



GÖTEBORGS
UNIVERSITET

DEPARTMENT OF POLITICAL SCIENCE

INFORMATION AND QUALITY OF GOVERNANCE IN NON-DEMOCRATIC SETTINGS

A Geospatial Analysis of Media Access and
Quality of Public Service Provision in Uganda

Klara Schönenberger

Master's Thesis:	30 credits
Programme:	Master's Programme in International Administration and Global Governance
Date:	24.05.2021
Supervisor:	Georgios Xezonakis
Words:	18.701

Abstract

This thesis investigated whether access to a non-state-owned radio station can improve the provision of public services at the district level as aspect of quality of governance in Uganda, depending on the visibility and street-discretion of the service. Thereby, this work attempts to fill the research gap on media access and quality of governance in a non-democratic setting. Information provided through access to a radio station can reduce the information-asymmetry between the population and the public officials and between the central government and the local authorities. The reduction in information-asymmetry should increase the ability to hold the responsible authorities accountable and reduce hidden actions (e.g., bribe taking) and hidden type (e.g., incompetence) by local authorities. Thus, it should improve the public service provision. Further, it is argued that only for services with a low visibility and a high street-level discretion access to a radio station has an effect. The thesis examines the provision of infrastructure, health care and education, using a linear regression approach. The results show no significant effects of the access to radio on the provision of the different public services. Thus, the hypothesis that access to a non-state-owned radio channel improves the provision of public services is not supported. The thesis contributes to the existing literature by expanding the research of the effect of information to a non-democratic setting and supports the growing scepticism about the effectiveness of bottom-up accountability.

Keywords: Media Access, Accountability, Public Service Provision, Autocracies, Uganda

Acknowledgments

I would like to thank everyone who contributed to my thesis, directly or indirectly. Firstly, I would like to express my sincere gratitude for the excellent supervision of Georgios Xezonakis and Marcia Grimes. Your feedback was incredibly valuable to me. Secondly, I would like to thank my parents for their incredible support throughout my entire studies. Thirdly, I want to thank my friends for supporting me the last year, be it with an open ear, technical assistance or as study buddies. Special thanks go out to Lorenz for the countless times he encouraged me over the last months. Lastly, thank you, Fabi, for always having my back.

Contents

1	Introduction	1
2	Literature Review	4
2.1	Information and Quality of Governance	4
2.2	Media and Governance	8
2.3	Media and Quality of Governance in Developing Countries	11
2.3.1	Media and Quality of Governance in Autocracies	12
3	Background Uganda	14
3.1	Media Landscape	14
3.2	Public Administration	15
3.3	State of Public Service Provision	16
4	Theory and Hypotheses	17
5	Data and Method	25
5.1	Data	25
5.1.1	Dependent Variables	25
5.1.2	Independet Variables	27
5.2	Descriptive Statistics	30
5.3	Model	32
6	Analysis	34
6.1	Diagnostic	34
6.2	Results	37
6.3	Robustness Check	46
7	Discussion	48
7.1	Limitations	49
8	Conclusion	51
	References	53
	Appendices	63

List of Figures

1	Map of the signal strength	30
2	Map of the distance to nearest major road	30
3	Map of the distance to nearest health facility	31
4	Map of the pupil-teacher ratio	31

List of Tables

1	Effect of media and service characteristics	22
2	Results model 1: Effect of access to radio station on overall public service .	42
3	Results model 2: Effect of access to radio station on infrastructure provision	43
4	Results model 3: Effect of access to radio station on health care provision .	44
5	Results model 4: Effect of access to radio station on education provision .	45

1 Introduction

The basis of all discussions about the development of countries is improving people's welfare. Whereas for a long time democracy was the ultimate goal to improve living standards, the view has shifted slowly towards the insight that the quality of governance (QoG) independent of the political regime is more important to solve central issues in the first stages of development.

The failure to create good governing institutions has dramatic consequences for the economy in general and specifically for the people most in need of the services of a state. Identifying approaches to secure QoG are of utmost importance and research has revealed various factors such as political, economic, and cultural characteristics that influence QoG. However, traditional approaches to improve governance have often failed in developing countries. Therefore, current research focuses on the concept of bottom-up accountability. According to this approach, citizens should be supported in their ability to hold their governments accountable, which consequently will improve their governance.

One popular way to increase the accountability abilities is by providing citizens with information. The underlying theory is based on the principal-agent problem. The citizens (the principal) delegate tasks and power to the government (the agent), but an information asymmetry impedes controlling the actions of the principal, in this case QoG. More information decreases the asymmetry and improves the capabilities to hold a government accountable. Research investigating the linkage between information and QoG is manifold and shows the impact of different kind of information on multiple aspects of governance. Important aspects of QoG where research has found a positive effect of information provision are for example corruption reducing efforts (Islam, 2006; Kosack & Fung, 2014; Reinikka & Svensson, 2005) and public spending (Casey, 2015; Ríos, Guillamón, Benito, & Bastida, 2018; Shi & Svensson, 2006). Often, information works through influencing voting behaviour and elections (Costas-Pérez, Solé-Ollé, & Sorribas-Navarro, 2012; Ferraz & Finan, 2008; Winters & Weitz-Shapiro, 2013).

One aspect of governance with great importance for citizens, especially the most vulnerable ones, that has often been neglected by research is the provision of public services. The sparse research that exists indicates that the availability of information improves public service provision (e.g., Björkman & Svensson, 2009; Deininger & Mpuga, 2005; Lieberman, Posner, & Tsai, 2014). Local level of governments are often crucial for the provision of public services. This level of analysis has not received much attention in

the research regarding issues of information provision and QoG. However, it is important because local officials are the ones implementing the legislation and often have a reasonable amount of discretion and responsibility. Thus, they have can have a high impact on the provision of public services. At the local level an additional information asymmetry problem, besides the one between citizens and government, emerges, namely the information asymmetry between the central government and the local government. Again, the provision of information could help to decrease this asymmetry, improve the accountability capabilities, therefore, improve the provision of services. Additionally, most studies focus on liberal democracies, creating a research gap regarding the growing number of autocratic countries.

Furthermore, research shows that it is important where the information is obtained from (Islam, 2006). Existing research ranges from information provided by state actors (e.g., Bauhr & Carlitz, 2020), over monitoring processes (e.g., Björkman & Svensson, 2009) to mass media, with a focus in literature on the first two. Research on mass media often concentrates on the freedom of press, but neglects the aspect of media access. However, for the effect of information provision on accountability to occur, it is important that people have access to the relevant media channels. Supporting evidence has been found that indeed access to media channels can improve governance (Besley & Burgess, 2002; Islam, 2006; Strömberg, 2004a).

To fill the gap in the research on improving public service provision, especially on the underresearched local level, and to contribute to the increasing demand for research in settings besides liberal democracies, this thesis investigates the research question how media access influences public services provision in a non-democratic setting. Thereby, a distinction between different kinds of public services infrastructure, health and education is made to investigate if there is a difference in the effect of access to a media channel between those services.

To answer the research question, the thesis focused on Uganda. The country has a vibrant media landscape, with radio being them most common source of information, providing independent reporting and reaching most of the citizens. Moreover, the local government levels are provided with a substantive amount of responsibility and resources, including decision powers on the provision of public services. A multiple linear regression model was used and in total four models were employed to investigate the effect of access

to one non-state-owned radio station on the provision of public services. The results indicate that media access does not influence the provision of public services. While the outcome of the analysis indicates that there is a difference between the individual services, explicit effects could not be detected.

This thesis makes several contributions. Firstly, it provides insights into institutions in a non-democratic setting that are traditionally investigated in democracies. Studies have shown that for basic human needs efforts should not only concentrate on improving democracy, but that QoG is as important or even more important at the first stage (Halleröd, Rothstein, Daoud, & Nandy, 2013). In looking at a non-democratic country this thesis answers to the call to take a closer look at QoG in non-democratic settings. Furthermore, this thesis addresses the increasing concern for the role of information and transparency in absence of democracy. It also fills the gap of studies that investigate the effect of the structure on local levels. To sum it up, this work adds to the body of knowledge about the topic of information and public goods provision in developing countries and takes the research on the role of media to a non-democratic setting. Further, it supports the critical view of bottom-up accountability and the role of information provision as an approach to improve QoG.

The thesis starts with an outline of the current state of research, followed by explaining the theoretical mechanisms that govern the relationship between media and QoG. Next, a short background on the country of interest Uganda is given, sketching out the media landscape and the political and administrative structure. Based on this, concrete hypotheses on the effects of access to a non-state-owned radio station on the level of public service provision are developed, which are tested with a multiple linear regression. The models and the data basis are presented before the results of the regression. The results are discussed and after a brief review of the robustness of the models, possible implications for research and practice are given, taking into account the limitations, before the entire work is briefly summarised in the last section.

2 Literature Review

The literature review will be structured as follows. First, an overview of the topic of information and Quality of Government (QoG) in general. Followed by a more specific review of the literature dealing with media as a form of information provision. Subsequently, a closer look at specific settings, developing countries and non-democracies, is offered. The section ends with a summary of identified gaps in the research and the contributions this thesis aims to make.

2.1 Information and Quality of Governance

Good governance is becoming a more and more popular concept for both researchers and practitioners, because failing to reach it has enormous negative economic and political consequences (Adsera, 2003; Islam, 2006). Research on what influences the QoG is widespread and has revealed various factors on all kind of levels. Important factors include political, economic and cultural characteristics, for example gender inequality (Alexander, 2018), economic development, ethnic heterogeneity, religion, legal traditions (La Porta, 1999; Levine, 2005), electoral rules (Chang & Golden, 2007; Kunicová & Rose-Ackerman, 2005; Persson, Tabellini, & Trebbi, 2003), political regimes (Bäck & Hadenius, 2008) and (de)centralization (Fisman & Gatti, 2002; Treisman, 2007). In general, most literature on QoG focuses on democratic states. The sparse research in autocracies has indicated that the type of regime is a crucial factor influencing QoG (Charron & Lapuente, 2011).

More and more research is interested in the provision of information as an important aspect for better government performance. The importance of providing information to improve government has been investigated by several researchers and is seen as necessary for improved QoG by multiple actors like NGOs and International Organisations (IOs) (Bauhr & Grimes, 2014).

Information is a very broad concept and research concerning the topic information and QoG incorporates many different aspects of it. The concepts and variables used differ substantively regarding who provides the information, the process of information provision and the content. Information can be given about individuals and their behaviour (e.g., Ferraz & Finan, 2008), about important (political) procedures (e.g., Ríos et al., 2018), but also more general to increase individual's knowledge (e.g., Keefer & Khemani, 2011). Information can be provided by the concerned institutions (often the state) (e.g., Bauhr & Carlitz, 2020), gained by outside actors like the citizens through for example

monitoring (e.g., Björkman & Svensson, 2009) or be revealed through independent actors like journalists (e.g., Besley & Burgess, 2002). However, this literature review section will not focus on this differentiation, because this would open up an entire new topic. Nevertheless, it will be stated out clearly which aspects of information are of interest for the analysis later on.

Information affects multiple aspects of governance. Hence, literature on the effect is diverse and provides linkages to multiple political outcomes. A large body of research concentrates on the relationship between information disclosure and corruption (Bauhr & Grimes, 2014; Di Tella & Schargrodsky, 2003; Islam, 2006; Kaufmann, Mehrez, & Gurgur, 2019; Kosack & Fung, 2014; Lindstedt & Naurin, 2010; Reinikka & Svensson, 2005). The main proposed theoretical mechanism is political accountability. The political space is seen as a typical principal-agent constellation. Information decreases the knowledge gap and makes it easier for citizens to hold governments accountable for their actions, deterring malfeasance (Banerjee, Kumar, Pande, & Su, 2011; Besley, 2005; Joshi, 2013; Lieberman et al., 2014; van Zyl, 2014). Information can for example work through influencing elections and voting behaviour. Concrete information about corruption influences voting behaviour and electoral outcomes as corruptive behaviour can be punished (e.g., Ferraz & Finan, 2008). Information cannot only decrease corruption when specific information about corrupt individuals is revealed, but also when general actions and processes are reported. This increases the risk for politicians to get caught, making corruption less worthwhile (Costas-Pérez et al., 2012; Ferraz & Finan, 2008; Winters & Weitz-Shapiro, 2013). Another framework to approach the role of information in reducing corruption is spatial and includes horizontal and vertical accountability. Horizontal accountability describes checks and balances in co-equal relationships, for example anti-corruption offices. Information enables the functioning of this mutual oversight mechanisms. Vertical accountability refers to the relationship between citizens and politicians where citizens apply pressure through electoral or other mechanisms (Fox, 2015). Information also improves this process. The identified corruption reducing effect of information has led to multiple information dissemination programs as part of the fight against corruption around the world.

Other aspects of QoG that information can impact are for example spending. Information can help to reduce political budget cycles, leading to political decisions less driven by elections and more by need. More informed voters reduce the increase of fiscal deficits in election years (Shi & Svensson, 2006). Information provision also seems to have an

effect on fiscal performance, for example through influencing the budgeting process (Ríos et al., 2018), and on public spending, impacting the allocation of funds (Casey, 2015). Additionally, research suggests that better informed individuals receive greater benefits from their government (Besley & Burgess, 2002; Strömberg, 2004b). The last relationship is often explained through a supply and demand approach. As information increases individual's knowledge about benefits, it increases the individual's demand for it. According to the framework, politicians respond to this with increasing the supply.

Closely related to general QoG is the quality of public goods and service provision. Although an especially important aspect for ordinary citizens, the impact of information on this issue has not received as much attention as for example the linkage between information and corruption. This paper will contribute to research on the former. Several studies support the argument that availability of information improves public service provision (Björkman & Svensson, 2009; Deininger & Mpuga, 2005; Fox, 2015; Keefer & Khemani, 2011; Lieberman et al., 2014). The main theoretical mechanism proposed is again the increased possibility of holding officials accountable. Several different frameworks besides a principal-agent view have been used to approach the issue. The World Bank for example introduced a two-routes schema of accountability (World Bank, 2004). Citizens have two ways to press for improvement of the provision of services. On the short route they can target the providers of the service directly. Providers could be for example responsible public officials, front-line workers or managers. On the long route citizens can try to press policy makers who then need to target the providers. On both routes citizens can use provided information to pressure for improved services (Kosack & Fung, 2014). Another framework is the supply and demand approach. Simply stated, an increased demand for public service provision creates a supply in terms of for example improved public service distribution processes. Information impacts the quality of public service provision through increasing the demand (Fox, 2015). In the spatial framework information can help citizens to make demands on the state - increase vertical accountability - and also enable horizontal accountability through simplifying oversight mechanisms.

Overall, most researchers find a positive relationship between increased information and better governance. Moreover, an effect of information availability on overall measures of QoG can be found (Islam, 2006). Additionally, a (politically) informed public seems to be more important to ensure good governance than the level of development (Adsera,

2003).

However, more and more studies question this inherently positive image of an increased amount of information and better governance (e.g., Joshi, 2013). Research indicates that the effect might vary across different contexts (Lindstedt & Naurin, 2010) and institutional settings (Malesky, Schuler, & Tran, 2012) and that more transparency could have an adverse effect when no changes lead to resignation (Bauhr & Grimes, 2014). The knowledge about how widespread corruption is could make citizens believe that potential actions will not be effective, thus, they might decide to not engage in any form of mobilisation and withdraw from the political process (Bauhr & Grimes, 2014; Chong, de La O, Karlan, & Wantchekon, 2015). The retraction can for example lead to electoral abstention and a lack of trust in institutions. Citizens then do not pressure for more accountability (Bauhr & Grimes, 2014; Chong et al., 2015; Joshi, 2013; Lindstedt & Naurin, 2010; Malesky et al., 2012). More critical literature suggests that increased transparency through simply making information available is not enough to improve the QoG.

The picture of the research related to the impact of information is inconclusive. On one hand, Reinikka and Svensson (2005) present evidence on how effective information can be in reducing the corruption of schools grants. On the other hand, studies like Bauhr and Grimes (2014) indicate that information about corruption fosters resignation and does not increase accountability. This ambiguity in the findings might be due to variation in underlying theoretical frameworks or to different operationalisations of information in the analyses. Another problem is that studies are hard to compare because authors approach the issue of information in different ways. Some concentrate on auditing or monitoring processes, others on campaigns or media and the relevant information can be about government performance in general or about certain individuals. Moreover, the settings and outcomes the studies focus on differ. For example, both Ferraz and Finan (2008) and Chong et al. (2015) propose that revealing information about corrupt politicians decreases the likelihood of their re-election significantly. Whereas Ferraz and Finan (2008) see this as a confirmation for the positive effect of information on transparency, Chong et al. (2015) go further and present results indicating that information also reduces the general probability of people voting. They conclude that the effect of information on corruption is not that positive, but rather drives people out of the political process completely.

An important aspect that has been neglected in most studies is that a lot of decisions which are crucial for the QoG assessment by ordinary citizens take place at the street level

(Hupe & Hill, 2007). For example, decisions about education like school buildings, hiring teachers etc. are most often made by local bureaucrats. Research has further shown that when analysing this more direct accountability, it is important to keep in mind the possible effect of different service characteristics at the local level (Batley & McLoughlin, 2015). Relevant service characteristics in this case are for example the visibility of activities and results, the nature of the good, the demand and the street-level discretion (Hupe & Hill, 2007; Povitkina & Bolkvadze, 2019; Batley & McLoughlin, 2015; Gofen, 2014). A detailed explanation of how these characteristics might matter is given in the following theory section.

What must be kept in mind is that most of the mentioned studies took place in democratic settings. Nevertheless, the few existing studies regarding the effect of information in autocracies indicate similar mechanism and impacts. Bauhr and Carlitz (2020) for example investigated the effect of information on the quality of service provision in Vietnam. They suggested that the effect of transparency is a function of information asymmetries that characterise different aspects of public service provision. The results suggest that the availability of more information improves education and health services. Positive evidence for an information initiative on providing health services was also found in Uganda (Kosack & Fung, 2014). Government auditing also seems to reduce the level of corruption in an autocratic setting (Liu & Lin, 2012). An even more wide-ranging effect of monitoring as tool to gain more information is found by Giang, Nguyen, and Tran (2017) suggesting an improvement in participation, accountability, administrative procedures and public service delivery.

Nevertheless, the ambiguity in research findings shows that many questions are still unanswered and further, more nuanced investigations in more diverse settings are needed.

2.2 Media and Governance

Research indicates that the information source is important in order to be effective in improving government quality (Islam, 2006). Actors outside of the institutions of the state apparatus like a free press seem to be more effective (Lindstedt & Naurin, 2010). The theoretical argument behind the effectiveness of different sources of information dates back to McCubbins and Schwartz (1984) and their differentiation between so called police-patrol and fire-alarm oversight systems. In a police-patrol oversight system agents inside the institution examine activities and possible violations on their own initiative. This

system is characterised by centralized, active and direct activities. In a fire-alarm system individuals and/or actors outside the agency like mass media are empowered to examine decisions. The institutions then respond to possible complaints. The interventions are less centralized, active and direct. This argument can be applied to the spatial framework of accountability, police patrols representing the horizontal accountability and fire-alarm systems correspond to the vertical aspect of accountability. Research backing this argumentation shows that media can occupy a very important aspect in the checks and balances system in democracies (McMillan & Zoido, 2004; Norris, 2006).

Media is supposed to impact government through its unique role of providing information (Strömberg, 2004a, 2015). Literature provides evidence for linkages between media and policy making through its impact on agenda setting (issue salience), activation and reinforcement, political knowledge, voter turnout and spending levels (Färdigh, 2013; Keefer & Khemani, 2012; Larcinese, 2009; Prat & Strömberg, 2010; Snyder & Strömberg, 2010; Strömberg, 2004b). The argument behind most of the findings is that because mass media has politically relevant information, it makes it easier to hold politicians accountable. This argumentation is based on the principal-agent framework on how information can impact QoG.

However, doubts about the relevance of media freedom alone have arisen. Looking at countries with free media reveals a huge variation in corruption and QoG (Färdigh, 2013). This indicates that media freedom alone is not sufficient and a more nuanced analysis of both variables, media and QoG are needed (Färdigh, 2013; Lindstedt & Naurin, 2010). Moreover, there needs to be a differentiation between media freedom and media access and research should additionally cover how these two aspects interact (Dutta & Roy, 2016).

Additionally, QoG itself consists of two aspects, one that reaches ordinary citizens and another aspect that includes businesses. Indicators for QoG beneficial for businesses concentrate on institution and policies that define the economic environment, like policies that make foreign investment easier. Critical aspects of QoG concentrated on the needs of ordinary people focus on public services like education and health, the impartiality of those and law enforcement (Färdigh, 2013).

Clearly differentiating between the aspects of QoG is necessary to create comparable results. Most studies look at the impact of media on aspects of QoG that improve the situation for the general population like corruption and delivery of public services (e.g.,

Casey, 2015; Chen, 2017; Keefer & Khemani, 2011; Reinikka & Svensson, 2005). As the main mechanism of media influence as a source of information relies on concepts of public accountability, this thesis will also focus on the aspect of QoG that addresses the basic needs of citizens as they are the ones involved in the public accountability. Thus, the thesis will concentrate on the quality of public services.

