixed 10 percent of discount)'. OOF-like flows are defined as 'i) financing to developing countries for representational or essentially commercial purposes provided by a non-DAC donor, ii) official bilateral transactions intended to promote development but having a grant element of less than 25 percent, iii) official bilateral transactions, whatever their grant element, that are primarily export-facilitating in purpose. This category includes by definition export credits extended directly to an aid recipient by an official agency or institution ("official direct export creedits"); iv) the net acquisition by governments and central monetary institutions of securities issued by multilateral development banks at market terms; v) subsidies (grants) to the private sector to soften its credits to developing countries; iv) funds in support of private investment'. Vague Official Finance is defined as 'TUFF projects financed by an official agency but which lack sufficient information on the intent or concessionality of an agreement to accurately sort into the ODA-like, OOF-like or Official Investment categories'. These definitions are taken from the AidData Data Management Plan (Stewart and Russell, 2015).

There were cases where aid flows were recorded for one country, but the geographical coordinates put the aid flow in another country. In such cases the precision code of each flow was considered, for example if the precision was 3 (ADM2), the geographical coordinates that put the aid flow to another country were ignored and information on ADM2 was considered. There were also cases where the aid flow had contradicting information on its location for neighbouring countries, particularly in road transport projects and water projects. In those cases the project number of each flow was considered. Some aid flows are divided between many locations in one specific country and the project number was used to identify in which country the flow belonged to.

Political variables

The share of votes for each party available from the CLEA dataset is unreliable (there are cases where it is higher than one due to incorrect coding), so party vote share measures are constructed manually by taking the total number of votes received by each party divided

by the sum of all party votes received in each district.

Based on this share, all parties are ranked for each region and each election and the top three parties are identified to capture the vote share of the top three parties. The top three parties that are identified are checked against the aggregate country election results to make sure the data are consistent with the results at the legislative elections.

Three dummy variables at the district level capturing the regime for each district are constructed. The variables take the value of 1 when each of the three parties (three dummies are constructed) in each district won the election nationally. For example, a variable *regime1* equals to 1 if the first party of each region is the party that won the national election. This variable equals to 0 if the party that won the national election is either the second or third party in each region.

The *INC* variable (incumbent vote share) is defined as follows:

$$INC = voteshareparty1 * regime1 + voteshareparty2 * regime2 + voteshareparty3 * regime3 \tag{C.1}$$

where the vote shares of the top three parties as well as the dummy variable for each party being in power are considered.

The *OPP* variable (opposition vote share) is defined as follows:

$$OPP = voteshareparty1 * (1 - regime1) + voteshareparty2 * (1 - regime2) + voteshareparty3 * (1 - regime3) \tag{C.2}$$

Furthermore, the opposition vote share is also constructed for the main opposition party, rather than the two main opposition parties.

The *VM* variable (victory margin) is the difference between the share of the incumbent and the share of the opposition:

$$VM = INC - OPP \tag{C.3}$$

The opposition vote share is firstly captured by taking the vote share of the largest opposition party, and secondly by taking the two largest opposition parties as a robustness check. The victory margin is based on the opposition share of the largest opposition party.

When the CLEA dataset has election information only up to the first administrative level, only the ADM1 regions are considered in constructing the dataset, even if the GADM database provides information on the ADM2 regions (Angola, Cape Verde, Lesotho, Liberia, Malawi, Mauritius, Mozambique and South Africa). Several other problems arose with the CLEA dataset. In some cases the constituency names did not match region names of GADM and no information was found on the internet either, therefore, such constituencies were excluded from the analysis. Also, there were cases that two or more GADM regions were aggregated into one constituency in the CLEA dataset and in those cases the two or more administrative units are merged into one. For example, a constituency named 'Gushiegu and Karaga' is available for Ghana in CLEA, where Gushiegu and Karaga correspond to two different administrative regions (ADM2) in GADM. As a result, all remainder variables for these two administrative regions are summed together and one administrative region is used instead of two.

Another issue is that we are proxying the power of the executive in aid allocation decisions using legislative election data, therefore, the executive election results are compared with the results of the legislative elections to make sure the results are consistent with regard to the party in power as well as the victory margin. There are cases where the election results are inconsistent and those elections are excluded from the sample. For example, the 2004 election for Guinea-Bissau, leaving Guinea-Bissau out of the sample. Another case is the Gambia, where the legislative elections took place in 2007 and the executive elections in 2006. In this case, we assume that the legislative election takes place in 2006 since the results between the two elections are consistent.

