The London School of Economics and Political Science

Papers on institutional quality and economic development in African regions

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Declaration

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

I declare that my thesis consists of 54,893 words.

Statement of conjoint work

I confirm that chapter 1 was jointly co-authored with Neil Lee and Andrés Rodríguez-Pose (LSE, Geography & Environment) and Chapter 3 was jointly co-authored with Neil Lee (LSE, Geography & Environment). In both these works I contributed a minimum of 50%.

Yohan Iddawela

Abstract

This thesis examines the relationship between institutional quality and regional economic development in African countries. It analyses three elements of institutional quality: the *impact* of institutional quality on economic development, the *drivers* of poor institutional quality, and *interventions* that can be adopted to improve institutional quality.

The first paper of this PhD, published in the Journal of Development Studies and co-authored with Neil Lee and Andrés Rodríguez-Pose, examines the relationship between sub-national government quality and economic development across 356 regions in 22 African countries. We create a novel index of sub-national government quality using Afrobarometer survey data, and we use high resolution night-time satellite images as a proxy for economic activity. We find that a reduction in sub-national government quality causes decreases in regional economic activity.

In the second paper, I examine one of the drivers of sub-national government quality in African regions – armed conflict. I find that armed conflict leads to a deterioration in sub-national government quality. Contrary to the existing literature which suggests that armed conflict leads to a loss of government legitimacy, I find that this occurs because sub-national governments divert resources away from delivering services and towards crisis response. As a result, I find that armed conflict does not lead to a reduction in national government quality as national governments possess much greater resources. Therefore, national governments are able to respond to crises without significantly reducing the quality of service delivery.

The third paper, co-authored with Neil Lee, examines the impact of national government quality on spatial inequality *within* African provinces. We create, for the first time, an index of within-province inequality using high resolution satellite imagery. We find that national government quality is just as important as differences in geographical endowments in driving spatial inequality within provinces. This is primarily because national governments in African countries have a history of city-specific favouritism – i.e. creating policies that benefit a particular city (typically due to corruption, nepotism or clientelism). This city-specific favouritism does not spill-over and benefit the wider province. Instead, it creates and exacerbates inequality within provinces.

The final paper qualitatively examines an intervention conducted by an NGO, SEMA, to increase the quality of service delivery in Kampala, Uganda. I analyse whether accountability interventions (i.e. designed to make officials more accountable to citizens) is a more powerful intervention than bureaucratic insulation (i.e. interventions designed to insulate bureaucrats from top-down and bottom-up perverse incentives). I find that accountability interventions are a promising way of creating non-financial incentives to improve the performance of government officials. However, such interventions on their own are ultimately unable to tackle systemic forms of corruption – particularly in the short-term.

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From time to time, I'm asked by prospective PhD students about any advice I can share before they embark on their journey. The advice over the years hasn't changed – pick supportive supervisors. I couldn't have been more fortunate in that department.

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Table of Contents

Introduction

1. Preface

During my master's degree, I found myself in Kampala speaking with many Ugandans to try and understand why their tradeables sector had stagnated over the previous decade. I had come to Uganda with a range of hypotheses about this stagnation: that high interest rates stifled the ability of firms to access finance, that volatile electricity had impacted the productivity of factories, or that Uganda's complex land tenure system had led to business owners losing their property as someone else had a legal claim to their land. As an outsider experiencing East Africa for the first time, my Ugandan colleagues at Makerere University would constantly remind me that the assumptions I had developed back in London would not be relevant on the ground in Kampala. They were, as usual, correct.

I had the privilege of speaking with sole traders, informal workers, and even employees from some of the largest multinational companies. Despite the varying backgrounds of the people I spoke with, over the course of many interviews and discussions, one pattern emerged – there were systemic issues with sub-national governments. At the same time donors discussed how they were increasingly working with sub-national governments in the face of widespread devolution across Africa. Wanting to learn more about sub-national government quality – not just in Uganda, but across the continent – I turned to the academic literature. However, upon searching, I was struck by how little had been written about sub-national institutions in African countries. Given national governments and donors alike were preaching the importance of devolution, I realised this absence of literature was a significant omission.

Therefore, over the past four years I took it upon myself, through this PhD, to contribute in some small way to providing an understanding of the dynamics of both sub-national governments and sub-national economic development in African regions. Given this PhD came out of my own policy-related questions, I wanted the thesis to not just contribute to academia – but to be relevant to policymakers. As such, this PhD goes beyond simply detailing the importance of institutions in spurring local economic development. Instead, I evaluate methods of trying to *improve* institutional quality. Furthermore, my co-authors and I create a number of novel indicators in this pursuit – the first index of sub-national government quality in African regions; and the first index of within-province spatial inequality derived from high-resolution

satellite imagery. It is my hope that the research and tools contained herein can help other researchers and policymakers – as I was – to develop interventions that improve economic development and raise living standards.