When looking at media access, it is important to also look at the media landscape in general. What kind of information is provided highly depends on who offers the information (Enikolopov & Petrova, 2015; Islam, 2006). Research shows that state ownership and media concentration are linked to higher corruption for example in the banking sector (Djankov, McLies, Nenova, & Shleifer, 2003; Houston, Lin, & Ma, 2011), probably because both factors also have a huge explanatory power for the problem of media capture (Besley & Burgess, 2001; Besley & Prat, 2006; Prat & Strömberg, 2010). Another aspect, especially in countries with high internet proliferation, is the distinction between social media and traditional media (Charron & Annoni, 2020). A huge problem for analysing any effect of media access and a reason for the limited amount of research is that observed media exposure is often endogenous because variation in media access is frequently correlated with other determinants of potential outcomes like QoG, introducing a problem of omitted variable biases. Thus, researchers need to find plausible exogenous variation (DellaVigna & La Ferrara, 2015; Crabtree & Kern, 2018).

Evidence from established democracies shows that the availability of mass media increases for example public spending, provision of food and calamity relief expenditures, suggesting that media can help to solve agency problems (Besley & Burgess, 2002; Islam, Djankov, & McLeish, 2002; Strömberg, 2004b). As there is a need to improve accountability worldwide, this evidence is important for new project implementations (Islam et al., 2002).

When examining the relationship between media access and QoG, most studies use the level of corruption as the indicator of interest (for examples see the first paragraph of this literature review). Results are quite unambiguous here and suggest that media access can reduce corruption (Adsera, 2003; Ahrend, 2002; Asomah, 2020; Brunetti & Weder, 2003; Chowdhury, 2004; Färdigh, 2013; Freille, Haque, & Kneller, 2007; Lessmann & Markwardt, 2010; Macdonell & Pesic, 2006). These studies offer important insights into the underlying mechanism of transparency and accountability and find promising evidence (Islam, 2006). A small number of studies direct their focus on the provision of public

services, indicating that access to mass media can for example increase literacy rates (DellaVigna & La Ferrara, 2015; Keefer & Khemani, 2011, 2012).

One question that remains largely unaddressed is the impact of media access in countries with low levels of press freedom (Dutta & Roy, 2016). However, this is an important question for several reasons. Firstly, as research indicates press freedom might not be the most relevant aspect (Islam et al., 2002), looking at different settings would contribute significantly to this research. Moreover, knowledge about this issue could provide valuable insight into how to design policies, initiatives, programs or campaigns outside the sometimes rather hard to achieve goal of press freedom.

2.3 Media and Quality of Governance in Developing Countries

The failure of traditional approaches to improve QoG in developing countries led to a need for new methods and re-examination of existing ideas and approaches (Reinikka & Svensson, 2005). Additionally, a growing body of literature on developing countries starts to doubt the promise of democratic institutions in providing public goods (Boräng, Jagers, & Povitkina, 2016; D’Arcy & Nistotskaya, 2017). As a consequence and in line with the provision of information argument outlined in the first two paragraphs, research has focused on the role that media can play in improving government in developing countries. It is especially important to study what makes governments responsive in low-income countries, as the vulnerable rely on the state substantively (Besley & Burgess, 2002). Most of the studies show a positive linkage between mass media and different aspects of QoG (e.g., Asomah, 2020; Casey, 2015; Ferraz & Finan, 2008; Keefer & Khemani, 2016). When the providers of public services are corrupt, media can be a powerful tool to reduce capture in public funds (Reinikka & Svensson, 2005). There is also evidence that information distributed by mass media increases the need for public goods and reduces support for clientelism benefits. Thus, leaving more resources for provision of public goods/services (Keefer & Khemani, 2014). In addition to studies in other countries, studies in developing countries find support for the supply and demand framework, showing that media increases the demand for public health and education provision, resulting in higher levels of service provisions (Keefer & Khemani, 2014). Moreover, despite the popular belief that private media are corrupt, literature indicates that private media in Sub-Saharan Africa actively addresses corruption and pressures political accountability (Asomah, 2020).

2.3.1 Media and Quality of Governance in Autocracies

Information in autocracies is mainly seen as threat to the existing regime as it would allow citizens to update their beliefs and gain better knowledge about what others believe, thus increasing the risk for mass political protest (Hollyer, Rosendorf, & Vreeland, 2015). However, current research on media in autocracies has shown that it is not only used as propaganda tool to influence the public, but also as an efficient tool to monitor lower-level officials through supervision by public opinion, thus influencing their behaviour (Chen, 2017; Egorov, Guriev, & Sonin, 2009; Lorentzen, 2014; Reinikka & Svensson, 2004). Policy makers in non-democratic countries tend to care about their reputation, as well (Islam, 2006). Thus, increased monitoring should make them more likely to produce good policies (Islam, 2006). Additionally, research shows that the idea behind censoring information is most often to prevent mass protest against the regime (Egorov et al., 2009; Guriev & Treisman, 2019; King, Pan, & Roberts, 2013). Yet, information about government performance, especially at the local level, is not necessarily censored, allowing media to actually broadcast relevant information (King et al., 2013). Moreover, models indicate that allowing some independent news is favourable for autocratic regime stability in comparison to strict censorship (Lorentzen, 2014). Study results further underpin the argumentations outlined above by, for example, showing that improved monitoring through more available information increased the quality and quantity of health care provision in Uganda (Björkman & Svensson, 2009). These findings are in line with the concept of using a fire-alarm system explained above.

The literature review has shown that besides a considerable amount of research on the effect of information and especially media, no coherent picture emerges. This might be due to a) variation in what is used as indicator of information as explanatory factor, for example it is no surprise that a study investigating information campaigns produced by the state and a study examining access to independent news outlets find different results. The variation might also be due to b) the divergence of variables investigated as outcome of interest, ranging from re-election probabilities to the number of bed nets. As for the more general effect of information on the QoG, there is also research that doubts the media impact mechanism of increased accountability (Keefer & Khemani, 2011, 2012). However, several aspects of the study by Keefer and Khemani (2011) raise questions. Firstly, the medium under study, community radios, is increasingly questioned to be independent

(Conrad, 2014). Secondly, the radio explicitly covers general information about the importance of education, not about performance of local officials, thus, not providing the relevant information for holding politicians accountable. This raises the need for further studies in the field, a gap this paper contributes to. Furthermore, most research can be found at the cross-country level, with little evidence on how information affects outcomes at the local level. Additionally, most of the evidence originates from liberal democracies. As today autocracies play a more and more important role it is crucial to know how media and information work in non-democratic settings. An essential aspect here is to examine the relationship between media access and information and governance outcomes. As outlined above, research should go beyond the concept of press freedom. Restricting analysis to one aspect of media masks potential effects, as especially in autocracies other aspects like access to non-state owned media could have an impact. Whereas large parts of the research investigated the impact on corruption, other aspects like provision of public services have received less attention. To address this research gap, this thesis aims to answer the following research question. How does access to an independent media channel influence different aspects of public service provision in a non-democratic setting?

By addressing this research question, the thesis firstly contributes to the research concerned with the topic of information and public goods provision in developing countries. Secondly, it investigates the role of media in non-democratic settings regarding governmental performance. Lastly, it explores both points mentioned before on the not so well researched local level.

3 Background Uganda

To answer the research question this thesis will focus on the situation in one country. The following section will give a short overview of the country of interest Uganda, focusing on the aspect of interest, media and public service provision and explain the reasons for choosing this case. The country lies in East-Central Africa and gained independence in 1962. During the dictatorial regimes of Idi Amin and Milton Obote Uganda experienced a violent and unstable phase. Since 1986 Yoweri Museveni is ruling the country and, as he won the recent elections, will continue to do so. Museveni's rule introduced, comparably speaking, a phase of stability and economic growth. However, Uganda is still one of the poorest countries in the world and faces serious challenges. Uganda is defined as an autocracy. As the regularly held elections have been won by the same party for the last 35 years, their democratic function has deteriorated. Political opponents are persecuted, intimidate and often victims of violent harassment.

3.1 Media Landscape

The decision to focus on Uganda out of the numerous non-democratic countries is based on several reasons, most importantly the media landscape. Reports on media freedom in Uganda indicate a more and more difficult situation, especially around elections. The World Press Freedom Index by Reporters Without Borders ranks the country 125 out of 179 ¹. Violence and other kinds of intimidation against journalists happen regularly and radio and TV stations are raided and subjects of suspension orders by media regulators. Especially small, local, rural stations are victims of threats and restrictions of their work and criticism against the central government and the ruling party are prosecuted aggressively (Burnett, 2010).

Nevertheless, Uganda has built and maintained a vibrant media sector with almost 300 radio stations and about 30 airing TV stations. The most popular medium in Uganda is the radio. More than 75% of the Ugandan people have a functioning radio within their household and in 2018 about 80% of the population listened to one or multiple radio programs. The difference between rural and urban areas in radio listenership is small. Radio is also the most common source of news, about half of the population gets news from a radio program every day and 22% use the radio a few times a week to

¹<https://rsf.org/en/uganda> last checked 19.03.2021

obtain information. The next popular medium is TV. A little more than a third of the population has a TV in the household and around 41% watch TV. The access to internet is substantively smaller, 13% have access to it in the household, however, the overall internet user rate has increased rapidly from 3.7% in 2007 to 23% in 2018 ². However, the internet is sometimes disconnected and access to social media is blocked, especially in times around elections. Additionally, the social media tax that installed a fee for users of WhatsApp, Twitter and Facebook is an obstacle to the use of social media in general and as a source of information in particular. Overall, mass media is important for the Ugandan population and access to some form of media is high. With the enormous amount of different media channels Uganda has a diverse media landscape. As research shows, this is an important factor against media capture (Prat & Strömberg, 2010). Beside the diverse supply of media sources, the ownership of these is characterized by pluralism. There are channels owned by the state or owned by media companies owned by the state, others are owned by private companies and international stations. This is important because ownership plurality has been found to be one of the most important factors against media capture (Prat & Strömberg, 2010). One can not only observe journalists interested in nationwide issues, but a substantive amount of journalists that concentrates on investigating local issues. Thus, overall, while the pressure on media and journalist from state side is increasing in Uganda and self-censorship can be expected, independent reporting is still possible, observable and reaching the citizens. All information in the paragraph above is obtained from the Uganda Media Landscape Report by the BBC Media Action (2019) if not indicated otherwise.

Another reason for choosing Uganda is that research has shown that radio and TV programs can influence the Ugandan people, for example through getting people into adopting behaviour that reduces the risk of a HIV infection (BBC Media Action, 2019). Moreover, the administrative landscape also is favourable in regard to analysing the research question.

3.2 Public Administration

The local government system in Uganda incorporates five levels of local administration ranging from the lowest level villages, followed by parish, sub-county and county, to the

²<https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=UG> last checked 19.03.21

highest level districts. Over time, a substantive amount of responsibility and resources has been transferred to the different levels of local administration and a decrease in the influence of central government on local government institutions has been observed (Akin, Hutchinson, & Strumpf, 2005; Devas & Grant, 2003). Among the local level governments districts have the most political authority and resources (Kahkonen & Lanyi, 2001). At the moment, Uganda has 134 districts plus the city district of the capital Kampala. Important decisions at the district level include the provision of basic health services. All staffing decisions regarding medical personnel are made at the district level (Akin et al., 2005). The delivery of primary education is also decentralized. Decisions about school personnel, school construction, operation and maintenance are made on the district level (Devas & Grant, 2003; Kahkonen & Lanyi, 2001). Thus, people holding leadership positions at the district level are quite powerful and a huge part of public service provision happens at this level (Green, 2008). The government at the district level is constituted in the local council V, consisting of the Chairperson, its executives and various directly elected councillors (The Electoral Commission, 2019). Elections for these positions are held together with the parliamentary and presidential election at the national elections.

3.3 State of Public Service Provision

The massive population growth in Uganda reinforces the need for a high-quality and efficient public service provision and the country has invested in this sector. There has been substantial progress in the infrastructure in the country. Uganda was able to more than double the electrical power generation capacity and has made significant improvement in the sanitation and water sector. Nevertheless, main challenges remain and include the still very low electrification rate, insufficient road maintenance, low road quality and especially the rural connectivity (Kabunga, Mogues, Bizimungu, Erman, & van Campenhout, 2016; Ranganathan & Foster, 2012).

The healthcare system faces the burden of infectious diseases like HIV/Aids and Malaria, which are among the five leading causes of mortality, as well as a growing burden of non-communicable diseases. One of the main problems in the healthcare system is the low quality of service, for example the lack of professionals and healthcare workers, a lack of needed drugs and equipment as well as long waiting times. A main reason for this is the insufficient funding (World Health Organization, 2017). Another significant problem is the long distance to healthcare facilities, on average it takes almost an hour to get to

a healthcare facility (Kabunga et al., 2016). Overall, the healthcare system discriminates the most vulnerable part of the population.

There has been positive development in the education sector, for example net enrolment rates at the primary education level have increased up to over 90% and more than three quarters of the adult population is literate³. However, Uganda faces major challenges. Secondary education is not accessible for most people and less than a quarter of the population attends secondary education. Additionally, a major problem is the low quality of teaching. There are not enough teachers and, moreover, high teacher absenteeism is common. Another major issue is the school environment that is often characterized by physical and psychological violence and an insufficient infrastructure (Global Partnership for Education, 2020; Kabunga et al., 2016; World Health Organization, 2017).

Overall, there has been a development in all aspects of public service provision, but major challenges remain. An important aspect is the immense difference of the quality of public service provision between rural and urban areas.

This thesis proceeds with introducing the theoretical framework that forms the base for the analysis of the research question in the specific case of Uganda.

4 Theory and Hypotheses

The underlying theoretical idea behind the relationship between media and governance can be described as a political agency framework. Good governance is a function of the ability of the public to hold politicians accountable. However, the relationship between citizens and political officials follows a classical principal-agent pattern: The principal are citizens, and the agent are the public officials that are supposed to act on behalf of their principal. This situation is characterised by an information asymmetry in favour of the agent, the elected officials. In this setting, principals can try to influence the policy outcomes via elections or lobbying but they can only do so with limited information. This results in problems of hidden actions (like bribe taking) and hidden type (like incompetence) (Islam et al., 2002). As the principal lacks information and monitoring capabilities, implementing mechanisms to punish such behaviour is difficult. Possible corrupt and or incompetent public officials remain in office, resulting in less effective and or less qualitative provision of public services. In addition to the principal agent relationship between citizens and

³<https://data.worldbank.org/indicator/SE.PRM.NENR?locations=UG> last checked 24.03.21

public officials there can also be a principal agent relationship between public officials from different levels of government. The principal are officials at the higher level, for example the central government. They delegate tasks to officials at lower government levels. These lower level officials are then the agents. As for the relationship between citizens and officials, the principal in this scenario needs information and monitoring capacities to punish deficient behaviour.

Media can play an important role in this framework to stop corruption and incompetence or inefficiencies. Media enhances the ability of the citizens to scrutinize government actions through three potential mechanisms. Media can provide information on candidates, their previous track records and their underlying motivation or competence. Thus, citizens can make their choices about whom to put in charge on a more informed base. Hence, more suitable candidates are selected. Secondly, media can affect the discipline of the incumbent. The marginal costs of misbehaviour increase when information about it gets public. The probability of this increases with media reporting malfeasant behaviour. When the cost of deficient behaviour is too high, incumbents stop doing so, resulting in higher quality of public services. Lastly, the media plays an important role in defining the salience of issues. Through providing information and reporting on a specific issue, media can increase the salience of this issue, thus, making responsiveness to a particular issue valuable for public officials (Besley, Burgess, & Prat, 2002).

Although primarily developed for democratic environments, this framework can be transferred to non-democratic settings. Firstly, all of the above mentioned mechanisms also work for citizens in a non-democratic setting. With the distinction that public officials might not be punished in elections but through collective uprising and protests. More information makes the coordination of such movements easier. Secondly, another mechanism can be observed in a non-democratic setting. Non-democratic leaders have strong incentives to ensure an effective and qualitative provision of public service delivery, as this is an important aspect of the legitimation of their regime (Albertus, Fenner, & Slater, 2018; Bueno de Mesquita & Smith, 2009; Svoboda, 2012). This so called performance legitimacy suggests that by providing services like infrastructure, public support for the state increases, reducing the threat of anti-regime mobilisation. As legitimacy is one of the main pillars of stability for an autocratic regime (Gerschewski, 2013) and stability of the regime is one of the main interest of rulers in an autocracy, public support is essential for a regime. To ensure the quality of public service the regime needs information on how

local officials are performing. However, the relationship between the central government who orders public service provision and the local authorities who carry out the orders and provide public services is characterized by an information asymmetry. This is similar to the principal-agent relationship between citizens and officials, with the difference being that in this relationship the central government acts as a principal and the local officials as agents. Therefore, the regime is in need of information about the local level administration and does not necessarily sanction reporting on malfeasance at the local level. Instead, autocratic regimes rely on the media as a monitoring tool, comparable to the fire-alarm system introduced in the literature review section. Research by Egorov et al. (2009) indicates that free media is used by autocratic regimes to pressure bureaucrats to provide information on their performance allowing to improve the governance. Lorentzen (2014) finds in a formal model of authoritarian regimes choosing how much reporting they allow that independent reporting can help an autocratic regime, supports this assumption. The provided information can then be used to punish local authorities and to improve the delivery of public services by implementing more competent local officials. Research has shown that even in countries with an extreme high level of censorship, negative news about local officials are reported (Chen, 2017) and that "permitting some independent investigative reporting will always be preferable to complete censorship [for autocratic regimes]" (Lorentzen, 2014, p. 493). Moreover, information about public service provision is not as critical and negative as other problems like corruption, while still being important for citizens. It is therefore reasonable to assume that information on the performance of local authorities related to the quality of public service provision in Uganda, where the censorship level is lower, is made available by the media.

However, the mere existence of media is not enough (Besley et al., 2002). Firstly, people must have access to the information distributed by the media. Secondly, the information provided must be relevant. Thus, it is important that citizens have access to non-captured media channels (Besley et al., 2002). Based on the outlined theoretical considerations and as literature has shown that non-state owned media is able to provide critical information to the public, even in non-democratic settings or in situations with limited press freedom, it is consequently argued that access to non-state owned media improves public service provisions ⁴. In addition, critical information on the performance

⁴The theory indicates that even state-owned radio stations would have incentives to provide relevant

of local authorities being available in the media in autocracies, it is important that the authorities held accountable are in fact responsible for the quality of public service provision. In Uganda officials mainly responsible for the provision of public services can be found at the local administrative level, with the highest amount of power and resources laying at the district level. The ability to hold the local officials accountable is important for the quality of service provision. Thus, the effect of information should be seen first at lower levels. This assumption is supported by research findings indicating that district officials in Uganda are aware of local demand for public service provision and act accordingly when possible. Following from this, the unit of interest for this thesis are the districts in Uganda.

In sum, better access to (more) information facilitates the monitoring of local authorities' public service provision activities for individuals and the central government. Thus, making it easier to hold public officials accountable. Consequently, the quality of public service provision should increase. This leads to the following hypothesis.

H1: Districts with better access to a non-state owned radio station have an increased quality of overall public service provision.

However, public services differ from one another. The most prominent example in the literature is the discussion about the nature of goods. The nature of the good, public or private respectively excludable and or rival, impacts the provision of public services substantively because it influences the incentives to provide services and the power users of these services have. The impact that new information has on the ability to monitor and hold politicians accountable is only marginally affected by this characteristic. Thus, compared to other characteristics, the nature of a good has only limited impact on the effect of media access on the quality of service provision. Nevertheless, the effect of media access might still be varying across different types of public services due to other varying characteristics (Batley & McLoughlin, 2015). Relevant service characteristics identified by previous literature are the visibility of activities and results, the demand and the street-level discretion (Batley & McLoughlin, 2015; Gofen, 2014; Hupe & Hill, 2007; Povitkina

information. However, under the framework of media as fire-alarms and the fact that censoring is still likely under the argumentation presented, a non-stated-owned media represents a most likely case. Thus, this work concentrates on this case.

& Bolkvadze, 2019). Visibility is meant in a physical sense and here concentrates on the observability of the results of the service provision. The demand describes how frequently and how regularly a service is used. The term street-level discretion is used to express the level of discretion local public officials have. A high level of street-level discretions denotes that the local bureaucrats have great power and responsibility in the decision-making and implementation of the public services.

Visibility is important because only if citizens are aware of the quality of the service provision, they can hold somebody accountable for it. When the visibility is low and the cost of gaining information is too high for individuals, media can help to increase visibility by acquiring and distributing the necessary information at a low cost for the individual (Islam et al., 2002). If the visibility of activities and results is already high, the effect of media is probably limited, because citizens do not rely on media to provide information. Thus, for services with a low visibility, access to a radio station should improve the provision of the service. For services with high visibility the impact of access to a radio station is limited.⁵

The level of demand impacts the incentives for politicians to respond to citizen's pressure (Batley & McLoughlin, 2015). A low demand, in terms of irregular use, makes it hard for citizens to put pressure on public officials. In this case, media can provide information that increase the ability of citizens to act collectively. Thus, access to a media channel should improve the public service provision when the service is characterised by a low demand. When the service is characterised by a high demand, respectively regular use, the effect of media is limited.