Political leaders

Information on political leaders is obtained from the Archigos dataset (Goemans et al., 2009), where the authors list all of the political leaders of each country as well as the date they entered and exited office and listed whether their exit is regular, irregular, through a direct imposition by another state or as a result of a natural death. A regular manner occurs legally through elections, whereas an irregular manner occurs with a coup. For the purposes of this analysis, leaders that were in power for less than 90 days are excluded from the sample. For example, Moses Zeh Blah in Liberia became president for 40 days when the president resigned, until a new president was sworn in.

Furthermore, there are cases where there is no available information on the ethnic group of a political leader, such as for Armando Emilio Guebuza in Mozambique; or cases where the birth region of a political leader falls outside the country, such as for Ian Khama of Botswana who was born in the United Kingdom. In such cases, observations for the birth

region and ethnic group variables are missing.

Ethnic groups

Some countries have information for only one ethnic group in the GeoEPR dataset as they are not classified as being heterogeneous in terms of ethnicity. For example, Portuguese is the only ethnic group in Cape Verde according to the GeoEPR dataset, Basotho is the only ethnic group in Lesotho, and although Mauritius has nine different ethnic groups in the GeoEPR dataset, the ethnic groups of the leaders (Hindu and French) cover the whole of Mauritius.

Natural resources

Data on petroleum fields and mineral facilities include the year of discovery or the year mining began in the different facilities. In this sample, no new fields are discovered and mining did not begin at a new facility throughout the sample. As a result, these variables are time-invariant although the datasets are dynamic.

C.3 Maps

Figure C.3.1 shows the allocation of Chinese aid flows. Ghana and Tanzania are the two largest recipients of Chinese foreign aid (darker shades on the map).

Figure C.3.2 shows the polygons that correspond to the co-ethnic regions of the political leaders in our sample. The blue polygons correspond to fully co-ethnic districts: districts that have only one ethnic group and it is that of the political leader. The red polygons correspond to partially co-ethnic districts: districts that have more than one ethnic group and one of them is that of the political leader. The ethnicity dummy that is used as a robustness check takes the value of 1 in all highlighted regions (partially or fully co-ethnic). This map contains the co-ethnic regions of all political leaders of the countries examined. If for example, a country has two political leaders over the period examined, the co-ethnic districts for both leaders are shown.

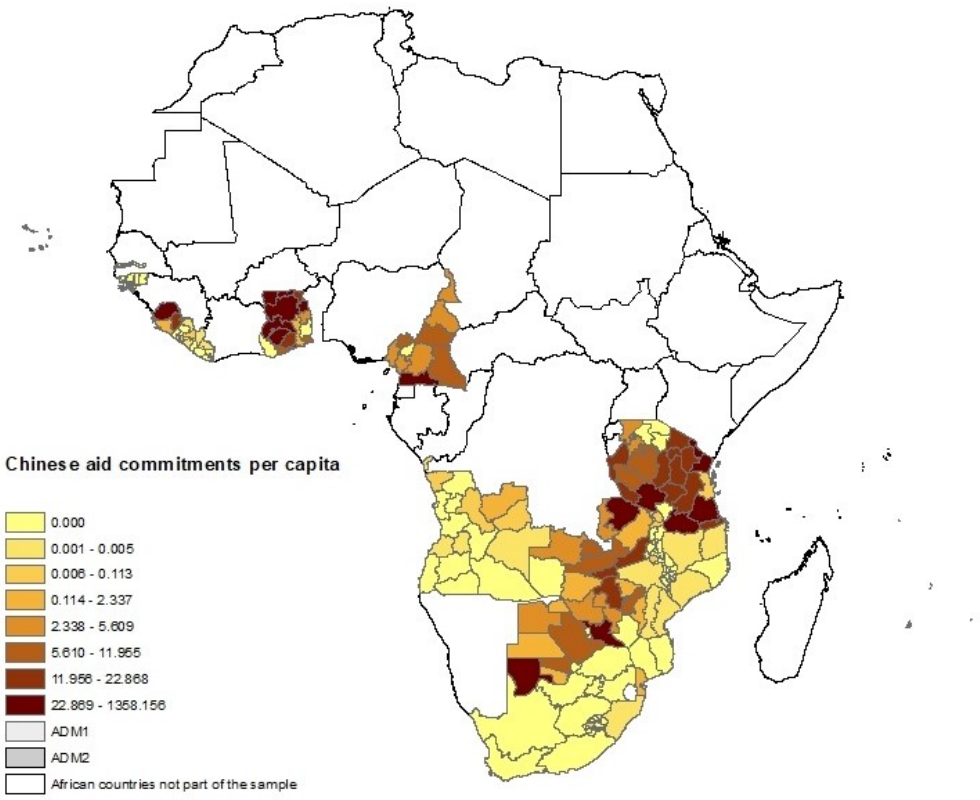


Figure C.3.1: Chinese aid commitments per district in Africa (total in million constant 2009USD, 2000 - 2011)