The street-level discretion inhabits an especially import role. On one side, it increases the information asymmetry between local authorities and the central government (Bauhr & Carlitz, 2020). Therefore, increasing the possible impact media can have, as new information substantively increases the monitoring abilities of the central government. With a higher information-asymmetry it is also more likely that the relevant information is reported, because the central government has a higher need to monitor the local authorities. On the other side, it also impacts the ability of individual citizens to hold the responsible

⁵It might be argued that a high visibility increases the salience of an issue and thus, media might broadcast more about this issue. However, the potential impact of new information increase the amount of information and consequently the abilities to hold responsible officials accountable. Nevertheless, the effect of new information is still greater for a service with low visibility.

politicians accountable. With a low level of discretion the responsibility for the provision of public services lies by the central government. However, as outlined above, it is unlikely that the media would cover critical information about the central government. Thus, media access would not increase the ability of people to hold the responsible officials accountable and the quality of the service provision would not improve. For a service characterised by street-level discretion, access to the radio station should improve the provision of public services. Whereas for a service characterised by low street-level discretion the proposed mechanism of increased accountability would not manifest, hence, access to a radio station would have no effect on the provision of public services, independent from all other service characteristics

The resulting out of the variance in the characteristics difference in the information asymmetries and ability to hold the right officials accountable should lead to different effects of media on the improvement of the quality of each service provision (Bauhr & Carlitz, 2020; Keefer & Khemani, 2011). Table 1 summarizes the expected effects of media access on the provision of public services depending on the service characteristics.

Table 1: Expected effect of media on public service provision dependent on service characteristics

Characteristic	Low	High
Visibility	strong impact	medium impact
Demand	strong impact	no impact
Discretion	no impact	strong impact

The main important areas of public service provision in developing countries that will be considered in the analysis are infrastructure, basic health services and primary education. The expected relationship for these different services can be hypothesized as follows.

The provision of infrastructure is an important aspect for citizens in developing countries. Thus, the demand is high, stable and in addition predictable, creating incentives for authorities to react to bottom-up pressure. Outcomes infrastructure provision are often highly visible to citizens. For example, roads play an important role in the infrastructure and both, the process to build them and the results of new roads, are detectable. Another example that is especially important for Ugandan citizens is access to water (Kahkonen & Lanyi, 2001). Both, the activity of building new pipelines and the result, individual

access to water, are highly visible. Activities to improve roads or water access are noticeable by citizens themselves without requiring high information gaining costs. Media can offer additional information for example comparisons to other parts of the country, but the effect of this additional information should be rather small. The quality of the infrastructure, on the other hand, is not visible. One can build a road that only lasts for a year or one can build a road that last for a decade, with considerably higher costs. But unless samples are analysed, the difference in quality remains hidden. This is also true for access to water. While expanding the network of pipes is visible, the quality of the water flowing through the pipes is not. This circumstance was for example used to measure corruption and other aspects of QoG (Olken, 2007; Povitkina & Bolkvadze, 2019). However, this thesis concentrates on quantity of service provision, because an analysis of the quality would exceed the scope of this thesis.

To continue, the street-level discretion for decisions related to infrastructure is low. In Uganda, the power lies with the central government and its institutions. According to the arguments outlined for the first hypothesis it is rather unlikely that critical information on this topic is covered by the media, as this would concern the central government and regime directly. Therefore, media could decrease the information asymmetry in some parts, but the information does not allow to hold the right officials accountable, as they sit in the central government. Local authorities lack the ability to change the quantity of infrastructure provision. Road infrastructure is characterised by a high demand, high visibility and low street-level discretion, consequently, we would expect no effect of media access on the quantity of this specific kind of public service provision on a local level.

H2a: Districts with better access to a non-state-owned radio station do not have an increased quantity of infrastructure provision.

The demand for healthcare in general is episodic and the service is used irregularly, people only need it when they are ill. This reduces the incentives for authorities to respond to public pressure and increases the potential effect of media access. The activities to improve the provision of health services are mostly quite visible, like building a new hospital. The results, however, are not as easily observable as for example infrastructure projects such as health service activities mostly produce long-term effects. This increases the potential effect new information provided by the media can have. Furthermore, decision power and resources regarding basic health provision in Uganda lies at the district

level. Thus, we have a high level of street-level discretion. Access to media can significantly reduce the information asymmetries. Moreover, the right officials, local authorities at the district level, can be held accountable by citizens and can actually influence the quality of healthcare provision. Therefore, the relationship between media access and the quality of health service provision is hypothesised as follows.

H2b: Districts with better access to a non-state-owned radio station have an increased quality of health service provision.

The demand for primary education is high and the service is used regularly. Hence, producing incentives for local authorities to respond to local requests. The activities to improve the provision of education services are mostly quite visible, like building a new school. Other important aspects like quality of teaching are not so easy to identify for ordinary citizens. Moreover, the results are not easily observable. Improvement in for example the literacy rate as most basic and important goal of primary education is only visible in the long-term. This increases the potential effect new information provided by the media can have. Furthermore, decisions about for example staffing and school constructions in Uganda are made at the district level. Therefore, the local officials enjoy a high level of street-level discretion. Overall, media can provide information that reduces the information asymmetries between authorities and citizens. The provided information also enables a greater ability to hold the responsible authorities accountable. Thus, the relationship is hypothesised as follows.

H2c: Districts with better access to a radio station have an increased quality of education service provision.

The next section introduces the method and data used to analyse the hypotheses elaborated in this section.

5 Data and Method

5.1 Data

To investigate the effect of access to an independent radio station on provision of public services, data from various resources was used. The final dataset contains 136 observations, representing the 135 districts plus the capital in Uganda.

To measure the proposed variables media access, overall public service provision, provision of infrastructure, provision of health care and provision of education georeferenced information on the districts and their administrative boundaries was needed. The corresponding data was obtained from The Humanitarian Data Exchange (HDX). It contains information on the location, boundaries and names of the districts in Uganda for the year 2020 (OCHA ROSEA, 2020). Further, georeferenced data on the villages in Uganda was needed. This was obtained from HDX, too. It includes amongst other things the location, type and name of villages in Uganda in 2019 (OCHA FISS, 2019).

5.1.1 Dependent Variables

The dependent variable (DV) in hypothesis *H1* is an index variable from the DVs of *H2a*, *H2b* and *H2c*. Therefore, the information on this variable is offered after the other DVs have been introduced. The DV in hypothesis *H2a*, quantity of infrastructure provision, was proxied through the average distance to the nearest major road in a district. Roads are a good example of infrastructure provision in developing countries because improving the transportation network is essential for other improvements. To measure the distance, OpenStreetMap (OSM) data on roads and villages in Uganda was used. The road data from 2020 contains amongst other things information on the location and the type of the road (Humanitarian OpenStreetMap Team, 2020c). The data was filtered so that it only includes major roads. According to OpenStreetMap Wiki (2013) the road conditions often do not correspond with the importance. What matters is the economic and social role. Thus, roads with the tags "motorway", "trunk", "primary", "secondary" or "tertiary" can be considered as major roads, independent of their condition, and were included in the analysis. The filtered data contains just over 10000 major roads in the 136 administrative units. The average distance from a village to a major road in a district was then calculated using the geographic information system application QGIS.

The DV provision of health care for hypothesis *H2b* was operationalised through the

average distance to the nearest health facility in a district. This operationalisation was chosen because difficulties in accessing health services are a major problem of the health system in Uganda. Improvements in this regard are important for the population. For the calculation, data on villages and data on health facilities was used. Health facility data was obtained from The Humanitarian Data Exchange (Humanitarian OpenStreetMap Team, 2020b). The data-set contains an ID-variable, information on the exact location, the name, and the amenity type. It includes pharmacies, but as they are not classified as a public service, they were filtered out. The final dataset contains 2344 different health facilities across Uganda. The computation of the variable of interest was carried out in QGIS.

For the DV provision of education in hypothesis *H2c*, the average pupil-teacher ratio in a district was used as operationalisation. This number is an important factor for the quality of education. Furthermore, to conform with the theoretical argumentation, it is necessary that the variable is characterized by high level of discretion and low visibility. District officials are responsible for the employment of new teachers. Thus, in contrary to for example new schools, a high level of discretion is given. Moreover, the importance of this ratio is not as easily visible for parents as are other indicators. The relevant data was obtained from the Ugandan Bureau of Statistics (Uganda Bureau of Statistics, 2018). This dataset contains information on the average pupil-teacher ratio in each district from 2012 to 2018. From 2018 to 2020 thirteen new districts were created. To match with the other variables and the administrative boundaries from 2020, data from the correspondent parent district was transferred to the new districts.

For the DV in the first hypothesis *H1*, overall level of provision of public services, an index variable containing the aforementioned variables was created. For this purpose, the individual variables average distance to major road, average distance to nearest health facility and pupil-teacher ratio in the district were rescaled to range from 1-10, with higher values indicating a higher distance and a higher pupil-teacher ratio. These values were then added together to create an additive index variable for the overall level of provision of public services, ranging from 1-30. As higher values in the individual variables indicate a worse provision of services, higher values in the overall variable express a worsening of the public service provision. Thus, a decrease in the overall variable implies an improvement of the public service provision.

5.1.2 Independent Variables

The most common problem when examining the effect of media is the lack of exogenous variation. To ensure the identification of the effect of media access, a factor that provides variation in coverage, but is not related to the dependent variable, is needed. This thesis approaches this problem by using geographic variation in signal strength (Crabtree & Kern, 2018). Thereby, a signal propagation model to predict radio signal strength is used. Terrestrial signal strength is a function of topography and transmitter characteristics. Variation is, conditional on observables, exogenous. This approach has been used to identify various effects of mass media like the linkage between independent TV channel and voting behaviour (Enikolopov, Petrova, & Zhuravskaya, 2011), the effect of TV propaganda channels on voting and level of violence (Peisakhin & Rozenas, 2018; Yanagizawa-Drott, 2014) and the effect of radio propaganda in a consolidating dictatorship (Adena, Enikolopov, Petrova, Santarosa, & Zhuravskaya, 2015).

To identify the effect of general access to non-state-owned radio stations, the variable should be operationalised as access to all non-state-owned radio stations. The amount of data and work needed go beyond the scope of this thesis, which is why the availability will be predicted for one non-state-owned radio station to begin with. As no data on the actual subscription rate is available, the variable will be operationalised as share of villages in a district with predicted access to the radio station. The radio station of choice is CapitalFM. The radio landscape in Uganda is very fragmented, however, CapitalFM has the highest share of listeners and reaches a significant amount of people with still enough variation for the analysis (BBC Media Action, 2019). It is also among the most popular radio stations in almost all regions in Uganda. Thus, even without data on actual listenership it is reasonable to assume that people with predicted access listen to the radio. Radio is the most regular source of news in Uganda (BBC Media Action, 2019), indicating that besides entertainment purposes information is broadcasted through radio stations. It was not possible to conduct an analysis of the content broadcasted, but CapitalFM is one of the biggest players in the Ugandan radio landscape making it less susceptible to government interference and allowing the assumption that some critical information on the provision of public services is distributed.

The variable was created in several steps. With data on the location of CapitalFM transmitters as well as technical specifications and digital elevation maps the radio coverage across Uganda was predicted. Data on the CapitalFM transmitters is provided by the

FMLIST database, an open source project collecting transmitter data⁶. For the elevation map, Shuttle Radar Topography Mission (SRTM) data was used. The data is provided by the U.S. Geological Survey (USGS) agency and can be obtained through the Earth Explorer⁷. The python package wavetracer⁸ was then used to predict signal strength for a 90x90 meter cell, using the Irregular Terrain Model (ITM, also called Longley-Rice) algorithm. Combining the resulting map and the map of villages allows to estimate whether the village has sufficient signal strength for listening using a normal receiver⁹. This way the share of villages in a district with access to Capital FM can be calculated.

The next independent variable (IV) is the population. On the one hand, the size and distribution of the population is important for the provision of public services. This increases the demand but also the competition for services. This variable is operationalised through the current level of population density. According to the theoretical argumentation the demand induced by population density should increase the incentives for officials to provide public services. A higher population density should also increase the ability to hold the officials accountable. On the other hand, it is highly likely that radio transmitters are placed strategically to reach as much people as possible. Thus, including population density as variable is important to ensure that the variation in radio signal strength is due to geographical variation only. For the measurement of the average population density in a district, data from WorldPop (WorldPop & CIESIN, 2019) was used. It contains the estimated population density per grid-cell *people/km²* at a resolution of 30 arc seconds in Uganda in 2020. QGIS was used to produce aggregated district-level population density estimates by overlaying the district shapefiles to the population grid raster.

The economic situation affects public service provision insofar as it increases the financial capacities of the districts to provide those services, resulting in higher levels of service provision. The economic situation could also affect the decision where to place the radio transmitters. To account for those effects the covariate economic situation was included in the model. It is operationalised through the average wealth index value of households in a district, based on the survey of the Demographic Health Survey (DHS) Program (ICF International, 2020). Because it could also be reversed, the positioning of radio transmit-

⁶<https://fm.scan.org/net.php?r=f&m=s&itu=UGA&pxf=Capital+FM>

⁷<https://earthexplorer.usgs.gov/>

⁸<https://pypi.org/project/wavetrace/>

⁹The signal is deemed as sufficient if it is at least 50 dBuV/m

ters affecting the economic situation, it is operationalised not as the current wealth index value, but the level five years before. The relevant data was gathered from the 2016 round of the DHS in Uganda (Uganda Bureau of Statistics - UBOS & ICF, 2018). The DHS project contains a huge amount of individual and household characteristics in developing countries covering multiple years, based on a standardised data collection process. It also contains a wealth index measuring the economic situation of a household based on assets like bikes and house construction materials. The corresponding variable in the dataset is hv270a, reporting the wealth index at the household level from 1 to 5, with higher values indicating a better economic situation. Other important variables are hv005, containing the sample weight, hv021, the cluster id, and hv023 with information about the stratification. The survey also includes a GPS dataset that contains the location of the clusters. Using this data and the district shapefile, QGIS was used to add the district information to the cluster. Subsequently, to get the average household wealth index value on a district level, data on the location is merged with the household data by the cluster id variable. Then, in accordance with the DHS Guide to Statistics (Croft, Marshall, & Allen, 2018), a weighted indicator for the average household wealth index values was created.

As the previous level of public service provision influences the current level, it is important to include a covariate reflecting this, in order to identify an effect that is attributable to the variation in radio access. Including the covariate is also a strong measure to rule out the possibility of an omitted variable bias (OVB), because potential unobservable confounders can be disregarded. In each model, these variables were operationalised like the main DV but with data from seven years earlier. This time lag was chosen, because it is long enough to capture changes in the provision of public services, as all of the included DV measure outputs that cannot easily be implemented immediately. To measure the IVs previous level of service provision, the same procedures that were used to obtain the district-level estimates for the corresponding DVs were used. Data on the pupil-teacher ratio in 2015 is available through the Ugandan Bureau of Statistics (Uganda Bureau of Statistics, 2018). Data for villages, roads and health facilities in Uganda in 2015 were obtained through the OverpassAPI (OpenStreetMap Wiki, 2020). The Python package OSMPythonTools¹⁰ was used to query the relevant data and transform it into a dataset.

¹⁰<https://github.com/mocnik-science/osm-python-tools>

5.2 Descriptive Statistics

Summary statistics for all variables used in the analysis can be found in Table B.1 in the Appendix. The distribution of the average radio signal strength in a district across the country can be observed in Figure 1, showing that the lowest signal strength can be found in the north and west of Uganda. Highest signal strength is observed in the districts Kampala, Stronko and Mbarara.

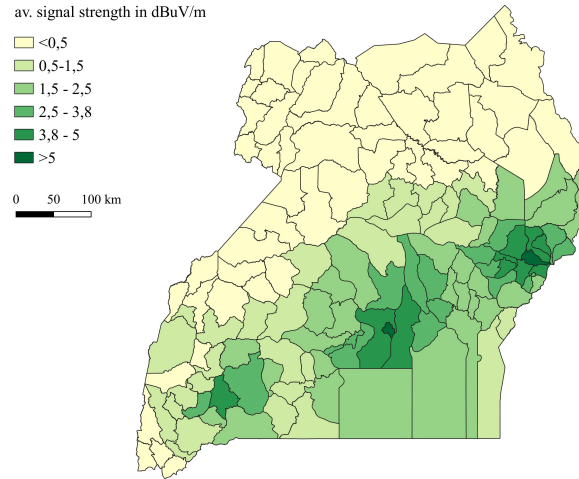


Figure 1: Average radio signal strength in a village, compared on a district level

The DV distance to major road is not as evenly distributed, but more districts with high average distance levels can be found in the northern part than in other parts of Uganda. See Figure 2 for a graphical representation.

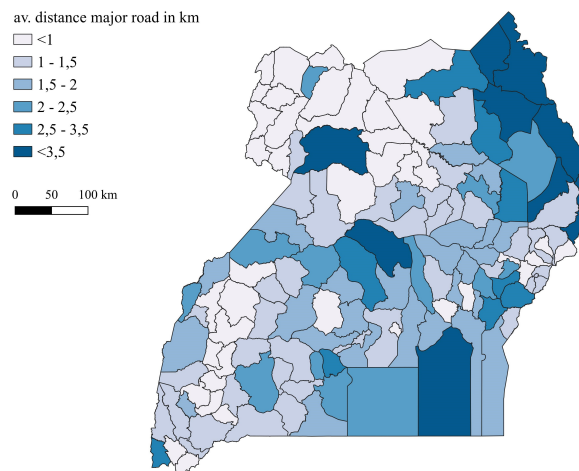


Figure 2: Average distance to nearest major road from a village, compared on a district level

Figure 3 shows the distribution of the DV average distance to nearest health facility. As for the other variables it is observable that the highest distance, thus, the worst service provision, can be found in the northern part of Uganda. Districts with a low average distance tend to be in the southern and south-eastern part of the country.

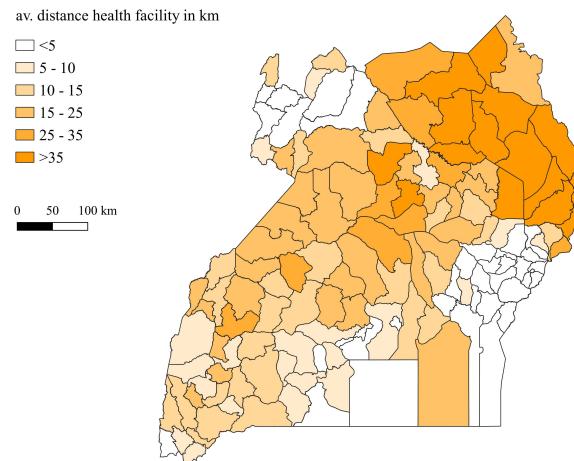


Figure 3: Average distance to nearest health facility from a village, compared on a district level

For a graphical distribution of the DV average pupil-teacher ratio see Figure 4. It shows that districts with a high average of pupil-teacher ratios tend to be in North Uganda, whereas the difference between the districts in South Uganda regarding their pupil-teacher ratio is small.

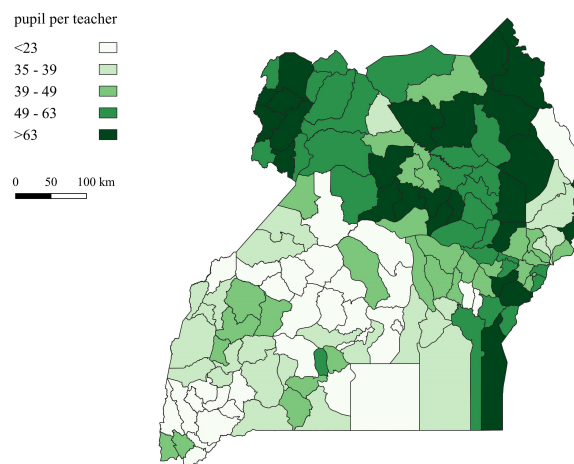


Figure 4 Average pupil-teacher ratio in a district

Overall, the graphical inspection indicates that areas with a high share of villages with

access to the radio station also tend to have better values for the provision of the different public service measurements.

5.3 Model

This section introduces the research strategy, the employed models, and the operationalisation of the hypotheses. A total of four linear regression models were set up to test the hypotheses. The presumed relationship between access to a non-state-owned radio station and the different indicators of the quality of public service provision were modelled as follows.

$$P_d = \gamma_0 + \gamma_1 R_d + \gamma_2 X_d + \epsilon_d \quad (1)$$

Where P_d is the outcome of interest, the level of public service provision in district d , R_d is the predicted access to a non-state-owned radio station in a district d , X_d is the vector of district covariates, and ϵ_d is the error term.

The level of public service provision is the DV in the first hypothesis. To test this, in model 1 the variable is operationalised as an index constructed from the variables provision of infrastructure, health, and education services, which will be analysed in the subsequent models. As for all variables included in the index a higher value corresponds to a lower level of public service provision, the created variable can be better described as a measurement of underdevelopment of the public services. An increase in the DV means a deterioration of the public service provision. Thus, in the analysis a decreasing effect of the access to a non-governmental radio station on the overall public service variable was expected.

The vector of covariates includes the variables on population, economic situation, and previous situation of public service delivery. According to the theoretical argumentation, population density and the economic situation should both have a positive impact on the provision of public services. Because a decrease in the DV represents an improvement of the provision of services, a decreasing effect of these covariates on the DV was expected. A previous low level of public service provision should have a negative impact on the current level, thus, for this covariate an increasing effect on the DVs was expected in the analysis.

To test the hypotheses $H2a$ - $H2c$, an estimation for each of the three issues infrastructure, health and education is performed. Model 2 estimating the effect on the provision

of infrastructure and testing *H2a* looks as follows.

$$PI_d = \gamma_0 + \gamma_1 R_d + \gamma_2 X_d + \epsilon_d \quad (2)$$

Where PI_d stands for the level of infrastructure provision in a district proxied through the average distance from a village to the nearest major road in a district. In accordance with the theoretical argumentation outlined above that infrastructure has a high visibility and a low level of discretion, the distance to a major road is very visible for individuals in the population, easier for example than the overall road density. Moreover, the decision power regarding the construction of new roads lies with the central government, as outlined in the background section about Uganda. In accordance with hypothesis *H2a* the effect in the model is therefore expected to be very small. The other specifications and variables are identical to equation 1.

The model 3 to estimate the effect on the provision of public health services and to test *H2b* looks as follows.

$$PH_d = \gamma_0 + \gamma_1 R_d + \gamma_2 X_d + \epsilon_d \quad (3)$$

Where PH_d stands for the level of public health service provision in a district. It is operationalised as district average distance from a village to the nearest health facility. Moreover, as outlined in the background section, officials at the district level have a considerable influence on the construction of new health facilities. Thus, improved accountability should lead to an improvement of the situation. An improvement means that the distance decreases. Hence, an effect with a negative sign was expected in the analysis. The other specifications are identical to equation 1.

The model 4 to estimate the effect on the provision of education and to test *H2c* looks as follows.

$$PE_d = \gamma_0 + \gamma_1 R_d + \gamma_2 X_d + \epsilon_d \quad (4)$$

Where PE_d stands for the level of education provision in a district. It is operationalised as the average pupil-teacher ratio in a district. The pupil-teacher ratio is an important factor of the quality of education. Furthermore, district officials are responsible for the employment of new teachers. Thus, in contrary to for example new schools, the accountability lies at the district level. Moreover, this aspect and its importance is not as easily visible for parents as are to others. Overall, an improvement of the educational quality

was expected. As a lower pupil-teacher ratio is favourable, the effect was anticipated to have a negative sign. The other specifications are identical to equation 1.

6 Analysis

6.1 Diagnostic

The results of an analysis of the basic models for each hypothesis can be found in Appendix A.1 - A.4¹¹. These original models were tested for potential violations various of OLS assumptions. First of all, a correlation matrix (see Appendix C.1) was used to detect potential multicollinearity issues. No conspicuous values could be detected.

Subsequently, the first model was checked for outliers. Following Ohr (2010), a scatter plot was created, plotting the studentized residuals against the leverage values (Appendix C.2.1.1). According to Ohr (2010), an outlier would be an observation that is both above the cutoff value for the leverage value and not within the cutoff values for the studentized residuals. The cutoff values for the studentized residuals were set at -2 and 2 (Ohr, 2010). The cutoff value for the leverage values was calculated according to Belsley, Kuh, and Welsch (1980). For model 1 the leverage cutoff value is:

$$\frac{2k}{n} = \frac{2 * 7}{136} \approx 0.1029 \quad (5.1)$$

For model 1 two outliers could be identified, the districts Kampala and Karenga. In accordance with Kohler and Kreuter (2016), the models were further controlled for influential observations using Cook's D and DFBETA. The cutoff value for Cook's D is:

$$\frac{4}{n} = \frac{4}{136} \approx 0.03 \quad (6)$$

Seven districts were identified as influential observation. The threshold for DFBETA according to Belsley et al. (1980) is:

$$\frac{4}{n} = \frac{4}{136} \approx 0.03 \quad (7)$$

For model 1 seven districts were identified as influential observations. For the further analysis only observations that were identified as outliers in at least two of the three described methods were considered to be influential enough. This leaves the districts of

¹¹All mentioned graphics and tables can be found in the Appendix

Kampala, Moroto, Nabilatuk and Napak as outliers. An exclusion of these observations did change the results of the estimation (Appendix C.2.2.1). The effect size of the main IV and the IV population density increased, whereas the estimator for the effect of the IV economic development and the IVs previous level of infrastructure and health facilities decreased. The economic situation variable is no longer significant, whereas the population density is now significant. However, all outliers are way beyond the cutoff values and excluding them increased the model fit, the linearity and allows to eliminate heteroscedasticity. As the exclusion does not change the substantive conclusion of the results, the four districts are excluded from the subsequent analyses.

Next, the linearity assumption was tested using a component-plus-residual plot and could be confirmed for all IVs (Appendix C.3.1.1 - C.3.1.3). The homoscedasticity assumption was tested for model 1 graphically with a residual-versus-fitted plot (Appendix B.4.1.1) as well as with a Breusch-Pagan Test. The graphic hinted to a problem of heteroscedasticity, which was confirmed by the test. To solve this problem, the logarithm of the DV overall level of public service provision was calculated and then the regression was estimated with the new DV. The homoscedasticity assumption could be confirmed (Appendix C.4.1.2), whereby the results of the regression coefficients did not change. Hence, the model was replaced by the model with the logarithmic DV. A graphical examination of the normal distribution assumptions revealed no violation (Appendix C.5.1.1). Therefore, the final model looks as follows.

$$\log(P_d) = \gamma_0 + \gamma_1 R_d + \gamma_3 X_d + \epsilon_d \quad (1.1)$$

Subsequently, model 2 was checked for outliers. Following the same method as for model 1, the graphical approach revealed one outlier, the district Kampala (Appendix C.2.1.2). The applied leverage cutoff value is:

$$\frac{2k}{n} = \frac{2 * 7}{136} \approx 0.0735 \quad (5.2)$$

The relevant cutoff value for Cook's D was the same as in (6). For model 2, ten districts were thus identified as influential observations. The cutoff value for DFBETA corresponds to the one identified for testing model 1 in (7). Eleven districts exceed this value in model 2. For further analysis only observations that were identified as influential in at least two of the three described methods were considered as outliers. In model 2 these are the districts Amudat, Buvuma, Kaabon, Kampala, Kotida, Moroto and Nabilatuk. Excluding those observations changed the estimation results substantively, changing the signs of the

regression estimators, and introduced heteroscedasticity to the model. However, achieving linearity and no violation of the normal distribution is only possible when Kampala is excluded from the model. As this is the capital district there is also a theoretical reason for excluding it from the analysis. Capitals differ substantively from the rest of the country, especially in political dimensions and in issues that influence the DV. Thus, the subsequent analysis was performed without the observation of the Kampala district, but including the other districts identified as outliers (Appendix C.2.2.2).

Next, the linearity assumption was tested using a component-plus-residual plot and could be confirmed for all IVs (Appendix C.3.1.4 - C.3.1.6). The homoscedasticity assumption for model 2 was tested graphically with a residual-versus-fitted plot (Appendix C.4.1.3) as well as with a Breusch-Pagan Test. The graphic hinted to a small problem of heteroscedasticity, which was not confirmed by the test. Therefore, no further changes to the model were made. A graphical examination of the normal distribution assumptions revealed no violation (Appendix C.5.1.2). Therefore, the final model looks like in (2), but with one less observation.

Subsequently, model 3 was checked for outliers. The graphical examination identical to that used for model 2 revealed one outlier in model 3, the district Kampala (Appendix C.2.1.3). Using the same Cook's D values as benchmark as for model 1 and 2, seven districts were identified as influential observations. The critical DFBETA value identified in 6 was exceeded by eight districts. For further analysis only observations that were identified as influential in at least two of the three described methods were considered as outliers. This leaves the districts of Kampala and Nabilatuk as outliers. Excluding those observations changed the sign of the main IV estimator (Appendix C.2.2.2), but all other attempts to suffice to the central assumptions failed. Thus, they were excluded from the analysis.

Next, the linearity assumption was tested using a component-plus-residual plot and showed a violation in the population density variable (Appendix C.3.1.7 - C.3.1.10). This problem was solved by taking the logarithm of the corresponding variable (Appendix C.3.2.1 for results after transformation). The homoscedasticity assumption was tested graphically with a residual-versus-fitted plot (Appendix B.4.1.4) as well as with a Breusch-Pagan Test. The graphic hinted to a problem of heteroscedasticity, which was confirmed by the test. To solve this problem, the logarithm of the DV distance to nearest health facility was calculated and then the regression was estimated with the new DV. The

homoscedasticity assumption could be confirmed (Appendix C.4.1.5), whereby the significance of the estimator for the economic situation and the previous level of health facilities was reduced. Hence, the model was replaced by the model with the logarithmic DV. A graphical examination of the normal distribution assumptions revealed no violation (Appendix C.5.1.3). Therefore, the final model looks as follows, with a change in the vector of control variables.

$$\log(P_{hd}) = \gamma_0 + \gamma_1 R_d + \gamma_2 X_d + \epsilon_d \quad (3.1)$$

Subsequently, model 4 was checked for outliers. Plotting the studentized residuals against the leverage values with equal cutoff values used in the examination of model 2 and 3 did not reveal any outlier (Appendix C.2.1.4). In accordance with Kohler and Kreuter (2016), the models were further controlled for influential observations using Cook's D and DFBETA. Looking at the Cook's D values, eight districts were identified as influential observations. Seven districts exceed the critical DFBETA value. For further analysis only observations that were identified as outliers in at least two of the three described methods were considered as influential enough. This leaves the districts of Manafwa, Namutumba and Yumbe as outliers. Excluding those changed the effect sizes of the economic situation estimator (Appendix C.2.2.2). To be sure that the other assumptions are met, excluding those observations was necessary.

Next, the linearity assumption was tested using a component-plus-residual plot and showed a violation in the population density variable (Appendix C.3.1.11 - C.3.1.14). This problem was solved by taking the logarithm of the corresponding variable (Appendix C.3.2.1 for results after transformation). The homoscedasticity assumption was tested for model 4 graphically with a residual-versus-fitted plot (Appendix C.4.1.6) as well as with a Breusch-Pagan Test. The graphic showed no problem of heteroscedasticity, which was confirmed by the test. A graphical examination of the normal distribution assumptions revealed no violation (Appendix C.5.1.4). Therefore, the final model looks as follows, with a change in the vector of control variables.

$$P_{ed} = \gamma_0 + \gamma_1 R_d + \gamma_2 X_d + \epsilon_d \quad (4.1)$$

6.2 Results

The following section presents the results of the main analysis with the models adjusted accordingly to the diagnostic in the section above. Firstly, the results of the analysis of the stepwise inclusion of variables for each hypothesis are shown. Subsequently, the

results of the main models for the individual analyses for each hypothesis are presented.

Table 2 shows the analysis results of the stepwise inclusion of IVs for hypothesis *H1*. Firstly, the bivariate relationship between the share of villages with access to the radio station and the overall public service provision was examined. For each following estimation another covariate was added to the analysis. Recall that a decrease in the DV in model 1 represents an improvement of the provision of public services. The bivariate analysis shows a statistically significant reducing effect of the radio access variable on the overall public services variable, as expected. One percent more villages with access to radio in a district would decrease the overall public service variable by about 1.01%. Adding the population density as variable to the analysis reduces the effect size of radio access and it is no longer statistically significant. One person more per km^2 would decrease the overall public services by about 0.1%. This effect is statistically significant. Adding a variable representing the economic situation to the model increases the effect size of radio access and reduces the population density effect. One additional unit in the wealth index would decrease the overall public services variable by about 41.91%. Lastly, adding the previous level of overall public services reduces the effect sizes of all other estimators. The estimator for population density is not significant anymore. One additional unit in the overall public services in 2013 would increase the current level by about 7.25%. The effect is statistically significantly.

Table 3 shows the analysis results of the stepwise inclusion of IVs for hypothesis *H2a*. The bivariate analysis shows a statistically non-significant negative effect of the radio access variable on the distance to the nearest major road. Adding the population density as variable to the analysis reduces the effect size of the radio access. One person more per km^2 would decrease the distance by 0.002km. This effect is statistically significant. Introducing the economic situation as variable into the analysis reduces the effect size of the other two estimators. One additional unit in the economy variable would lead to a 0.15km decrease in the distance to the nearest major road. This effect is statistically significant. Lastly, adding the distance to the major road in 2013 to the model reduces the sizes of the economic estimators. One additional kilometre in the district average in 2013 would statistically significantly increase the current distance by 0.4km.

Table 4 shows the analysis results of the stepwise inclusion of IVs for hypothesis *H2b*. In the bivariate analysis one percent more villages with access to the radio station in a district would decrease the distance to the nearest health facility by about 2.02%. This

effect is statistically significant. Adding the population density variable to the analysis reduces the effect size of radio access. A one percent decrease in the population density would decrease the distance by about 0.75%. This effect is statistically non-significant. Introducing the economy variable into the model further decreases the effect sizes of the two other variables. The economic situation has a statistically not significant effect on the distance to the nearest health facility. One additional unit there would reduce the distance by about 7.25%. When the distance in 2013 is considered in the model, the effect of radio access is no longer statistically significant. One kilometre more in the average distance to the nearest health facility in 2013 would lead to an increase in today's distance by about 0.3%. This effect is statistically non-significant.

Table 5 shows analysis results of the stepwise inclusion of IVs for hypothesis *H2c*. For the relationship between radio access and pupil-teacher ratio a negative statistically significant affect of the share of villages with access to the radio could be detected. One percent more villages with access to the radio station would reduce the pupil-teacher ratio by 0.10 pupils per teacher. Adding the population density variable reduces the effect size and the estimator is no longer statistically significant. A one percent increase in the population density would decrease the pupil-teacher ratio by 0.05 pupil per teacher. This effect is statistically significant. When adding a variable for the economic situation a negative statistically significant effect on the pupil-teacher ratio can be detected. One additional unit would lead to 13.66 less pupils per teacher. Introducing the economy variable reduces the effect sizes of the other estimators and the sign of the estimator for the population density turns positive. Adding the pupil-teacher ratio in 2013 to the model changes the size of estimator for radio access and the economic situation. One pupil per teacher more in 2013 would lead to an increase in today's pupil-teacher ratio by 1.02 pupils per teacher. This effect is statistically significant. When this variable is considered in the model, the effect of the economic situation is no longer statistically significant and the sign of the radio access estimator turns positive.

The stepwise inclusion of the variables indicates that the selected variables are relevant for the analysis and potential confounders. Not including them in the final model could introduce biased estimation results. This supports the established models for the main analysis. Next, the results of the multiple linear regression of the final models are presented in detail. The presentation of the following results always applies under the condition that the respective other variables are kept constant.

The last row in Table 2 shows the regression coefficients for model 1 estimated to test hypothesis *H1*. Recall that a decrease in the DV in model 1 represents an improvement of the provision of public services. A one percent increase in the share of villages with access to the radio station would increase the overall public services by about 0.1 percent. The effect is statistically non-significant. An increase of the population density by one (one additional person per km^2) would decrease the overall public service provision by 0.02 percent. This effect is statistically non-significant. Increasing the wealth index by one leads to a decrease in the overall public service provision by approximately 22.14 percent. This estimate is statistically significant. The previous level of public services in 2013 statistically significantly increases the current level of overall public service provision. An increase in the 2013 level would increase the current level by about 7.24 percent. Recall that the DV represents a non-provision of public services and an increase would mean a worsening of public service provision. Thus, the estimator for radio access is expected to have a negative sign. As the estimator of the main IV radio access is not statistically significant and points into a different direction than proposed, the hypothesis *H1: Districts with better access to a non-state-owned radio station have an increased quality of public service provision* can not be supported by the results of this analysis.

The last row in Table 3 shows the regression coefficients of model 2, estimated to test hypothesis *H2a*. In model 2 an increase by one percent in the share of villages with access to the radio station would increase the distance to the nearest major road by 0.005km. The estimator is statistically non-significant. One additional person per km^2 would decrease the distance to the nearest major road by 0.001km. The effect is statistically significant. Adding one unit to the economic development variable would reduce the distance to the nearest major road by 0.05km. The estimator is statistically non-significant. One km more in the average distance to the nearest major road in 2013 would increase the current distance by 0.4km. The effect is statistically significant. These results do not support hypothesis *H2a: The quantity of infrastructure provision does not increase for districts with better access to a non-state-owned radio station*. The hypothesis suggests a null effect of the access to radio on the quantity of infrastructure. The size of the effect estimator is small, the smallest of all four models, hence, supporting the claim of a small effect. However, as the estimator for this relationship is statistically non-significant, the null hypothesis cannot be rejected.

The last row in Table 4 shows the regression coefficients of model 2, estimated to test

hypothesis *H2a*. In model 3 one percent more villages with access to the radio station would decrease the distance to the nearest health facility by approximative 1.01 percent. The effect is statistically non-significant. A one percent increase in the population density would decrease the distance to the nearest health facility by about 0.68 percent. The effect is statistically significant. The economic development has a statistically non-significant decreasing effect on the distance to the nearest health facility. One additional unit would reduce the distance by 8.33 percent. One km more on the average distance to the nearest health facility in 2013 would increase the current distance by about 0.30 percent. The effect is statistically non-significant. The hypothesis *H2b: Districts with better access to a non-state-owned radio station have an increased quality of provision of health services* cannot be supported. Although the effect of radio access on the distance to the nearest major road is negative, what coincides with the hypothesis, as a reduction of the distance implies an improvement of the provision of health care, the effect is statistically non-significant. Thus, the results of this analysis do not support the hypothesis.

The last row in Table 5 shows the regression coefficients of model 2, estimated to test hypothesis *H2a*. In model 4 one percent more villages with access to the radio station would increase the pupil-teacher ratio by 0.02 pupils per teacher. The effect is statistically non-significant. A one percent increase in the population density would increase the pupil-teacher ratio by 0.0077 pupils per teacher. The effect is statistically non-significant. An additional unit in the economic situation would reduce the pupil-teacher ratio by 0.74 pupils per teacher. This effect is statistically non-significant. One additional pupil per teacher in 2013 would increase the current pupil-teacher ratio by 1.02 pupils per teacher. This estimator is statistically significant. Additionally to being statistically non-significant, the sign of the estimator for the effect of radio access points against the proposed direction, suggesting that an increase in the share of villages with access to the radio would increase the pupil-teacher ratio, hence, decreasing the quality of the education. Thus, this analysis presents no support for the hypothesis *H2c: Districts with better access to a non-state-owned radio station have an increased quality of provision of education services*.

Table 2: Results of the stepwise inclusion of IVs for *H1*, testing the effect of access to radio station on overall public service

	<i>Dependent variable: Log of Overall Public Services</i>			
	(1)	(2)	(3)	(4)
Share of villages with access to radio	-0.01*** (0.002)	-0.001 (0.002)	-0.002 (0.002)	0.001 (0.001)
Population density		-0.001*** (0.0002)	-0.0004** (0.0002)	-0.0002 (0.0002)
Economic Situation			-0.35*** (0.04)	-0.20*** (0.04)
Overall Public Services 2013				0.07*** (0.01)
Constant	1.79*** (0.04)	1.99*** (0.06)	2.80*** (0.11)	1.75*** (0.16)
Observations	134	134	134	134
R ²	0.07	0.17	0.48	0.64
Adjusted R ²	0.06	0.16	0.46	0.63
Residual Std. Error	0.46 (df = 132)	0.44 (df = 131)	0.35 (df = 130)	0.29 (df = 129)
F Statistic	9.90*** (df = 1; 132)	13.72*** (df = 2; 131)	39.32*** (df = 3; 130)	58.55*** (df = 4; 129)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 3: Results of the stepwise inclusion of IVs for *H2a*, testing the effect of access to radio station on provision of infrastructure

	<i>Dependent variable: Distance Major Road</i>			
	(1)	(2)	(3)	(4)
Share of villages with access to radio	-0.01 (0.01)	0.002 (0.01)	0.001 (0.01)	0.005 (0.005)
Population density		-0.002** (0.001)	-0.001** (0.001)	-0.001** (0.0005)
Economic situation			-0.15 (0.13)	-0.05 (0.10)
Distance major road 2013				0.40*** (0.04)
Constant	1.66*** (0.11)	2.01*** (0.17)	2.34*** (0.35)	1.16*** (0.30)
Observations	135	135	135	135
R ²	0.01	0.06	0.07	0.44
Adjusted R ²	0.01	0.04	0.05	0.42
Residual Std. Error	1.20 (df = 133)	1.18 (df = 132)	1.18 (df = 131)	0.92 (df = 130)
F Statistic	1.72 (df = 1; 133)	4.09** (df = 2; 132)	3.13** (df = 3; 131)	25.73*** (df = 4; 130)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4: Results of the stepwise inclusion of IVs for *H2b*, testing the effect of access to radio station on provision of health care

	<i>Dependent variable: Log of Distance to Health Facility</i>			
	(1)	(2)	(3)	(4)
Share of villages with access to radio	-0.02*** (0.004)	-0.01* (0.003)	-0.01* (0.003)	-0.01 (0.004)
(Log) Population density		-0.75*** (0.10)	-0.72*** (0.11)	-0.68*** (0.11)
Economic situation			-0.07 (0.09)	-0.08 (0.09)
Distance health facilities 2013				0.003 (0.003)
Constant	2.47*** (0.08)	6.41*** (0.51)	6.40*** (0.51)	6.08*** (0.60)
Observations	134	134	134	134
R ²	0.14	0.41	0.41	0.42
Adjusted R ²	0.13	0.40	0.40	0.40
Residual Std. Error	0.89 (df = 132)	0.74 (df = 131)	0.74 (df = 130)	0.74 (df = 129)
F Statistic	21.70*** (df = 1; 132)	45.68*** (df = 2; 131)	30.62*** (df = 3; 130)	23.27*** (df = 4; 129)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5: Results of the stepwise inclusion of IVs for *H2a*, testing the effect of access to radio station on provision of education

	<i>Dependent variable: Pupil -Teacher Ratio</i>			
	(1)	(2)	(3)	(4)
Share of villages with access to radio	-0.10* (0.06)	-0.02 (0.07)	-0.07 (0.05)	0.02 (0.03)
(Log) Population density		-4.50** (1.92)	2.84* (1.63)	0.77 (0.82)
Economic situation			-13.66*** (1.39)	-0.74 (0.95)
Pupil-teacher ratio 2013				1.02*** (0.05)
Constant	48.53*** (1.40)	71.95*** (10.08)	70.17*** (7.64)	-5.70 (5.42)
Observations	133	133	133	133
R ²	0.02	0.06	0.46	0.87
Adjusted R ²	0.02	0.05	0.45	0.86
Residual Std. Error	15.13 (df = 131)	14.88 (df = 130)	11.28 (df = 129)	5.64 (df = 128)
F Statistic	3.05* (df = 1; 131)	4.33** (df = 2; 130)	37.35*** (df = 3; 129)	209.41*** (df = 4; 128)

Note: *p<0.1; **p<0.05; ***p<0.01

6.3 Robustness Check

For a robustness check the DV for the provision of infrastructure and the provision of education are operationalised differently. Due to a lack of appropriate data, a different operationalisation of the provision of health on a district-level was not possible.