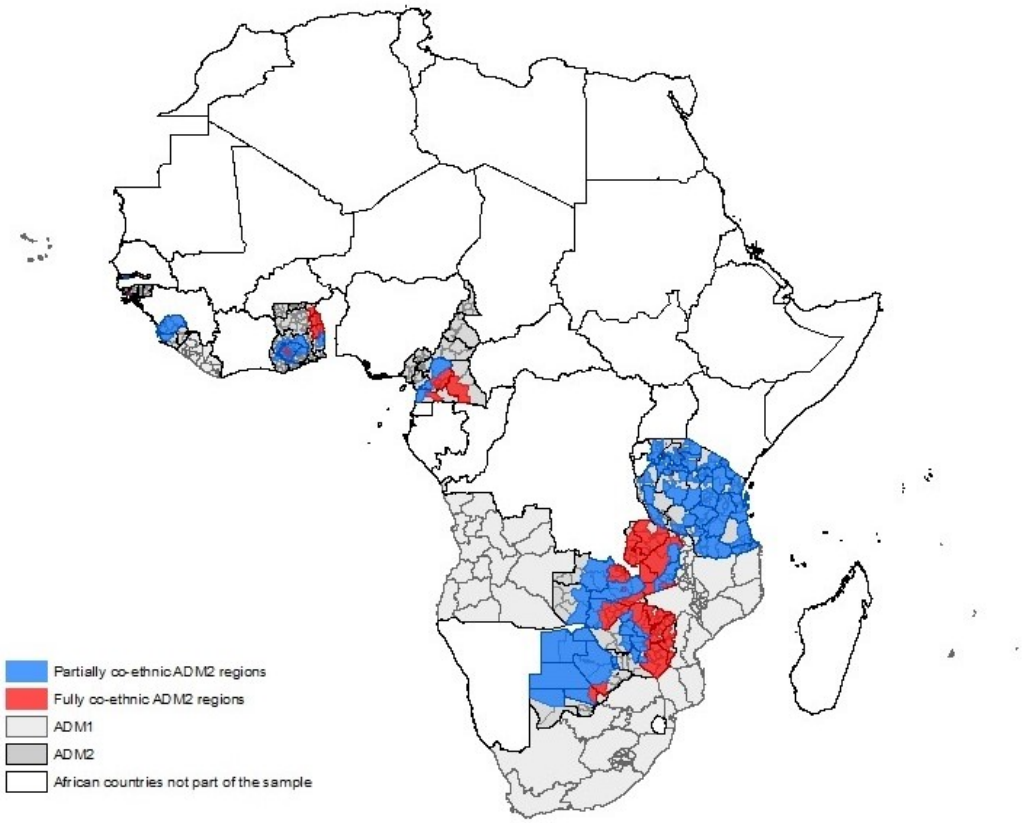


Figure C.3.2: Co-ethnic districts in Africa

C.4 Empirical results

Table C.4.1 shows the full regression coefficients of the regression with per capita WB aid as the dependent variable when country-year fixed effects are included and interaction terms between the victory margin and the two competition dummies. The relevant marginal effects are shown in Table 4.5 of Section 4.5.1.

Table C.4.2 shows the full regression coefficients of the regression with per capita aggregate aid as the dependent variable when country-year fixed effects are included and interaction terms between the victory margin and the two competition dummies. The relevant marginal effects are shown in Table 4.6 of Section 4.5.1.

Table C.4.3 shows the marginal effects of the political variables and the full co-ethnicity dummy in different environments of electoral competition when the alternative method of forwarding the political variables is used.

Table C.4.4 shows the marginal effects of the political variables and the full co-ethnicity dummy in different environments of electoral competition when the four countries that receive the least amount of aid are removed (Cape Verde, the Gambia, Mauritius and Zimbabwe).