The provision of infrastructure is measured as share of households with access to an improved water source. The data for this variable was gained from the 2016 Uganda Demographic and Health Survey (Uganda Bureau of Statistics - UBOS & ICF, 2018). The relevant variable in the dataset is hv201, containing information about the main source of drinking water of a household. From this, a binary variable indicating if the main water source of a household is improved was created. Following the WHO/UNICEF Joint Monitoring Programme (JMP) on Water and Sanitation guidelines unimproved sources are those coded as "unprotected well", "unprotected spring", "surface water" and "other" (Croft et al., 2018). Other important variables are hv005, containing the sample weight, hv021, the cluster id and hv023 with information about stratification. The survey also includes a GPS dataset that contains the location of the clusters (Uganda Bureau of Statistics - UBOS & ICF, 2018). This information and the district shapefile were used to add the district information to the cluster. To get the share of households with access to an improved water source on a district level, data on the location was merged with the household data by the cluster id variable. In accordance with the DHS Guide to Statistics (Croft et al., 2018), a weighted indicator for the share of households using an improved water source on the district-level was created. Exchanging the measurement for the infrastructure variable had little influence on the effect for the main investigated relationship between the media access and the public service provision (Table D.1.1).

Density of school facilities was used as alternative measurement for the provision of education. Data on the location of schools was obtained through the HDX (Humanitarian OpenStreetMap Team, 2020a). School density (schools/ km^2) at the district level was then calculated using QGIS and the district shapefiles. Using the new measurement introduces statistical significance of the main IV share of villages with access to radio, but the sign of the estimator points in the proposed direction (Table D.1.1). As school density is rather a measurement of the quantity of education and not the quality compared to the pupil-teacher ratio, no change in the results would have been suspicious. This shows that one has to be careful about the operationalisation of the variable for it to yield valid measurements and at the same time proves robust to different operationalisations that

measure the same concept. Additionally, these findings support the choices regarding the operationalisation of the variables that were made.

In the next section, the bearing of the results presented for the above derived hypothesis is discussed and possible explanations for discrepancies are given.

7 Discussion

To recall, none of the hypotheses *H1*, *H2a*, *2b* and *2c* received support from the estimated models, and only in hypothesis *H2b* points the sign of the effect into the expected direction.

There are several possible reasons for the non-significance of the estimated effects which could lead to situations where the proposed theoretical mechanism does not come into play. One potential reason could be that the radio station does not reach enough people to have an effect. Although it is the channel with the highest listenership rates, the majority of the Ugandan population does not have access to it. Because no detailed content analysis of the specific radio station was performed, it is possible that the information provided is neither sufficient for the individuals to hold public officials accountable nor for the central government to hold local officials accountable. Another explanation is that the information does reach the citizens, but they do not act upon it. This argument is supported by research findings indicating that information on chronic failures in public service provision does not cause high intrinsic interest (Keefer & Khemani, 2011).

Another reason could be that this work only looks at one single radio channel. This could lead to an underestimation of the overall effect of non-state-owned radio channels, as this analysis neglects most of them. This colludes with the thought that not enough people are reached for an effect to occur. Furthermore, it would be possible that for some unknown reasons the assumption that the regime allows critical information to be broadcasted does not hold in Uganda.

More likely is that although people receive information, want to act upon it and hold public officials accountable, the information does not improve accountability options. Supporting this explanation is the slowly evolving scepticism about the general effectiveness of bottom-up accountability. For example the study by Raffler, Posner, and Parkerson (2019) that is similar to the study by Björkman and Svensson (2009) concludes that information does not improve the monitoring capabilities of the citizens and consequentially does not improve health outcomes either. In line with this argumentation are findings by Keefer and Khemani (2012) showing that media access increases willingness to pay for better health care but does not increase government accountability. The accountability effect of media access in the education sector could also be weakened through high levels of street divergence. In this sector a range of actors besides the local officials and the central government play a role, like principals, teachers, parents, and students themselves. Identifying the right person to hold accountable requires a lot of effort and the informa-

tion needed must be detailed, resulting in huge amounts of information that must be processed. More people who are potentially responsible reduce the ability of individuals to hold the right person accountable. The problem of multiple responsible individuals could also be true for the central government, as for them to identify the person they would need to address in order to improve the education service can be difficult.

Independent from the fact, that the hypotheses did not receive support from the results of the analysis in this work, this thesis provides valuable insights. The effect sizes of the individual models differ as proposed in the theoretical section, supporting the idea that there is a difference between services according to their demand, visibility and street-level discretion.

Although one must be very careful when interpreting the estimators of covariates, some insights can be derived from looking at the economic situation, the population density and previous levels of service provision. The effect sizes of all covariates are quite high, suggesting a considerable impact of them on the DV and supporting the decision to integrate them into the model. Significant over three of four models are the previous levels of public service provision, suggesting that these variables have a huge influence on the current levels. Adding the economic situation and the previous levels to the analyses also made the media access variable statistically non-significant in the three models where the bivariate regression found a significant effect, indicating that the first found correlation between media access and public service provision is due to the influence of both covariates.

7.1 Limitations

However, there are some limitations that need to be taken into account with regard to the informative value of this work.

Firstly, QoG and more specific public service provision is a broad concept, which also leads to large differences in the results in the literature due to a wide variety of operationalisations, and makes the generalisability and comparability of the results difficult. Secondly, the theoretical argumentation considers the individual mechanisms as given. Although there is enough evidence in the literature for each of the steps, not testing them for the specific case of Uganda and the chosen radio station analysed in this work is a weakness that needs to be kept in mind when discussing the results and possible

implications.

The operationalisation of the variables must be considered, too. Regarding the operationalisation of the dependent variable, it would have been preferable to measure the quality of the services more explicitly. Although the availability of health facilities is a characteristic of the health care system, it would have been desirable to add another criterion such as staff absenteeism, waiting times or availability of drugs at the health facilities. However, this data was not available in the needed format. Quality of the road network would have been even harder to determine. Furthermore, the operationalisation of the variable access to radio station must be seen critically, too. Only one radio station was included in the measurement. To get a full picture of the proposed effect, one should have included the signal strength of all non-state radio stations. The information necessary is in principle available, but the work to incorporate all of it would have exceeded the scope of this thesis. Thus, this analysis could underestimate the effect of radio stations because most of them are neglected. Moreover, due to creating a binary variable indicating if a village has access to the radio channel or not, the IV highly depends on the chosen cutoff value. Although the chosen value is based on what technical literature and legal regulation suggest, it introduces a possible bias into the results. However, other approaches like using the untransformed measure as a continuous treatment or instrumental variable were not possible due to the chosen level of analysis. Another problem is the chosen level of analysis itself, as it is still highly aggregated. Using counties or sub-counties would have been another approach, but information on the quality of the provision of education at those disaggregated levels was not available. Furthermore, the chosen method restrains the informative value of the results, because no time-varying relationship is modelled. The inclusion of a lagged DV in the analysis models a change, but in a static model. This could be problematic, but it was the only way to ensure exogeneity of the media access variable because the necessary data to perform an analysis including a time-component in the DV was not available. The static analysis could mask an effect over time.

Furthermore, the results are difficult to generalise to other non-democratic settings. For the theoretical mechanism to work certain preconditions like a minimum of federal structure and political power at the local level and a diverse media landscape are required.

8 Conclusion

The aim of this work was to investigate the relationship between media and governance outcomes. Although there has been a lot of work in this area, no coherent picture is visible and several gaps in the literature were identified. Trying to fill these gaps this thesis concentrated on the lack of insights into local levels in non-democratic settings and the unresearched aspect of QoG public service provision. The specific research question asked was: How does access to an independent media channel influence different aspects of public service provision in a non-democratic setting?

It was argued that access to a media channel can reduce the information asymmetry between a) citizens and local officials and b) between the central government and local officials. This then increases the ability to hold officials accountable for misbehaviour that leads to poor outcomes in the provision of public services. As a consequence, local officials are replaced with better performing ones or improve their behaviour, resulting in better provision of public services. It was further hypothesised that the effect of media access differs between different types of public services. The effect of media should be higher for services with low visibility and high street-level discretion. Consequently, access to media channels should not influence the provision of infrastructure but should have an effect on the provision of health care and education.

The empirical analysis focused on Uganda because of its diverse media and administrative landscape and because previous studies conducted there support the theoretical claims made. As relevant non-state-owned media channel the radio station Capital FM was chosen. By applying a linear regression estimation, the effect of access to a non-state-owned radio station on the provision of public services was analysed in four models. One model included an index representing the overall level of public service provision. The other three models each included one of the individual variables infrastructure, health and education.

Although causality cannot be inferred from the results they show effects of access to the radio station in opposition to the expected direction and only partly correspond to the expectations. In the data analysed for this thesis, increased access to the radio station seems to have no substantial effect on the distance to the nearest major road as measurement for the provision of infrastructure. In the specific model used, access to the radio station appears to reduce the distance to the nearest health facility, the proxy for

the provision of health care. In contrast to the proposed hypothesis access to the radio station seems to increase rather than decrease the pupil-teacher ratio that was used to measure the provision of education.

Some limitations exist, mostly due to a lack of available data. For example the operationalisation of the variables reduce the value of the findings. Nevertheless, some conclusions for theory and future research can be drawn from this work. The assumption that better access to information is an effective instrument to improve specific aspects of QoG could not be supported and needs further, more nuanced research. Although evidence for all of the mechanisms at the individual steps has been found, there seems to be a gap in the argumentation chain leading to the non-effect of media access. Before concluding that there is no relationship at all, it would be important to identify where in the causal chain problems might arise. Besides improving the analysis with what was mentioned in the limitations, it would be an interesting approach to investigate the effects of media access in different countries. What also became clear in this work is that the lack of available data is a huge problem in the entire research area. Disaggregated data is rare and potentially useful survey data is often limited to certain regions. Further efforts should be made to improve the data available to researchers to enable the use of more sophisticated analyses.

This thesis contributes to research concerned with how to improve governance in developing countries and more specifically on the role information can play. Through focusing on a non-democratic country, this work adds to the growing need of research in non-democratic settings. Furthermore, it explored both aforementioned aspects on the neglected local level. The results also have some implications for practitioners. In the recent decade, a lot of money has been used to implement projects that aimed to increase the monitoring and accountability capacities of citizens through increasing the available information with the presumption this would improve the QoG. However, critics about the effectiveness of such projects have started to emerge and this work suggests that those doubts are justified. Researchers and practitioners might have to come up with new ideas and approaches to improve the service delivery in developing countries.

References

- Adena, M., Enikolopov, R., Petrova, M., Santarosa, V., & Zhuravskaya, E. (2015). Radio and the rise of the nazis in prewar germany. *The Quarterly Journal of Economics*, 130(4), 1885–1939. doi: 10.1093/qje/qjv030
- Adsera, A. (2003). Are you being served? political accountability and quality of government. *Journal of Law, Economics, and Organization*, 19(2), 445–490. doi: 10.1093/jleo/ewg017
- Ahrend, R. (2002). Press freedom, human capital and corruption. *DELTA Working Paper*(2002-11). doi: 10.2139/ssrn.620102
- Akin, J., Hutchinson, P., & Strumpf, K. (2005). Decentralisation and government provision of public goods: The public health sector in uganda. *The Journal of Development Studies*, 41(8), 1417–1443. doi: 10.1080/00220380500187075
- Albertus, M., Fenner, S., & Slater, D. (2018). *Coercive distribution: Elements in the politics of development*. Cambridge: Cambridge University Press. doi: 10.1017/9781108644334
- Alexander, A. C. (2018). The historic roots of quality of government: The role of gender equality. In H. Stensöta & L. Wängnerud (Eds.), *Gender and corruption* (pp. 21–36). Cham: Springer International Publishing. doi: 10.1007/978-3-319-70929-1
- Asomah, J. Y. (2020). Can private media contribute to fighting political corruption in sub-saharan africa? lessons from ghana. *Third World Quarterly*, 41(12), 2011–2029. doi: 10.1080/01436597.2020.1806707
- Bäck, H., & Hadenius, A. (2008). Democracy and state capacity: Exploring a j-shaped relationship. *Governance*, 21(1), 1–24. doi: 10.1111/j.1468-0491.2007.00383.x
- Banerjee, A. V., Kumar, S., Pande, R., & Su, F. (2011). *Do informed voters make better choices? experimental evidence from urban india*. (Unpublished manuscript)
- Batley, R., & McLoughlin, C. (2015). The politics of public services: A service characteristics approach. *World Development*, 74, 275–285. doi: 10.1016/j.worlddev.2015.05.018
- Bauhr, M., & Carlitz, R. (2020). When does transparency improve public services? street-level discretion, information, and targeting. *Public Administration*. doi: 10.1111/padm.12693
- Bauhr, M., & Grimes, M. (2014). Indignation or resignation: The implications of transparency for societal accountability. *Governance*, 27(2), 291–320. doi: 10.1111/

- BBC Media Action. (2019). *Uganda - media landscape report*. Retrieved 12.01.2021, from https://www.communityengagementhub.org/wp-content/uploads/sites/2/2019/09/Uganda-Media-Landscape-report_BBC-Media-Action_February-2019.pdf
- Belsley, D. A., Kuh, E., & Welsch, R. E. (1980). *Regression diagnostics*. Hoboken, NJ, USA: John Wiley & Sons, Inc. doi: 10.1002/0471725153
- Besley, T. (2005). Political selection. *Journal of Economic Perspectives*, 19(3), 43–60. doi: 10.1257/089533005774357761
- Besley, T., & Burgess, R. (2001). Political agency, government responsiveness and the role of the media. *European Economic Review*, 45(4-6), 629–640. doi: 10.1016/S0014-2921(01)00133-7
- Besley, T., & Burgess, R. (2002). The political economy of government responsiveness: Theory and evidence from india. *The Quarterly Journal of Economics*, 117(4), 1415–1451. doi: 10.1162/003355302320935061
- Besley, T., Burgess, R., & Prat, A. (2002). Mass media and political accountability. In R. Islam, S. Djankov, & C. McLeish (Eds.), *The right to tell* (pp. 45–60). DC: Washington.
- Besley, T., & Prat, A. (2006). Handcuffs for the grabbing hand? media capture and government accountability. *American Economic Review*, 96(3), 720–736. doi: 10.1257/aer.96.3.720
- Björkman, M., & Svensson, J. (2009). Power to the people: Evidence from a randomized field experiment on community-based monitoring in uganda. *The Quarterly Journal of Economics*, 124(2), 735–769. doi: 10.1162/qjec.2009.124.2.735
- Boräng, F., Jagers, S. C., & Povitkina, M. (2016). Political determinants of electricity provision in small island developing states. *Energy Policy*, 98, 725–734. doi: 10.1016/j.enpol.2016.04.040
- Brunetti, A., & Weder, B. (2003). A free press is bad news for corruption. *Journal of Public Economics*, 87(7-8), 1801–1824. doi: 10.1016/S0047-2727(01)00186-4
- Bueno de Mesquita, B., & Smith, A. (2009). Political survival and endogenous institutional change. *Comparative Political Studies*, 42(2), 167–197. doi: 10.1177/0010414008323330
- Burnett, M. (2010). *A media minefield increased threats to freedom of expression in uganda*. New York, NY.
- Casey, K. (2015). Crossing party lines: The effects of information on redistributive politics.

- American Economic Review*, 105(8), 2410–2448. doi: 10.1257/aer.20130397
- Chang, E. C. C., & Golden, M. A. (2007). Electoral systems, district magnitude and corruption. *British Journal of Political Science*, 37(1), 115–137. doi: 10.1017/S0007123407000063
- Charron, N., & Annoni, P. (2020). What is the influence of news media on people’s perception of corruption? parametric and non-parametric approaches. *Social Indicators Research*(153), 1139–1165. doi: 10.1007/s11205-020-02527-0
- Charron, N., & Lapuente, V. (2011). Which dictators produce quality of government? *Studies in Comparative International Development*, 46(4), 397–423. doi: 10.1007/s12116-011-9093-0
- Chen, D. (2017). Facilitating public service provision: The emerging role of municipal television news in china. *The China Quarterly*, 229, 130–149. doi: 10.1017/S0305741016001545
- Chong, A., de La O, A. L., Karlan, D., & Wantchekon, L. (2015). Does corruption information inspire the fight or quash the hope? a field experiment in mexico on voter turnout, choice, and party identification. *The Journal of Politics*, 77(1), 55–71. doi: 10.1086/678766
- Chowdhury, S. K. (2004). The effect of democracy and press freedom on corruption: an empirical test. *Economics Letters*, 85(1), 93–101. doi: 10.1016/j.econlet.2004.03.024
- Conrad, D. (2014). Deconstructing the community radio model: Applying practice to theory in east africa. *Journalism: Theory, Practice & Criticism*, 15(6), 773–789. doi: 10.1177/1464884913504257
- Costas-Pérez, E., Solé-Ollé, A., & Sorribas-Navarro, P. (2012). Corruption scandals, voter information, and accountability. *European Journal of Political Economy*, 28(4), 469–484. doi: 10.1016/j.ejpoleco.2012.05.007
- Crabtree, C., & Kern, H. L. (2018). Using electromagnetic signal propagation models for radio and television broadcasts: An introduction. *Political Analysis*, 26(3), 348–355. doi: 10.1017/pan.2018.8
- Croft, T. N., Marshall, A. M., & Allen, C. K. (2018). *Guide to dhs statistics*. Rockville, Maryland.
- D’Arcy, M., & Nistotskaya, M. (2017). State first, then democracy: Using cadastral records to explain governmental performance in public goods provision. *Governance*, 30(2), 193–209. doi: 10.1111/gove.12206

- Deininger, K., & Mpuga, P. (2005). Does greater accountability improve the quality of public service delivery? evidence from uganda. *World Development*, 33(1), 171–191. doi: 10.1016/j.worlddev.2004.09.002
- DellaVigna, S., & La Ferrara, E. (2015). Economic and social impacts of the media. In D. Strömberg, J. Waldfogel, & S. P. Anderson (Eds.), *Handbook of media economics* (Vol. 1, pp. 723–768). Amsterdam, The Netherlands and Oxford, UK: North-Holland. doi: 10.1016/B978-0-444-63685-0.00019-X
- Devas, N., & Grant, U. (2003). Local government decision-making? citizen participation and local accountability: some evidence from kenya and uganda. *Public Administration and Development*, 23(4), 307–316. doi: 10.1002/pad.281
- Di Tella, R., & Schargrodsky, E. (2003). The role of wages and auditing during a crackdown on corruption in the city of buenos aires. *The Journal of Law and Economics*, 46(1), 269–292. doi: 10.1086/345578
- Djankov, S., McLies, C., Nenova, T., & Shleifer, A. (2003). Who owns the media? *Journal of Law and Economics*, 46(2), 341–381.
- Dutta, N., & Roy, S. (2016). The interactive impact of press freedom and media reach on corruption. *Economic Modelling*, 58, 227–236. doi: 10.1016/j.econmod.2016.05.008
- Egorov, G., Guriev, S., & Sonin, K. (2009). Why resource-poor dictators allow freer media: A theory and evidence from panel data. *American Political Science Review*, 103(4), 645–668. doi: 10.1017/S0003055409990219
- Enikolopov, R., & Petrova, M. (2015). Media capture: Empirical evidence. In D. Strömberg, J. Waldfogel, & S. P. Anderson (Eds.), *Handbook of media economics* (Vol. 1, pp. 687–700). Amsterdam, The Netherlands and Oxford, UK: North-Holland. doi: 10.1016/B978-0-444-63685-0.00017-6
- Enikolopov, R., Petrova, M., & Zhuravskaya, E. (2011). Media and political persuasion: Evidence from russia. *American Economic Review*, 101(7), 3253–3285. doi: 10.1257/aer.101.7.3253
- Färdigh, M. A. (2013). *What's the use of a free media? the role of media in curbing corruption and promoting quality of government* (Ph. D Dissertation, University of Gothenburg, Gothenburg). Retrieved 26.01.2021, from https://gupea.ub.gu.se/bitstream/2077/34302/1/gupea_2077_34302_1.pdf
- Ferraz, C., & Finan, F. (2008). Exposing corrupt politicians: The effects of brazil's publicly released audits on electoral outcomes. *The Quarterly Journal of Economics*, 123(2), 703–745. doi: 10.1162/qjec.2008.123.2.703

- Fisman, R., & Gatti, R. (2002). Decentralization and corruption: evidence across countries. *Journal of Public Economics*, 83(3), 325–345. doi: 10.1016/S0047-2727(00)00158-4
- Fox, J. A. (2015). Social accountability: What does the evidence really say? *World Development*, 72, 346–361. doi: 10.1016/j.worlddev.2015.03.011
- Freille, S., Haque, M. E., & Kneller, R. (2007). A contribution to the empirics of press freedom and corruption. *European Journal of Political Economy*, 23(4), 838–862. doi: 10.1016/j.ejpoleco.2007.03.002
- Gerschewski, J. (2013). The three pillars of stability: legitimation, repression, and co-optation in autocratic regimes. *Democratization*, 20(1), 13–38. doi: 10.1080/13510347.2013.738860
- Giang, L., Nguyen, C., & Tran, A. (2017). Does papi monitoring improve local governance? evidence from a natural experiment in vietnam. *International Journal of Development Issues*, 16(1), 85–106. doi: 10.1108/IJDI-05-2016-0028
- Global Partnership for Education (Ed.). (2020). *Uganda*. Retrieved 23.03.2021, from <https://www.globalpartnership.org/where-we-work/uganda>
- Gofen, A. (2014). Mind the gap: Dimensions and influence of street-level divergence. *Journal of Public Administration Research and Theory*, 24(2), 473–493. doi: 10.1093/jopart/mut037
- Green, E. (2008). *District creation and decentralisation in uganda*. London: Crisis States Research Center.
- Guriev, S., & Treisman, D. (2019). Informational autocrats. *Journal of Economic Perspectives*, 33(4), 100–127. doi: 10.1257/jep.33.4.100
- Halleröd, B., Rothstein, B., Daoud, A., & Nandy, S. (2013). Bad governance and poor children: A comparative analysis of government efficiency and severe child deprivation in 68 low- and middle-income countries. *World Development*, 48, 19–31. doi: 10.1016/j.worlddev.2013.03.007
- Holtyer, J. R., Rosendorf, B. P., & Vreeland, J. R. (2015). Transparency, protest, and autocratic instability. *American Political Science Review*, 109(4), 764–784. doi: 10.1017/S0003055415000428
- Houston, J. F., Lin, C., & Ma, Y. (2011). Media ownership, concentration and corruption in bank lending. *Journal of Financial Economics*, 100(2), 326–350. doi: 10.1016/j.jfineco.2010.12.003
- Humanitarian OpenStreetMap Team. (2020a). *Hotosm uganda education facilities*. Re-

- trieved from https://data.humdata.org/dataset/hotosm_uga_education_facilities
- Humanitarian OpenStreetMap Team. (2020b). *Hotosm uganda health facilities*. Retrieved from https://data.humdata.org/dataset/hotosm_uga_health_facilities
- Humanitarian OpenStreetMap Team. (2020c). *Hotsom uganda roads*. Retrieved from https://data.humdata.org/dataset/hotosm_uga_roads
- Hupe, P., & Hill, M. (2007). Street-level bureaucracy and public accountability. *Public Administration*, 85(2), 279–299. doi: 10.1111/j.1467-9299.2007.00650.x
- ICF International (Ed.). (2020). *The dhs program: Demographic and health surveys*. Retrieved 13.01.2021, from <https://www.dhsprogram.com/>
- Islam, R. (2006). Does more transparency go along with better governance. *Economics and Politics*, 18(2), 121–167. doi: 10.1111/j.1468-0343.2006.00166.x
- Islam, R., Djankov, S., & McLeish, C. (Eds.). (2002). *The right to tell: The role of mass media in economic development*. DC: Washington. doi: 10.1596/0-8213-5203-2
- Joshi, A. (2013). Do they work? assessing the impact of transparency and accountability initiatives in service delivery. *Development Policy Review*, 31, 29–48. doi: 10.1111/dpr.12018
- Kabunga, N. S., Mogues, T., Bizimungu, E., Erman, A., & van Campenhout, B. (2016). *The state of public service delivery in uganda: Report of a baseline survey*. Kampala. Retrieved from <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/130450>
- Kahkonen, S., & Lanyi, A. (2001). *Decentralization and governance : Does decentralization improve public service delivery?* World Bank, Washington, DC.
- Kaufmann, D., Mehrez, G., & Gurgur, T. (2019). Voice or public sector management? an empirical investigation of determinants of public sector performance based on a survey of public officials. *Journal of Applied Economics*, 22(1), 321–348. doi: 10.1080/15140326.2019.1627718
- Keefer, P., & Khemani, S. (2011). *Mass media and public services: The effects of radio access on public education in benin*. The World Bank. doi: 10.1596/1813-9450-5559
- Keefer, P., & Khemani, S. (2012). *Do informed citizens receive more...or pay more? the impact of radio on the government distribution of public health benefits*. The World Bank. doi: 10.1596/1813-9450-5952
- Keefer, P., & Khemani, S. (2014). *Radio's impact on preferences for patronage benefits*. The World Bank. doi: 10.1596/1813-9450-6932
- Keefer, P., & Khemani, S. (2016). The government response to informed citizens: New evidence on media access and the distribution of public health benefits in africa.

- The World Bank Economic Review*, 30(2), 233–267. doi: 10.1093/wber/lhv040
- King, G., Pan, J., & Roberts, M. E. (2013). How censorship in china allows government criticism but silences collective expression. *American Political Science Review*, 107(2), 326–343. doi: 10.1017/S0003055413000014
- Kohler, U., & Kreuter, F. (2016). *Datenanalyse mit stata: allgemeine konzepte der datenanalyse und ihre praktische anwendung*. Walter de Gruyter GmbH & Co KG.
- Kosack, S., & Fung, A. (2014). Does transparency improve governance? *Annual Review of Political Science*, 17(1), 65–87. doi: 10.1146/annurev-polisci-032210-144356
- Kunicová, J., & Rose-Ackerman, S. (2005). Electoral rules and constitutional structures as constraints on corruption. *British Journal of Political Science*, 35(4), 573–606. doi: 10.1017/S0007123405000311
- La Porta, R. (1999). The quality of government. *Journal of Law, Economics, and Organization*, 15(1), 222–279. doi: 10.1093/jleo/15.1.222
- Larcinese, V. (2009). Information acquisition, ideology and turnout: Theory and evidence from britain. *Journal of Theoretical Politics*, 21(2), 237–276. doi: 10.1177/0951629808100765
- Lessmann, C., & Markwardt, G. (2010). One size fits all? decentralization, corruption, and the monitoring of bureaucrats. *World Development*, 38(4), 631–646. doi: 10.1016/j.worlddev.2009.11.003
- Levine, R. (2005). Law, endowments and property rights. *Journal of Economic Perspectives*, 19(3), 61–88. doi: 10.1257/089533005774357842
- Lieberman, E. S., Posner, D. N., & Tsai, L. L. (2014). Does information lead to more active citizenship? evidence from an education intervention in rural kenya. *World Development*, 60, 69–83. doi: 10.1016/j.worlddev.2014.03.014
- Lindstedt, C., & Naurin, D. (2010). Transparency is not enough: Making transparency effective in reducing corruption. *International Political Science Review*, 31(3), 301–322. doi: 10.1177/0192512110377602
- Liu, J., & Lin, B. (2012). Government auditing and corruption control: Evidence from china’s provincial panel data. *China Journal of Accounting Research*, 5(2), 163–186. doi: 10.1016/j.cjar.2012.01.002
- Lorentzen, P. (2014). China’s strategic censorship. *American Journal of Political Science*, 58(2), 402–414. doi: 10.1111/ajps.12065
- Macdonell, R., & Pesic, M. (2006). The role of media in curbing corruption. In R. Stapenhurst, N. Johnston, & R. Pelizzo (Eds.), *The role of parliament in curbing corruption*

- (pp. 111–127). Washington, D.C: World Bank.
- Malesky, E., Schuler, P., & Tran, A. (2012). The adverse effects of sunshine: a field experiment on legislative transparency in an authoritarian assembly. *American Political Science Review*, 762–786. doi: 10.1017/S0003055412000408
- McCubbins, M. D., & Schwartz, T. (1984). Congressional oversight overlooked: Police patrols versus fire alarms. *American Journal of Political Science*, 28(1), 165. doi: 10.2307/2110792
- McMillan, J., & Zoido, P. (2004). How to subvert democracy: Montesinos in peru. *Journal of Economic Perspectives*, 18(4), 69–92. doi: 10.1257/0895330042632690
- Norris, P. (2006). The role of the free press in promoting democratization, good governance, and human development. In *Paper for the midwest political science association annual meeting: World press freedom day* (pp. 20–22). Retrieved from https://www.researchgate.net/profile/Pippa-Norris-2/publication/228345456_The_role_of_the_free_press_in_promoting_democratization_good_governance_and_human_development/links/09e41511b15d8af1f5000000/The-role-of-the-free-press-in-promoting-democratization-good-governance-and-human-development.pdf
- OCHA FISS. (2019). *Uganda villages*. Retrieved from <https://data.humdata.org/dataset/uganda-villages>
- OCHA ROSEA. (2020). *Uganda - subnational administrative boundaries*. Retrieved from <https://data.humdata.org/dataset/uganda-administrative-boundaries-admin-1-admin-3>
- Ohr, D. (2010). Lineare regression: Modellannahmen und regressionsdiagnostik. In C. Wolf & H. Best (Eds.), *Handbuch der sozialwissenschaftlichen datenanalyse* (pp. 639–675). Wiesbaden: VS Verlag für Sozialwissenschaften. doi: 10.1007/978-3-531-92038-2{\textunderscore}25
- Olken, B. A. (2007). Monitoring corruption: Evidence from a field experiment in indonesia. *Journal of Political Economy*, 115(2), 200–249. doi: 10.1086/517935
- OpenStreetMap Wiki (Ed.). (2013). *Highway tag africa*. Retrieved 05.04.2021, from https://wiki.openstreetmap.org/w/index.php?title=Highway_Tag_Africa&oldid=2112057
- OpenStreetMap Wiki (Ed.). (2020). *Overpass api*. Retrieved 06.04.2021, from https://wiki.openstreetmap.org/w/index.php?title=Overpass_API&oldid=2080108
- Peisakhin, L., & Rozenas, A. (2018). Electoral effects of biased media: Russian television

- in ukraine. *American Journal of Political Science*, 62(3), 535–550. doi: 10.1111/ajps.12355
- Persson, T., Tabellini, G., & Trebbi, F. (2003). Electoral rules and corruption. *Journal of the European Economic Association*, 1(4), 958–989. doi: 10.1162/154247603322493203
- Povitkina, M., & Bolkvadze, K. (2019). Fresh pipes with dirty water: How quality of government shapes the provision of public goods in democracies. *European Journal of Political Research*, 58(4), 1191–1212. doi: 10.1111/1475-6765.12330
- Prat, A., & Strömberg, D. (2010). The political economy of mass media. In D. Acemoglu, E. Dekel, & M. Arellano (Eds.), *Advances in economics and econometrics* (pp. 135–187). Cambridge: Cambridge University Press. doi: 10.1017/CBO9781139060028.004
- Raffler, P., Posner, D. N., & Parkerson, D. (2019). The weakness of bottom-up accountability: experimental evidence from the ugandan health sector. *Los Angeles: Innovations for Poverty Action*.
- Ranganathan, R., & Foster, V. (2012). *Uganda’s infrastructure: A continental perspective* (No. 5963). The World Bank. doi: 10.1596/1813-9450-5963
- Reinikka, R., & Svensson, J. (2004). *The power of information: Evidence from a newspaper campaign to reduce capture*. The World Bank. doi: 10.1596/1813-9450-3239
- Reinikka, R., & Svensson, J. (2005). Fighting corruption to improve schooling: Evidence from a newspaper campaign in uganda. *Journal of the European Economic Association*, 3(2-3), 259–267. doi: 10.1162/jeea.2005.3.2-3.259
- Ríos, A.-M., Guillamón, M.-D., Benito, B., & Bastida, F. (2018). The influence of transparency on budget forecast deviations in municipal governments. *Journal of Forecasting*, 37(4), 457–474. doi: 10.1002/for.2513
- Shi, M., & Svensson, J. (2006). Political budget cycles: Do they differ across countries and why? *Journal of Public Economics*, 90(8-9), 1367–1389. doi: 10.1016/j.jpubeco.2005.09.009
- Snyder, J. M., & Strömberg, D. (2010). Press coverage and political accountability. *Journal of Political Economy*, 118(2), 355–408. doi: 10.1086/652903
- Strömberg, D. (2004a). Mass media competition, political competition, and public policy. *The Review of Economic Studies*, 71(1), 265–284. doi: 10.1111/0034-6527.00284
- Strömberg, D. (2004b). Radio’s impact on public spending. *The Quarterly Journal of Economics*, 119(1), 189–221. doi: 10.1162/003355304772839560

- Strömberg, D. (2015). Media coverage and political accountability. In D. Strömberg, J. Waldfogel, & S. P. Anderson (Eds.), *Handbook of media economics* (Vol. 1, pp. 595–622). Amsterdam, The Netherlands and Oxford, UK: North-Holland. doi: 10.1016/B978-0-444-63685-0.00013-9
- Svolik, M. W. (2012). *The politics of authoritarian rule*. Cambridge University Press.
- The Electoral Commission (Ed.). (2019). *Voter education handbook*. Uganda. Retrieved 19.04.2021, from <https://www.ec.or.ug/sites/default/files/press/Voter%20Education%20Hand%20book%202020.pdf>
- Treisman, D. (2007). What have we learned about the causes of corruption from ten years of cross-national empirical research? *Annual Review of Political Science*, 10(1), 211–244. doi: 10.1146/annurev.polisci.10.081205.095418
- Uganda Bureau of Statistics (Ed.). (2018). *Pupil teacher ratio by district*. Retrieved 05.04.2021, from <https://www.ubos.org/explore-statistics/21/>
- Uganda Bureau of Statistics - UBOS, & ICF. (2018). *Uganda demographic and health survey 2016 [datasets]: Ughr7bfl.dta, ugge7afl.shp*. Kampala, Uganda and Rockville, Maryland, USA.
- van Zyl, A. (2014). How civil society organizations close the gap between transparency and accountability. *Governance*, 27(2), 347–356. doi: 10.1111/gove.12073
- Winters, M. S., & Weitz-Shapiro, R. (2013). Lacking information or condoning corruption: When do voters support corrupt politicians? *Comparative Politics*, 45(4), 418–436. doi: 10.5129/001041513X13815259182857
- World Bank. (2004). *World development report 2004: Making services work for poor people*. Retrieved from <https://openknowledge.worldbank.org/handle/10986/5986>
- World Health Organization (Ed.). (2017). *Primary health care systems (primasys): Case study from uganda*. Geneva. Retrieved 24.03.21, from https://www.who.int/alliance-hpsr/projects/alliancehpsr_ugandaabridgedprimasys.pdf?ua=1
- WorldPop, & CIESIN. (2019). *The spatial distribution of population density in 2019, uganda*. University of Southampton. Retrieved 05.04.2021, from <https://www.worldpop.org/geodata/summary?id=44351> doi: 10.5258/SOTON/WP00674
- Yanagizawa-Drott, D. (2014). Propaganda and conflict: Evidence from the rwandan genocide. *The Quarterly Journal of Economics*, 129(4), 1947–1994. doi: 10.1093/qje/qju020

A Preliminary Results

Table A.1: Results of the estimation of the preliminary models for *H1*

	<i>Dependent variable: Overall Public Services</i>			
	(1)	(2)	(3)	(4)
Share of villages with access to radio	-0.04*** (0.01)	-0.03* (0.02)	-0.02 (0.01)	0.01 (0.01)
Population density		-0.001* (0.0005)	-0.0002 (0.0004)	-0.0001 (0.0003)
Economic situation			-2.81*** (0.30)	-1.62*** (0.30)
Overall public services 2013				0.52*** (0.07)
Constant	6.81*** (0.32)	6.97*** (0.33)	14.29*** (0.81)	6.48*** (1.26)
Observations	136	136	136	136
R ²	0.06	0.08	0.46	0.62
Adjusted R ²	0.06	0.07	0.44	0.60
Residual Std. Error	3.55 (df = 134)	3.52 (df = 133)	2.72 (df = 132)	2.30 (df = 131)
F Statistic	9.30*** (df = 1; 134)	6.09*** (df = 2; 133)	36.88*** (df = 3; 132)	52.54*** (df = 4; 131)

Note: *p<0.1; **p<0.05; ***p<0.01

Table A.2: Results of the estimation of the preliminary models for *H2a*

	<i>Dependent variable: Distance Major Road</i>			
	(1)	(2)	(3)	(4)
Share of villages with access to radio	-0.01 (0.005)	-0.004 (0.01)	-0.004 (0.01)	0.0004 (0.004)
Population density		-0.0002 (0.0002)	-0.0002 (0.0002)	-0.0001 (0.0001)
Economic situation			-0.22* (0.13)	-0.11 (0.10)
Distance major road 2013				0.40*** (0.04)
Constant	1.66*** (0.11)	1.70*** (0.11)	2.27*** (0.35)	1.09*** (0.30)
Observations	136	136	136	136
R ²	0.02	0.03	0.05	0.43
Adjusted R ²	0.01	0.02	0.03	0.41
Residual Std. Error	1.20 (df = 134)	1.20 (df = 133)	1.19 (df = 132)	0.93 (df = 131)
F Statistic	2.67 (df = 1; 134)	2.08 (df = 2; 133)	2.35* (df = 3; 132)	24.57*** (df = 4; 131)

Note: *p<0.1; **p<0.05; ***p<0.01

Table A.3: Results of the estimation of the preliminary models for *H2b*

	<i>Dependent variable: Distance Health Facility</i>			
	(1)	(2)	(3)	(4)
Share of villages with access to radio	-0.18*** (0.06)	-0.14** (0.07)	-0.11* (0.07)	-0.03 (0.06)
Population density		-0.002 (0.002)	-0.001 (0.002)	-0.0002 (0.002)
Economic situation			-8.77*** (1.57)	-7.79*** (1.49)
Distance health facilities 2013				0.24*** (0.05)
Constant	17.54*** (1.46)	18.00*** (1.52)	40.83*** (4.32)	28.81*** (4.86)
Observations	136	136	136	136
R ²	0.06	0.07	0.25	0.34
Adjusted R ²	0.05	0.05	0.23	0.32
Residual Std. Error	16.04 (df = 134)	16.03 (df = 133)	14.47 (df = 132)	13.54 (df = 131)
F Statistic	8.37*** (df = 1; 134)	4.78*** (df = 2; 133)	14.28*** (df = 3; 132)	17.16*** (df = 4; 131)

Note: *p<0.1; **p<0.05; ***p<0.01

Table A.4: Results of the estimation of the preliminary models for $H2c$

	<i>Dependent variable: Pupil-Teacher Ratio</i>			
	(1)	(2)	(3)	(4)
Share of villages with access to radio	-0.11* (0.06)	-0.07 (0.07)	-0.02 (0.05)	0.03 (0.03)
Population density		-0.002 (0.002)	0.0001 (0.002)	0.0001 (0.001)
Economic situation			-12.06*** (1.27)	-0.93 (0.89)
Pupil-teacher ratio 2013				0.99*** (0.05)
Constant	48.53*** (1.38)	48.99*** (1.43)	80.38*** (3.48)	0.25 (4.66)
Observations	136	136	136	136
R ²	0.02	0.03	0.43	0.84
Adjusted R ²	0.02	0.02	0.41	0.84
Residual Std. Error	15.09 (df = 134)	15.08 (df = 133)	11.65 (df = 132)	6.11 (df = 131)
F Statistic	3.11* (df = 1; 134)	2.19 (df = 2; 133)	32.71*** (df = 3; 132)	176.40*** (df = 4; 131)

Note:

*p<0.1; **p<0.05; ***p<0.01

B Descriptive Statistics

Table B.1: Descriptive statistics for all variables

Variable	Min.	Max.	Mean	Median	Sd
Share of villages	0	100	7.818	0.00	21.8
Overall public service	0.3705	20.5405	6.4794	5.3219	3.65
Overall public service 2013	0	21.033	8.391	8.208	3.69
Distance major road	.2590	8.7440	1.6041	1.2610	1.21
Distance major road 2013	0.2349	14.4531	2.1097	1.6764	1.90
Distance health facility	1.385	96.071	16.105	11.955	16.5
Distance health facility 2013	1.149	102.063	35.790	33.195	23.5
Pupil-teacher ratio	23	97	47.71	44.50	15.2
Pupil-teacher ratio 2013	26	92	50.02	48	13.6
Population density	31.44	8319.56	322.52	231.41	719
Wealth index	1	4.467	2.696	2.756	0.816

C Diagnostics

C.1 Multicollinearity

Table C.1: Correlation matrix

Access radio	Population	Economy	Roads 2013	Health 2013	Education 2013
1					
0.492	1				
0.185	0.224	1			
-0.156	-0.120	-0.147	1		
-0.365	-0.242	-0.212	0.222	1	
-0.203	-0.189	-0.685	0.141	-0.005	1