Table C.4.5 shows the marginal effects of the political variables and the full co-ethnicity dummy in different environments of electoral competition when the dependent variable is aggregate aid flows in levels and when the four countries that receive the least amount of aid are removed.

Table C.4.1: World Bank aid per capita (log) models: District-level

	(1)	(2)	(3)	(4)	(5)
Victory margin*No competition	0.055	0.089	0.079	0.053	0.053
	(0.079)	(0.073)	(0.076)	(0.080)	(0.080)
Victory margin*Competition	-0.028	-0.058	-0.067	-0.070	-0.071
	(0.054)	(0.054)	(0.054)	(0.054)	(0.053)
Competition dummy	-0.703	-0.693	-0.693	-0.697	-0.696
	(0.591)	(0.592)	(0.596)	(0.597)	(0.597)
Capital regions		0.367***	0.194	0.153	0.153
		(0.095)	(0.127)	(0.133)	(0.133)
Mineral facilities		0.179***	0.178***	0.189***	0.189***
		(0.047)	(0.047)	(0.047)	(0.047)
Petroleum fields		0.143	0.156	0.154	0.153
		(0.098)	(0.095)	(0.094)	(0.094)
Area (log)		-0.041**	0.002	-0.001	-0.000
		(0.018)	(0.021)	(0.021)	(0.021)
Population (log)			0.002	0.002	0.002
			(0.021)	(0.021)	(0.021)
Night-time lights (log)			0.222***	0.229***	0.231***
			(0.066)	(0.066)	(0.066)
Birth regions				-0.002	-0.003
				(0.118)	(0.119)
Fully co-ethnic regions*No competition				0.201*	0.200*
				(0.111)	(0.111)
Fully co-ethnic regions*Competition				-0.175**	-0.173**
				(0.070)	(0.070)
Chinese aid per capita (log)					-0.019
					(0.044)
R-squared	0.337	0.344	0.347	0.348	0.348
No. of districts	645	645	645	645	645
N	4999	4999	4999	4999	4999
Country-year fixed effects	Yes	Yes	Yes	Yes	Yes

Standard errors clustered at the district level in parentheses. * p <0.10, ** p <0.05, *** p <0.01. Country-year fixed effects are included.

Table C.4.2: Aggregate aid per capita (log) models: District-level

	(1)	(2)	(3)	(4)
Victory margin*No competition	0.073	0.104	0.092	0.065
	(0.085)	(0.077)	(0.079)	(0.083)
Victory margin*Competition	-0.071	-0.101*	-0.110*	-0.112**
	(0.057)	(0.056)	(0.057)	(0.056)
Competition dummy	-0.695	-0.685	-0.684	-0.688
	(0.592)	(0.593)	(0.598)	(0.599)
Capital regions		0.412***	0.208	0.175
		(0.092)	(0.129)	(0.134)
Mineral facilities		0.171***	0.170***	0.178***
		(0.048)	(0.048)	(0.047)
Petroleum fields		0.109	0.125	0.124
		(0.097)	(0.092)	(0.092)
Area (log)		-0.038**	0.014	0.013
		(0.019)	(0.022)	(0.022)
Population (log)			-0.006	-0.006
			(0.021)	(0.020)
Night-time lights (log)			0.269***	0.275***
			(0.066)	(0.066)
Birth regions				-0.022
				(0.121)
Fully co-ethnic regions*No competition				0.202*
				(0.112)
Fully co-ethnic regions*Competition				-0.114
				(0.080)
R-squared	0.358	0.365	0.368	0.369
No. of districts	645	645	645	645
N	4999	4999	4999	4999
Country-year fixed effects	Yes	Yes	Yes	Yes

Standard errors clustered at the district level in parentheses. * p <0.10, ** p <0.05, *** p <0.01. Country-year fixed effects are included.

Table C.4.3: Aggregate aid per capita (log) models - Marginal effects of electoral competitiveness: District-level (future)