C.2 Outliers

C.2.1 Graphical examination

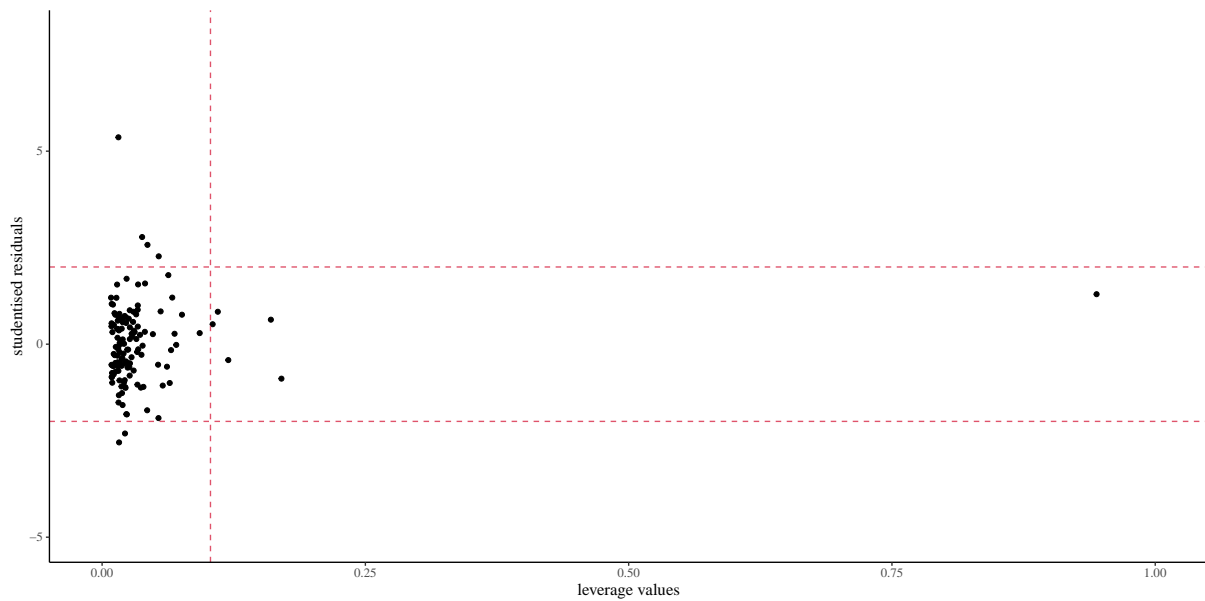


Figure C.2.1.1: Studentised residuals plotted against the leverage values including cutoffs for model 1

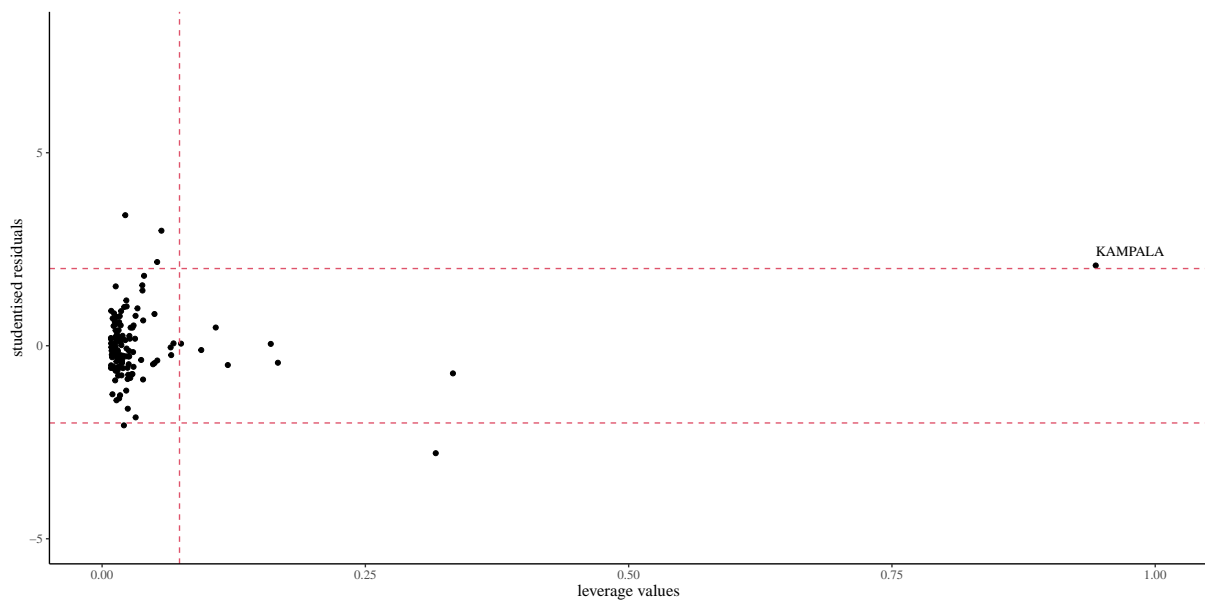


Figure C.2.1.2: Studentised residuals plotted against the leverage values including cutoffs for model 2

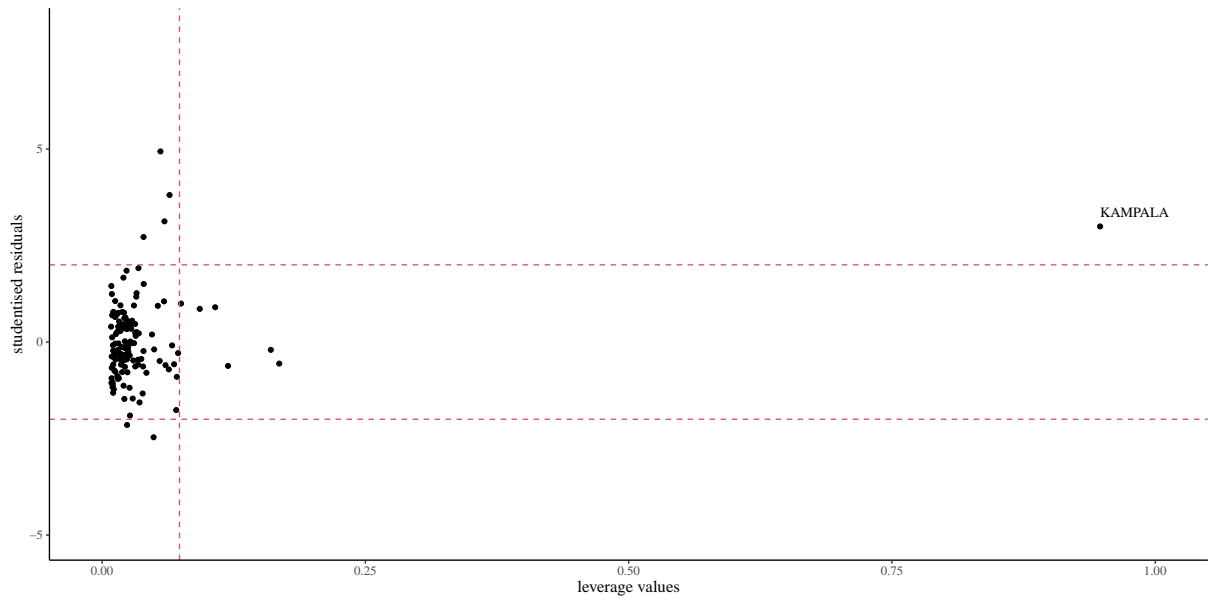


Figure C.2.1.3: Studentised residuals plotted against the leverage values including cutoffs for model 3

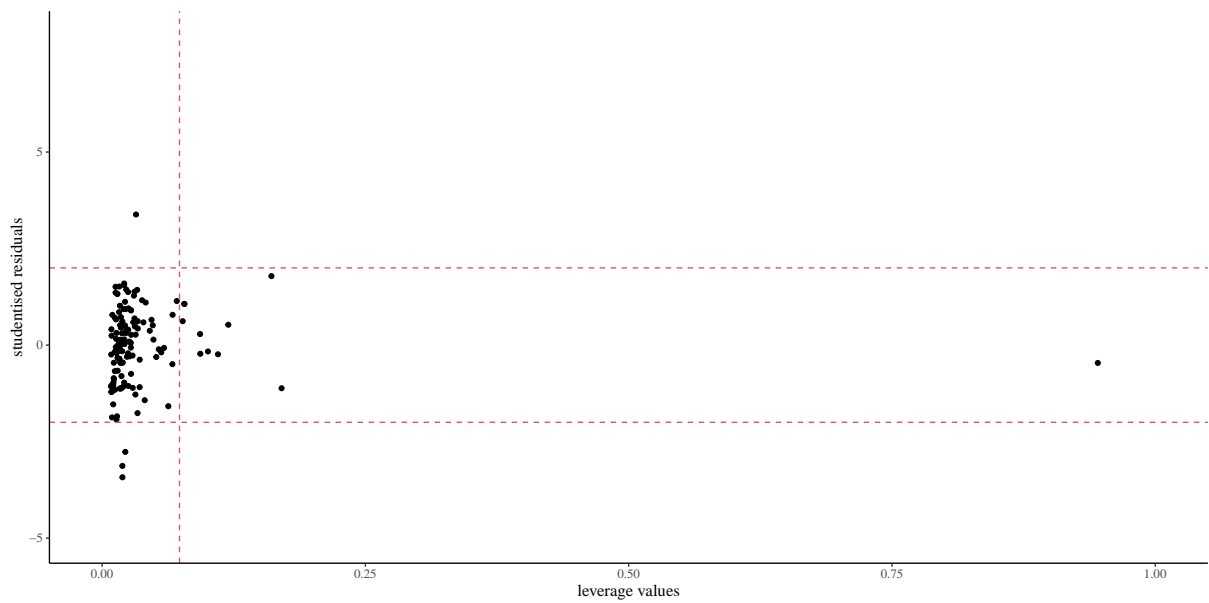


Figure C.2.1.4: Studentised residuals plotted against the leverage values including cutoffs for model 4

C.2.2 Results without outliers

Table C.2.2.1: Results of the basic linear regression model for overall public services without outliers

	<i>Dependent variable:</i>
	Overall Public Services
Share of villages with access to radio	0.01 (0.01)
Population density	−0.002 (0.001)
Economic situation	−1.44*** (0.30)
Overall public service 2013	0.51*** (0.07)
Constant	6.38*** (1.25)
Observations	134
R ²	0.61
Adjusted R ²	0.59
Residual Std. Error	2.24 (df = 129)
F Statistic	49.67*** (df = 4; 129)
<i>Note:</i> *p<0.1; **p<0.05; ***p<0.01	

Table C.2.2.2: Results of the basic linear regressions for individual public services without outliers @lccc

	<i>Dependent variable:</i>		
	Distance Major Road (1)	Distance Health Facility (2)	Pupil-Teacher Ratio (3)
Share of villages with access to radio	0.005 (0.005)	0.04 (0.07)	0.03 (0.03)
Population density	-0.001** (0.0005)	-0.02*** (0.01)	0.0002 (0.001)
Economic situation	-0.05 (0.10)	-6.01*** (1.46)	-0.39 (0.88)
Distance major road 2013	0.40*** (0.04)		
Distance health facilities 2013		0.17*** (0.05)	

Table C.2.2.2: Results of the linear regression for the individual public services without outlier continued @lccc

	<i>Dependent variable:</i>		
	Distance Major Road (1)	Distance Health Facility (2)	Pupil-Teacher Ratio (3)
Pupil-teacher ratio 2013			1.03*** (0.05)
Constant	1.16*** (0.30)	31.48*** (4.71)	-2.99 (4.60)
Observations	135	134	133
R ²	0.44	0.36	0.87
Adjusted R ²	0.42	0.34	0.86
Residual Std. Error	0.92 (df = 130)	12.69 (df = 129)	5.66 (df = 128)
F Statistic	25.73*** (df = 4; 130)	17.91*** (df = 4; 129)	207.87*** (df = 4; 128)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01		

C.3 Linearity

C.3.1 Graphical examination

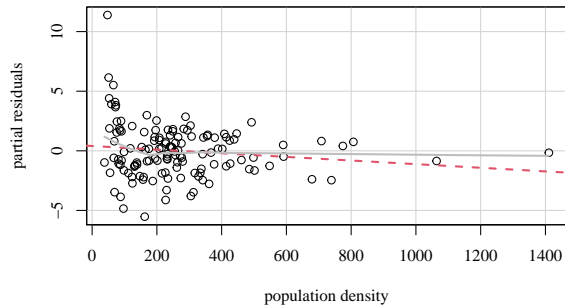


Figure C.3.1.1: Component+residual plot for population density in model 1



Figure C.3.1.2: Component+residual plot for economic situation in model 1

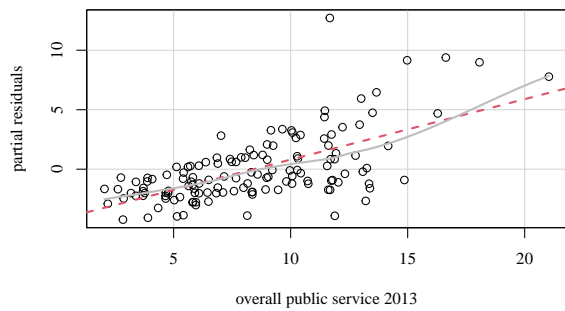


Figure C.3.1.3: Component+residual plot for overall public services 2013 in model 1

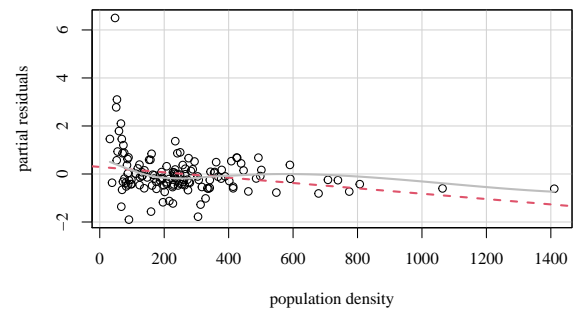


Figure C.3.1.4: Component+residual plot for population density in model 2



Figure C.3.1.5: Component+residual plot for economic situation in model 2

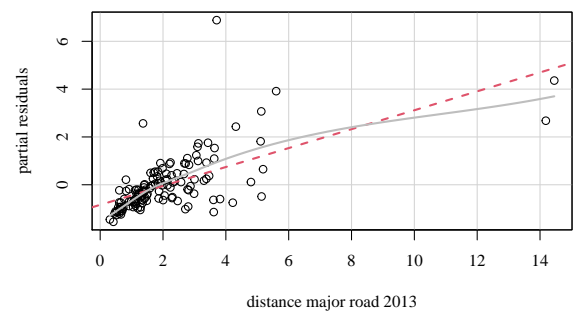


Figure C.3.1.6: Component+residual plot for distance to major road 2013 in model 2

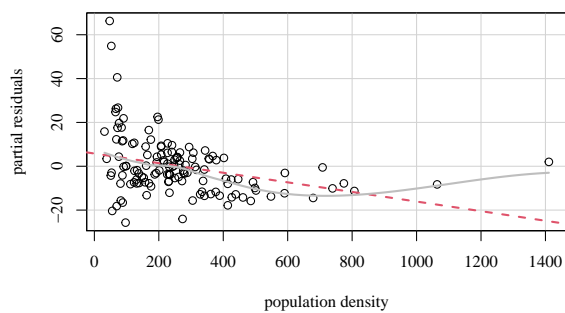


Figure C.3.1.7: Component+residual plot for population density in model 3 before transforming the variable

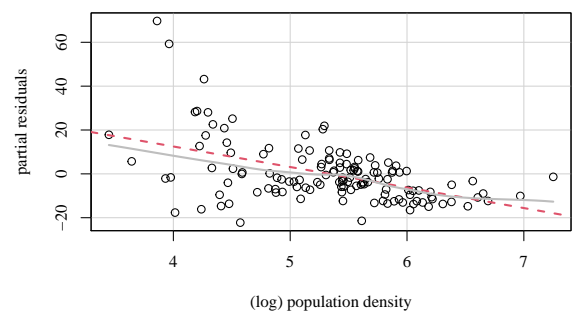


Figure C.3.1.8: Component+residual plot for population density in model 3 after transforming the variable



Figure C.3.1.9: Component+residual plot for economic situation in model 3

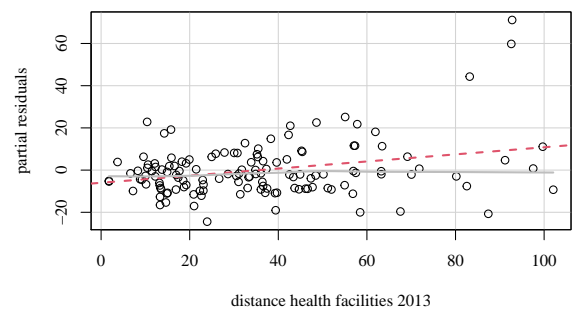


Figure C.3.1.10: Component+residual plot for health facilities 2013 in model 3

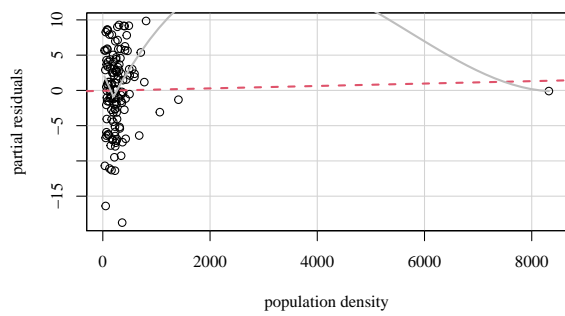


Figure C.3.1.11: Component+residual plot for population density in model 4 before transforming the variable

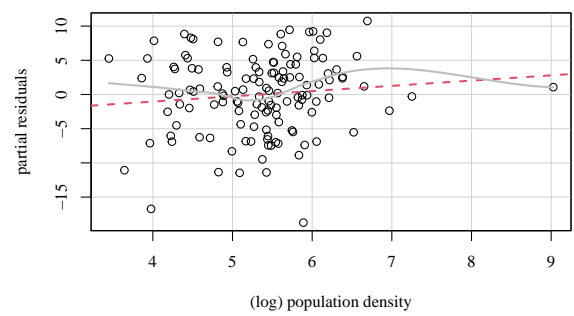


Figure C.3.1.12: Component+residual plot for population density in model 4 after transforming the variable



Figure C.3.1.13: Component+residual plot for economic situation in model 4

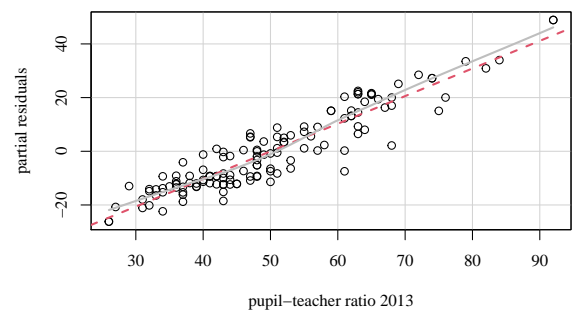


Figure C.3.1.14: Component+residual plot for pupil-teacher ratio 2013 in model 4

C.3.2 Results after transforming IV

Table C.3.2.1: Results of the linear regressions for model 3 and 4 after transforming the IV population density

	<i>Dependent variable:</i>	
	Distance Health Facility (1)	Pupil-Teacher Ratio (2)
Share of villages with access to radio	0.03 (0.06)	0.02 (0.03)
(Log) Population density	−9.36*** (3.55)	0.77 (0.82)
Economic situation	−4.22*** (1.45)	−0.74 (0.95)
Distance health Facilities 2013	0.13** (0.05)	
Pupil-teacher ratio 2013		1.02*** (0.05)
Constant	72.10*** (9.73)	−5.70 (5.42)
Observations	134	133
R ²	0.42	0.87
Adjusted R ²	0.41	0.86
Residual Std. Error	12.01 (df = 129)	5.64 (df = 128)
F Statistic	23.74*** (df = 4; 129)	209.41*** (df = 4; 128)

Note:

*p<0.1; **p<0.05; ***p<0.01

C.4 Heteroscedasticity

C.4.1 Graphical examination

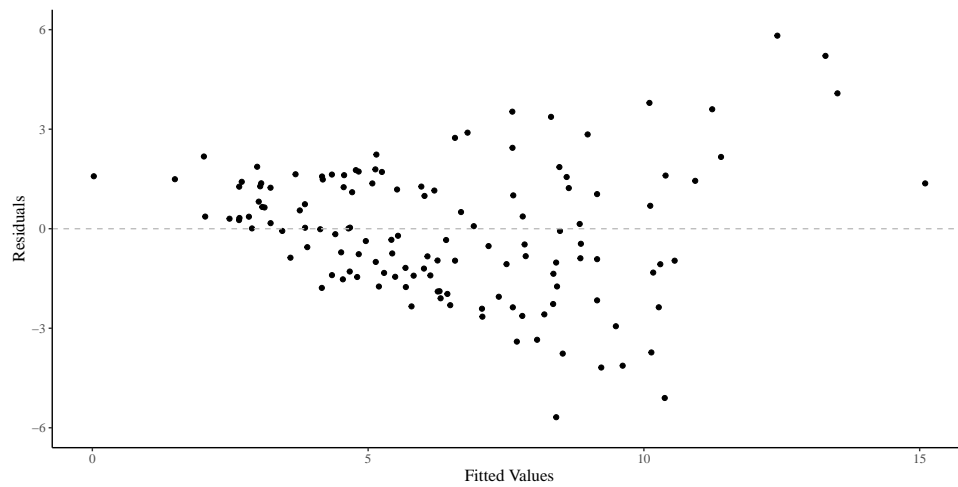


Figure C.4.1.1 Residuals plotted against fitted values for model 1 before transformation of the DV