	(1)	(2)	(3)	(4)
Victory margin*No competition	-0.038	-0.005	-0.016	-0.045
	(0.098)	(0.090)	(0.094)	(0.098)
Victory margin*Competition	-0.077	-0.108*	-0.117**	-0.117**
	(0.055)	(0.056)	(0.056)	(0.055)
Fully co-ethnic regions*No competition				0.235*
				(0.124)
Fully co-ethnic regions*Competition				-0.148*
				(0.088)
R-squared	0.372	0.379	0.382	0.383
Incumbent vote share*No competition	-0.055	0.023	0.013	-0.049
	(0.190)	(0.174)	(0.181)	(0.190)
Incumbent vote share*Competition	-0.274**	-0.330***	-0.337***	-0.332***
	(0.110)	(0.110)	(0.110)	(0.111)
Fully co-ethnic regions*No competition				0.228*
				(0.126)
Fully co-ethnic regions*Competition				-0.142
				(0.088)
R-squared	0.373	0.380	0.383	0.384
Opposition vote share*No competition	0.073	-0.008	0.013	0.074
	(0.191)	(0.176)	(0.184)	(0.192)
Opposition vote share*Competition	0.127	0.193*	0.212*	0.212*
	(0.111)	(0.112)	(0.112)	(0.111)
Fully co-ethnic regions*No competition				0.234*
				(0.125)
Fully co-ethnic regions*Competition				-0.148*
				(0.088)
R-squared	0.372	0.379	0.382	0.383
Country-year fixed effects	Yes	Yes	Yes	Yes
Geographical controls	No	Yes	Yes	Yes
District controls	No	No	Yes	Yes
Regional favouritism	No	No	No	Yes
No. of districts	645	645	645	645
N	4670	4670	4670	4670

Standard errors clustered at the district level in parentheses. * p <0.10, ** p <0.05, *** p <0.01. Country-year fixed effects are included. Geographical controls include the capital region dummy, the area of the district (log), the mineral facility dummy and the petroleum field dummy. District controls include night-time light intensity (log) and the population of the district (log). Regional favouritism corresponds to the birth region dummy and the full co-ethnicity dummy. An alternative way of forwarding the data is used for this sample.

Table C.4.4: Aggregate aid per capita (log) models - Marginal effects of electoral competitiveness: District-level (aid importance)

	(1)	(2)	(3)	(4)
Victory margin*No competition	0.096	0.121	0.101	0.057
	(0.093)	(0.085)	(0.088)	(0.092)
Victory margin*Competition	-0.085	-0.118**	-0.122**	-0.119**
	(0.058)	(0.057)	(0.058)	(0.058)
Fully co-ethnic regions*No competition				0.408**
				(0.174)
Fully co-ethnic regions*Competition				-0.111
				(0.080)
R-squared	0.340	0.347	0.351	0.353
Incumbent vote share*No competition	0.187	0.251	0.224	0.138
	(0.185)	(0.165)	(0.172)	(0.181)
Incumbent vote share*Competition	-0.290**	-0.350***	-0.345***	-0.333***
	(0.113)	(0.113)	(0.114)	(0.114)
Fully co-ethnic regions*No competition				0.399**
				(0.175)
Fully co-ethnic regions*Competition				-0.107
				(0.079)
R-squared	0.340	0.348	0.352	0.353
Opposition vote share*No competition	-0.186	-0.251	-0.213	-0.127
	(0.184)	(0.166)	(0.173)	(0.182)
Opposition vote share*Competition	0.166	0.236**	0.245**	0.239**
	(0.114)	(0.115)	(0.116)	(0.116)
Fully co-ethnic regions*No competition				0.405**
				(0.174)
Fully co-ethnic regions*Competition				-0.111
				(0.080)
R-squared	0.340	0.347	0.351	0.353
Country-year fixed effects	Yes	Yes	Yes	Yes
Geographical controls	No	Yes	Yes	Yes
District controls	No	No	Yes	Yes
Regional favouritism	No	No	No	Yes
No. of districts	551	551	551	551
N	4511	4511	4511	4511

Standard errors clustered at the district level in parentheses. * p <0.10, ** p <0.05, *** p <0.01. Country-year fixed effects are included. Geographical controls include the capital region dummy, the area of the district (log), the mineral facility dummy and the petroleum field dummy. District controls include night-time light intensity (log) and the population of the district (log). Regional favouritism corresponds to the birth region dummy and the full co-ethnicity dummy. Cape Verde, Gambia, Mauritius and Zimbabwe are removed from the sample.

Table C.4.5: Aggregate aid in levels (log) models - Marginal effects of electoral competitiveness: District-level

	(1)	(2)	(3)	(4)
Victory margin*No competition	1.088**	1.177**	1.070**	0.852*
	(0.507)	(0.463)	(0.455)	(0.471)
Victory margin*Competition	-0.292	-0.491*	-0.596**	-0.593**
	(0.289)	(0.288)	(0.282)	(0.279)
Fully co-ethnic regions*No competition				1.962***
				(0.703)
Fully co-ethnic regions*Competition				-0.585*
				(0.306)
R-squared	0.430	0.441	0.458	0.460
Incumbent vote share*No competition	2.018**	2.289**	2.203**	1.771*
	(1.008)	(0.914)	(0.893)	(0.929)
Incumbent vote share*Competition	-1.120*	-1.483**	-1.608***	-1.574***
	(0.574)	(0.576)	(0.557)	(0.554)
Fully co-ethnic regions*No competition				1.919***
				(0.706)
Fully co-ethnic regions*Competition				-0.562*
				(0.305)
R-squared	0.430	0.442	0.459	0.460
Opposition vote share*No competition	-2.196**	-2.472***	-2.232**	-1.806*
	(0.997)	(0.910)	(0.893)	(0.927)
Opposition vote share*Competition	0.510	0.929	1.198**	1.190**
	(0.567)	(0.571)	(0.563)	(0.556)
Fully co-ethnic regions*No competition				1.940***
				(0.705)
Fully co-ethnic regions*Competition				-0.584*
				(0.307)
R-squared	0.430	0.441	0.458	0.460
Country-year fixed effects	Yes	Yes	Yes	Yes
Geographical controls	No	Yes	Yes	Yes
District controls	No	No	Yes	Yes
Regional favouritism	No	No	No	Yes
No. of districts	551	551	551	551
N	4511	4511	4511	4511

Standard errors clustered at the district level in parentheses. * p <0.10, ** p <0.05, *** p <0.01. Country-year fixed effects are included. Geographical controls include the capital region dummy, the area of the district (log), the mineral facility dummy and the petroleum field dummy. District controls include night-time light intensity (log) and the population of the district (log). Regional favouritism corresponds to the birth region dummy and the full co-ethnicity dummy. Cape Verde, Gambia, Mauritius and Zimbabwe are removed from the sample

Chapter 5

Conclusion

5.1 Motivations and aims

Although foreign aid aims to build the necessary infrastructure for development by strengthening institutions and overcoming any 'state capacity' issues identified in the literature (Besley and Persson, 2011), it can at the same time provide opportunities for illegal rent-seeking activities and corruption (Bräutigam and Knack, 2004). Foreign aid is primarily given to governments, therefore, the effectiveness of foreign aid is likely to depend on the behaviour of recipient governments and how political leaders allocate aid (Morrissey, 2015a, McGillivray and Morrissey, 2000, Devarajan et al., 1999). The empirical literature reaches no consensus on the effect of aid on growth (Dalgaard et al., 2004, Dalgaard and Hansen, 2001, Hansen and Tarp, 2001, Burnside and Dollar, 2000).

Foreign aid may not be used as intended by the donor and the literature on foreign aid argues that aid can be used for personal motives and political purposes (Bräutigam and Knack, 2004, Knack, 2001). This raises the issue of 'fungibility', which is defined as aid not being used as intended by the donor (McGillivray and Morrissey, 2000). For example, aid could be financing tax reductions, reductions in spending or changes in the pattern of spending, or leaders might be diverting aid flows into their private pockets (Wright and Winters, 2010). On the other hand, aid may be fungible if it frees up public resources to finance a project that would otherwise not be financed (Devarajan and Swaroop, 1998). Fungibility could arise due to malicious intent, aid illusion or the optimal choice of recipient governments.

Fungibility and the way aid is used by political leaders was central to this thesis, where the allocation of foreign aid from different donors was examined both at the country level and at the district level. This thesis aimed to identify whether aid is used as intended with regard to spending and tax revenue patterns and whether aid is used as a political tool to advance the personal agendas of political leaders.

The first study of this thesis aimed to investigate the effect of aid on general government spending in an attempt to explore whether aid is used as intended. The empirical literature on fungibility does not consider that aid might have a heterogeneous effect on spending depending on institutional quality (Dieleman et al., 2013, Van de Sijpe, 2012, Lu et al., 2010). Therefore, the degree of fungibility was examined to explore whether or not it

depends on institutional quality. The hypothesis of this study was that institutional quality would make aid more fungible. Following the literature, on- and off-budget aid flows were considered by breaking down aid flows according to their modality (Van de Sijpe, 2012). On- and off-budget aid was expected to impact spending in different ways. On-budget aid is recorded in the governments' accounts, therefore, a one-to-one effect of on-budget aid to spending was expected. Off-budget aid was not expected to impact spending since it is not recorded in the government's accounts.