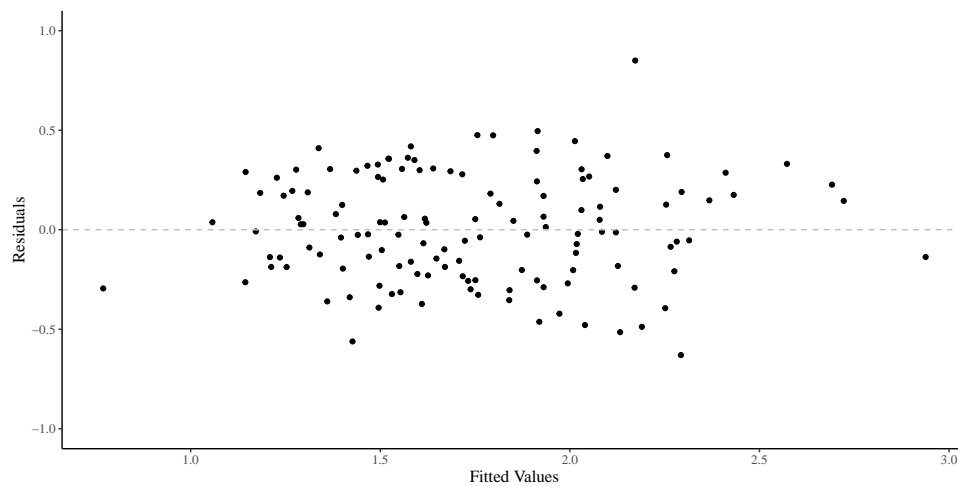


Figure C.4.1.2 Residuals plotted against fitted values for model 1 after transformation of the DV

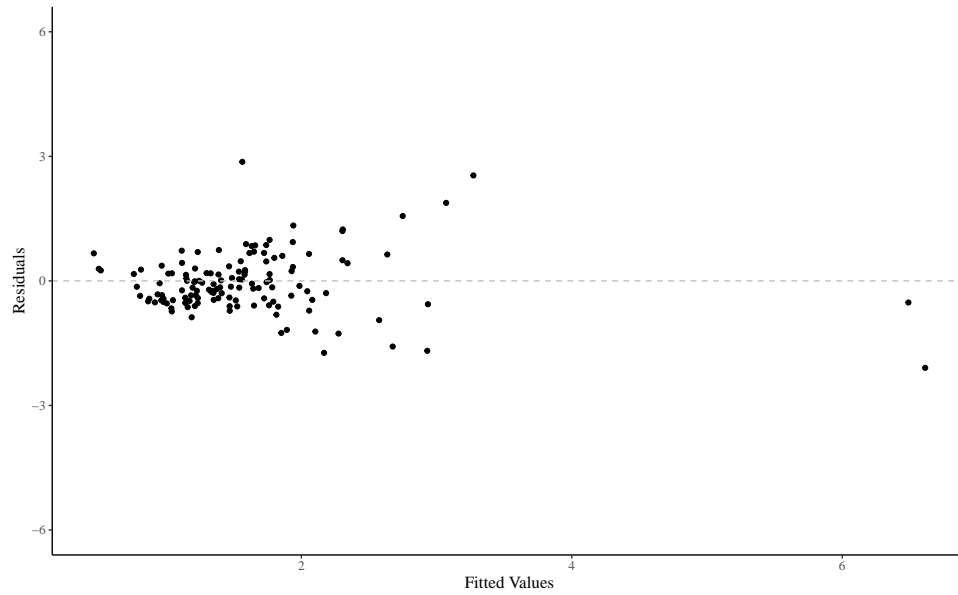


Figure C.4.1.3 Residuals plotted against fitted values for model 2

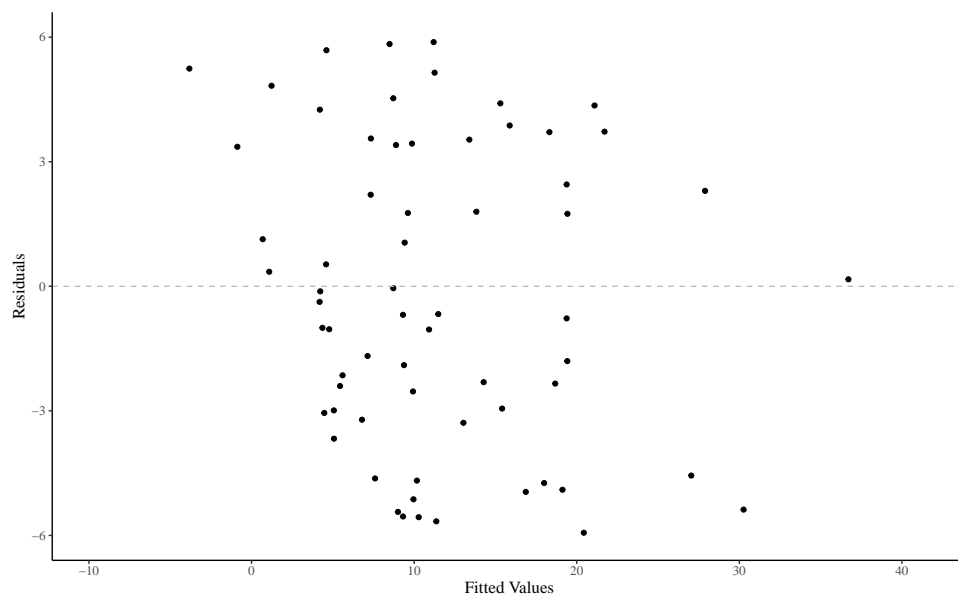


Figure C.4.1.4 Residuals plotted against fitted values for model 3 before transformation of the DV

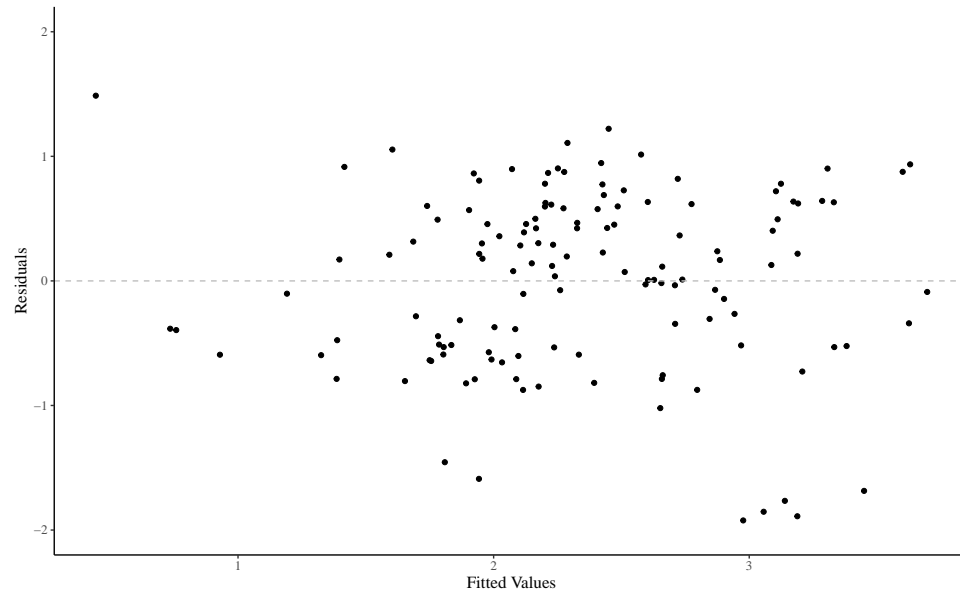


Figure C.4.1.5 Residuals plotted against fitted values for model 3 after transformation of the DV

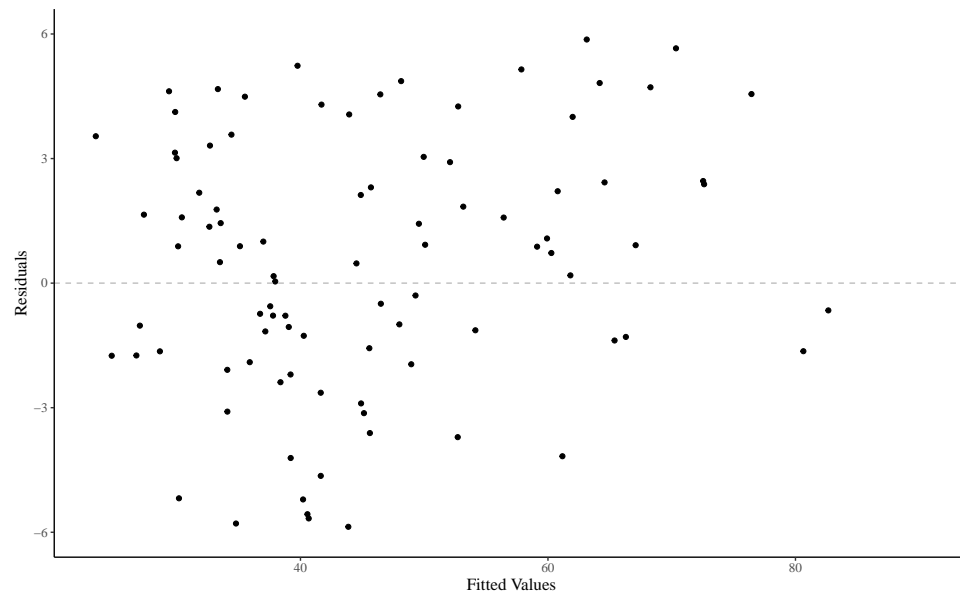


Figure C.4.1.6 Residuals plotted against fitted values for model 4

C.5 Normal Distribution

C.5.1 Graphical examination

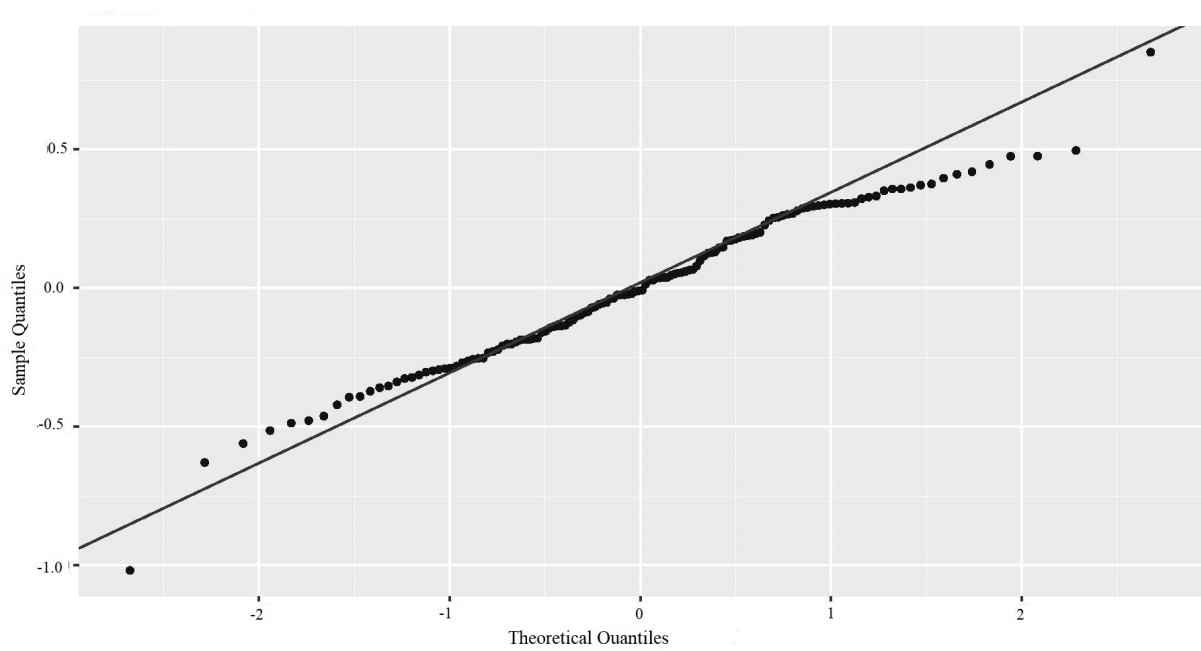


Figure C.5.1.1: Normal Q-Q Plot showing the correlation between the sample and a normal distribution for model 1, the line represents the optimal case

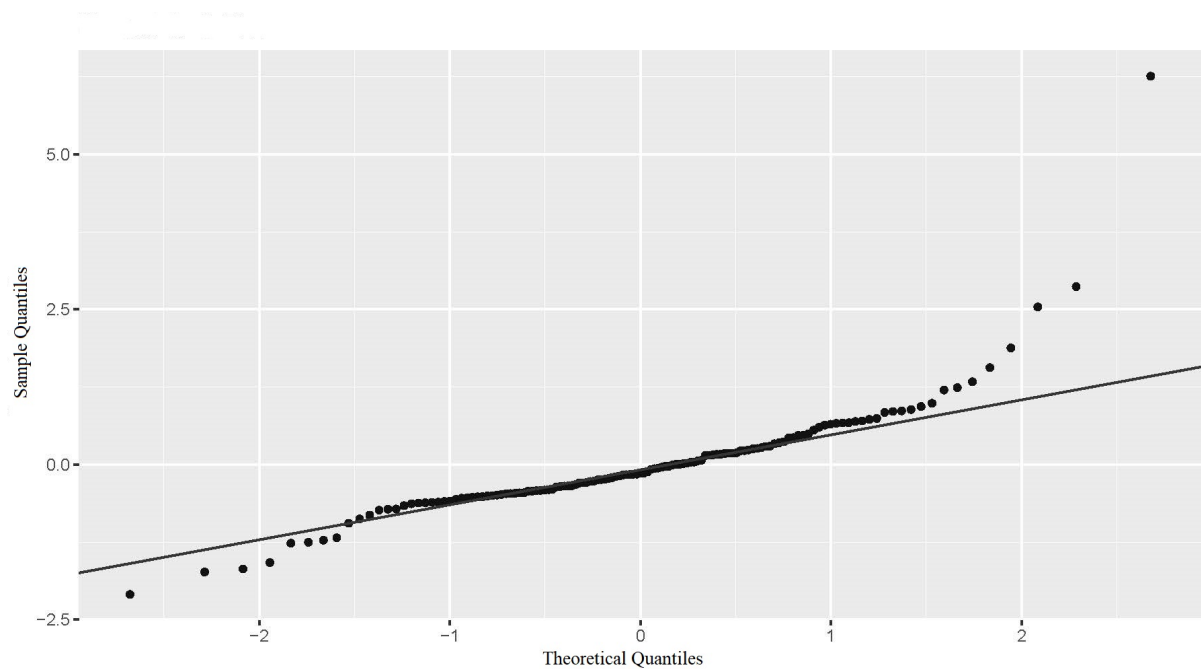


Figure C.5.1.2: Normal Q-Q Plot showing the correlation between the sample and a normal distribution for model 2, the line represents the optimal case

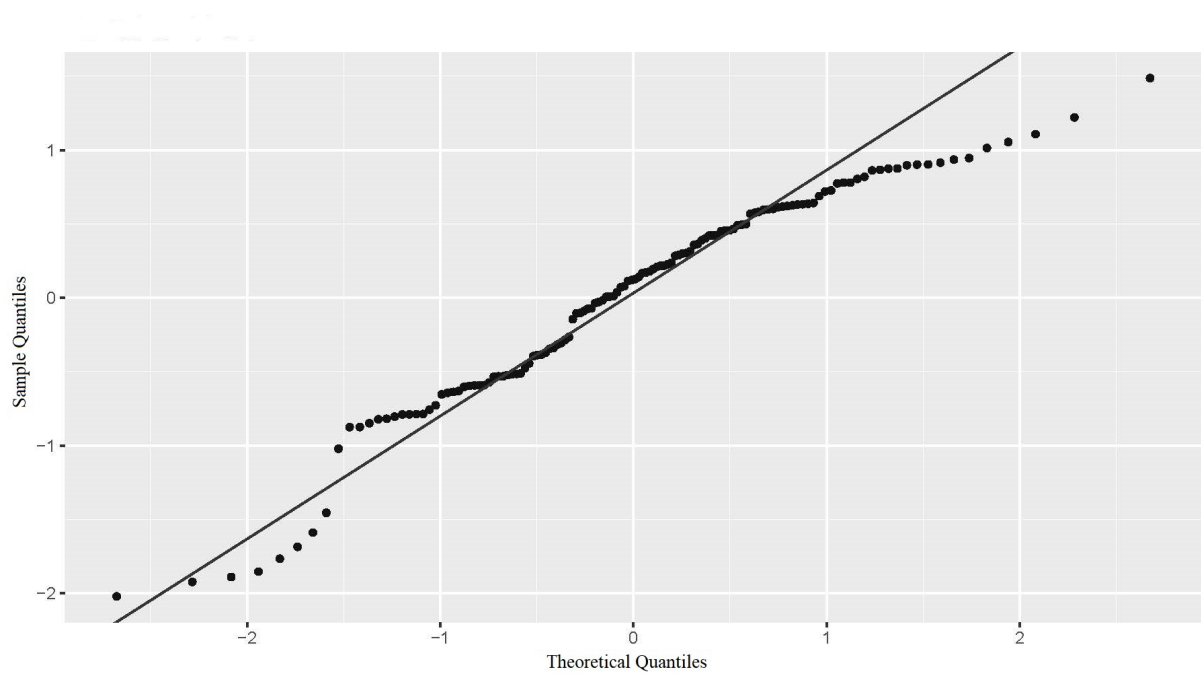


Figure C.5.1.3: Normal Q-Q Plot showing the correlation between the sample and a normal distribution for model 3, the line represents the optimal case

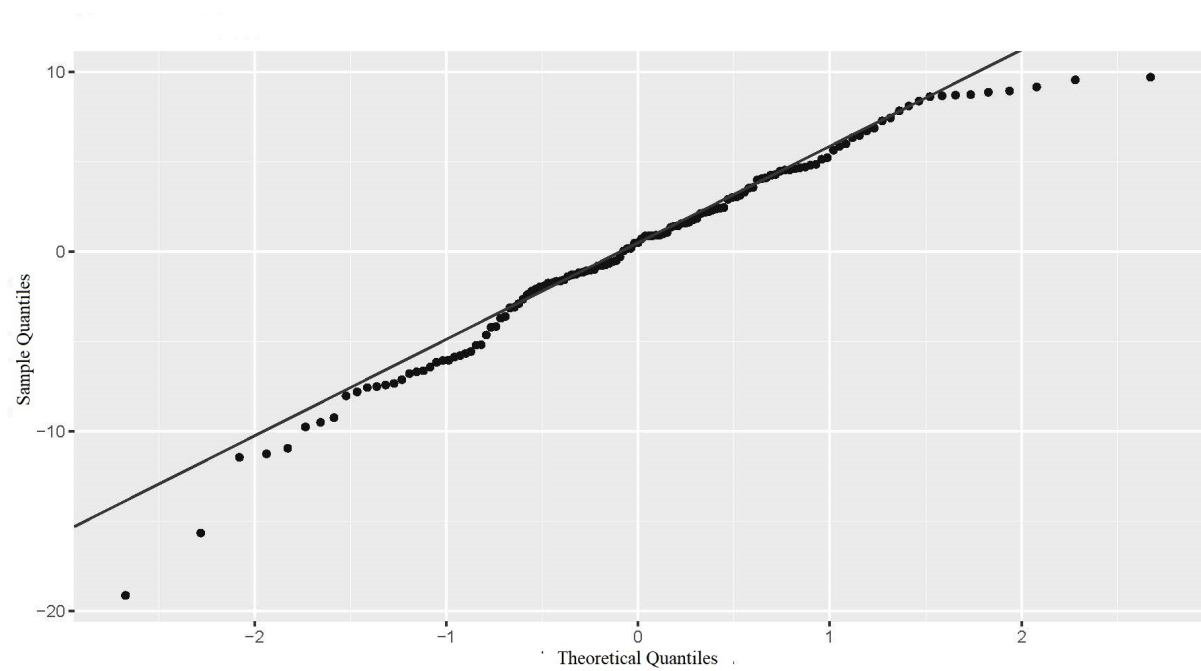


Figure C.5.1.4: Normal Q-Q Plot showing the correlation between the sample and a normal distribution for model 4, the line represents the optimal case

D Robustness Check

D.1 Results with different operationalisation

Table D.1.1: Results of the linear regressions for provision of infrastructure and education using access to improved water source and school density as measurements

	<i>Dependent variable:</i>	
	Improved Water Source (1)	School Density (2)
Share of villages with access to radio	−0.0002 (0.001)	0.003** (0.002)
Population density	0.0004*** (0.0001)	
(Log) Population density		0.29*** (0.05)
Economic situation	−0.10*** (0.02)	−0.04 (0.06)
Infrastructure 2013	0.0000 (0.01)	
Education 2013		−0.003 (0.003)
Constant	0.93*** (0.06)	−1.08*** (0.32)
Observations	135	133
R ²	0.18	0.41
Adjusted R ²	0.16	0.39
Residual Std. Error	0.19 (df = 130)	0.33 (df = 128)
F Statistic	7.25*** (df = 4; 130)	22.20*** (df = 4; 128)

Note:

*p<0.1; **p<0.05; ***p<0.01