The second study of the thesis extended the first one and looked at the revenue side of the budget constraint that recipient governments face. A newly constructed dataset on tax revenues developed by the International Centre for Tax and Development was used, which considers both central and general government data and collects tax revenue data from various sources, such as international databases and country reports (Prichard et al., 2014). This study aimed to investigate the effect of aid on general tax revenues in an attempt to explore whether aid is used as intended or finances tax reductions. The same hypothesis as for Chapter 2 was tested for total tax revenue and its sub-components. Following the literature on tax revenues (Morrissey et al., 2014, Benedek et al., 2012, Gupta et al., 2003), total aid flows were classified according to their type of finance, namely grants and loans.

The final study examined the sub-national allocation of foreign aid. The sub-national allocation of aid across different districts could depend on political economy motives and re-election prospects. Therefore, leaders can distribute aid flows across different districts for their own personal and political agendas (Masaki, 2015, Jablonski, 2014). Furthermore, leaders can exhibit ethnic favouritism by targeting co-ethnic districts (De Luca et al., 2015, Hodler and Raschky, 2014). The effect of competitive elections was also examined. How political leaders target aid may depend on the degree of electoral competitiveness and their certainty of getting re-elected (Hicken, 2011). The literature investigating the motives behind the sub-national allocation of aid flows is limited to a few studies of individual countries (Masaki, 2015, Jablonski, 2014, Dionne et al., 2013, Briggs, 2012). The final study examined the sub-national allocation of foreign aid from China and the World Bank (WB) in 17 African countries using district-level data and Geographical Information System software. A novel dataset on legislative election results is used at the constituency level, which as been geo-coded at the district level for the purposes of this thesis (Kollman et al., 2016).

5.2 Summary of results

The results of the first study suggest that the fungibility of aid with regard to government spending depends on institutional quality, especially for off-budget aid. On-budget aid is found to be fully fungible at all levels of institutional quality suggesting that aid is not used as intended, although alternative estimation techniques show that institutional quality also matters for the fungibility of on-budget aid. The importance of considering institutional quality is highlighted by these results, since in the absence of the interaction term inferences on the extent of fungibility change. More precisely, off-budget aid would be classified as partially fungible, whereas with the interaction term the results show that off-budget aid is fully fungible in environments of low institutional quality and non-fungible in environments of high institutional quality. These findings suggest that aid is not used as intended in the context of government spending. Nevertheless, these fungibility results could be explained by the recipient government behaving optimally and adjusting tax revenues.

The results of the second study suggest that aid in the context of tax revenues is non-fungible, where this finding holds for all levels of institutional quality and for aid given as different types of finance. Based on the model developed by Chatterjee et al. (2012) and the budget constraint recipient governments face (Gupta et al., 2003), these results could still be explained by the optimal choice of recipient governments. Recipient governments might respond to aid receipts by adjusting external borrowing or running a budget surplus. Nevertheless, the results with regard to tax revenues indicate that the optimal choice of recipient governments is not a plausible explanation.

The results of the final study suggest that in environments of strong electoral competition, where political leaders face the uncertainty of re-election, political economy motives prevail. To this end, leaders are found to target aid away from districts of their core voters and to district that support the opposition in an attempt to sway the opposition voters into voting for them. These findings suggest that leaders prefer to target districts that vote for the opposition to gain high electoral returns, rather than waste resources on districts that are loyal and would thus vote for them. On the other hand, in environments of no or low electoral competition without strong re-election motives, leaders are found to target and favour their co-ethnic regions.

The first and second studies identify the effect of institutional quality and corruption on the allocation of foreign aid by political leaders across the components of the budget constraint in developing countries. These show that aid is not used as intended in the context of spending. Considering the findings of Chapters 2 and 3, the aid resources that did

not have the anticipated effect on spending, did not impact tax revenues either. The fact that institutional quality plays a role for fungibility, making aid more fungible could be an indication that fungibility is caused by malicious intent. Political leaders might be diverting aid into their private pockets to satisfy their own personal preferences. On the other hand, aid illusion could also be exacerbated in environments of low institutional quality, contradicting the argument that leaders aim to satisfy their own personal preferences.

The findings of the third study indicate that aid is used for political purposes. Aid is used as a political tool to maximise the re-election prospects of political leaders in environments of high electoral competition. In environments of low or no electoral competition, aid is found to be used as a tool to favour co-ethnic districts.

Overall, the findings of the thesis support the idea that foreign aid is used for personal and political reasons by the leaders of developing countries. Foreign aid is not found to contribute to spending and is thus considered fungible. Based on the findings of this thesis, the optimal choice of recipient government is not a plausible explanation for the fungibility result. This suggests that malicious intent or aid illusion are possible causes of fungibility, particularly since institutional quality is found to matter for the degree of fungibility. Furthermore, the sub-national allocation of foreign aid flows across different African countries suggests that it is indeed used for political economy reasons and ethnic favouritism.

5.3 Future research

These results are largely dependent on the quality of the data used. Data for developing countries suffer the problem of a large number of missing values, especially in Africa (Devarajan, 2013). The missing values proves to be a problem when dynamic models are estimated with appropriate methods of moments that use past levels and past differences, which further reduces the number of available observations. On the other hand, data for foreign aid are of high quality and are becoming more detailed with time. For example, the Creditor Reporting System of the Development Assistance Committee of the Organisation for Economic Cooperation and Development (OECD-DAC) gives information on the purpose of aid projects, its type of finance, its modality and others (OECD, 2013). Furthermore, foreign aid flows have recently started becoming geo-coded by researchers to identify where each project is delivered across the recipient country. This detail in the foreign aid datasets signals the importance that donors place on foreign aid and research done on foreign aid and its effects.

To further understand the extent of fungibility, the components of the budget constraint

can be examined. As Chatterjee et al. (2012) show, recipient governments might be behaving optimally and adjusting other components of the budget constraint. So far the analysis of this thesis has focused on expenditures and tax revenues. Exploring the effect of aid on spending, tax revenues, borrowing and the fiscal balance on a common sample of observations can prove to be helpful in identifying the extent of fungibility and the cause behind fungibility. Furthermore, the database of the OECD-DAC can be fully exploited to investigate the effect aid for different purposes (sectors) and different aid modalities on components of the budget constraint.

Moreover, with regard to the sub-national allocation of aid flows, the motives of 'new' and 'emerging' donors can now be examined with the recent geo-coding of aid flows, such as India or Saudi Arabia. The AidData project website makes such datasets publicly available and the database is frequently updated to include datasets from different donors (Stewart and Russell, 2015). Due to the large availability of province or district-level data, patterns in individual countries can also be examined. For example, the final study of this thesis investigates ethnic favouritism and electoral strategies in a sample of 17 heterogeneous African countries. As a next step, individual countries can be examined to identify whether different leaders behave in a different way by exploiting any changes in the political regime. For example, Ghana experienced a change in the regime throughout the period studied and examining the allocation of foreign aid using Difference-in-Difference can prove important in identifying the causal effect of ethnicity or vote shares on aid allocation. Furthermore, exploring the different characteristics of these heterogeneous African countries is another interesting extension of the final study of the thesis. For example, the electoral rules or electoral systems of countries could be driving how leaders target aid.

5.4 Policy implications

The results of this thesis highlight the importance of institutional quality. Improving the 'state capacities' of developing countries, strengthening institutions and the legal system should be a priority, since these characteristics are found to be associated with reduced fungibility with regard to spending. According to Collier (2008), aid alone may not be sufficient for sustainable growth; international institutions should aim at fighting corruption and strengthening institutions rather than diverting larger amounts of aid or else aid funds disbursed will most likely be wasted. This trap of bad governance, as described by Collier, leads to a vicious cycle: corruption and the ineffectiveness of aid could result to income inequalities and to the under-provision of public services, thus damaging an

economy even further.

Exploring the full extent of fungibility and the effect of aid on the different components of the budget constraint could prove to be particularly useful for the international arena. Donors divert large flows of their resources towards developing countries and have a target of allocating 0.7% of their GNI as aid to developing countries (World Bank, 2015, Development Initiatives, 2013). Furthermore, examining the effects of aid for various purposes, different aid modalities and types of finance is important for policy makers and donors when deciding how to allocate aid to developing countries. Understanding if aid is fungible, and which types of aid are more fungible than others is important for donor countries since the resources devoted could have alternative uses that could be productive both in the donor and recipient countries.

The findings of this thesis show that aid is fungible and that it is used as a political tool to advance the re-election prospects of political leaders. This holds for bilateral flows from OECD countries at the country level, aid from China, which is a 'new' donor, and multilateral aid from the WB at the district level. These results suggest that there is a need for better monitoring of aid projects, both where foreign aid is spent and how it is allocated across regions.

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