In the first chapter of this thesis I, along with my co-authors Neil Lee and Andrés Rodríguez-Pose, create a novel index of sub-national government quality (SNGQ) for 22 African countries. We examine the causal impact of SNGQ on regional economic development. In the second chapter, I investigate the drivers of SNGQ and focus specifically on the role of armed conflict in causing deteriorations of SNGQ. In the third chapter, Neil Lee and I create a new measure of within-province spatial inequality and investigate the role of national government quality in spurring spatial inequality within the provinces of 52 African countries. Finally, chapter 4 involves a qualitative analysis of a citizen-feedback intervention in Kampala, that has been designed to improve service delivery. In summary, this PhD looks at the impact of sub-national and national government quality on regional economic development, the drivers of SNGQ, and interventions that can be introduced to improve institutional quality.

This introduction goes on to discuss why these topics deserve to be further studied, I then provide a summary of the individual chapters and their main contributions, and finally I conclude by discussing the policy implications and suggest further areas for research.

2. Institutions and regional economic development in African countries

2.1 The role of sub-national institutions in African regions

Quality of government is defined by Rothstein and Teorell (2008) as "the impartiality of institutions that exercise government authority". It involves the respect for private property rights, freedom from official corruption, and the ability to provide high quality services to citizens (Fan et al., 2009).

Over the past two decades there has been an upsurge in studies, galvanised by Acemoglu et al.'s seminal 2001 paper, which established two main findings. First, that the quality of historical institutions subsequently impacted the quality of present-day institutions; and second, that present-day institutions are a fundamental driver of economic growth. This paper subsequently launched further studies that confirmed the central role of institutions in explaining economic growth (e.g. Easterly, 2001; Rodrik et al., 2004; Rothstein, 2011;

Acemoglu and Robinson, 2012). However, the vast majority of these studies have focussed on the role of *national* institutions. Sub-national governments have, due to data availability constraints, received much less attention.

More recently, a handful of studies have considered sub-national institutions in Europe, China and South America. For instance, Charron et al. (2014) created the first sub-national government quality index for 172 European regions across 18 countries. They found strong evidence that high quality regional governments are associated with higher levels of GDP, health and education. Rodríguez–Pose and Garcilazo (2015) extend this analysis to address reverse causality concerns by instrumenting present-day sub-national institutional quality with literacy rates in the Austro-Hungarian empire. They find that there is a causal relationship between sub-national government quality and regional innovative performance in Europe. Similarly, Revilla Diez et al. (2016), use data from the World Bank's Doing Business surveys to come up with a proxy for regional institutional quality in Ukraine. They find that investors are attracted to regions with good quality regional institutions – typically the capital – which subsequently improves the performance of multi-national firms. In China, Rodríguez–Pose and Zhang (2019) use a novel dataset to link 2,700 firms located across 25 cities with their institutional environment. They find that institutional deficiencies in rule of law, corruption and weak regulatory quality of local government institutions are a primary barrier to firm-level innovation. Meanwhile, Niedzwieci (2016) investigates sub-national institutions in Argentina and Brazil and finds that sub-national institutions hinder local service delivery. This is primarily the case in which the responsibility for certain welfare programs have been devolved to local governments. However, variations in local government implementation are pinned down to political factors (e.g. different parties operating at the local level to the national level); as well as poor institutional clarity over which level of government is responsible for the delivery of specific programs.

Given these studies suggest there is a fundamental relationship between sub-national institutional quality and economic development; it is surprising that sub-national institutions in Africa have been previously overlooked. This becomes even more surprising given the central role of sub-national institutions in African countries.

There are two primary reasons why sub-national institutions in African countries deserve further interrogation. First, many African countries have experienced ongoing devolution over

the past two decades, which has seen sub-national governments becoming more responsible for driving regional development agendas (Bratton, 2012; Erk, 2015). This is partly because national governments in Africa have historically lacked the capacity to govern effectively across all regions in a country. They have found it challenging to administer the rule of law, and to levy taxes – particularly in more rural areas (Herbst, 1997). Devolution was thus thought to be a solution to these governance problems. As a result, many countries in Africa underwent a wave of decentralisation throughout the 1990s and 2000s, whereby sub-national governments were handed more authority to implement regional economic development programs (Handley et al., 2009).

Second, sub-national institutions have historically played an important role in shaping economic activity within African countries. Colonisation in Africa frequently saw European empires exercising power indirectly by empowering local state apparatuses – usually Native Authorities – to rule on their behalf (Mamdani, 1999:867). This form of colonisation was known as 'indirect rule' – separate to the 'direct rule' experienced in colonies such as South Africa, Rhodesia, the Gold Coast, and Kenya; whereby Europeans settled and set up institutions to directly rule over the locals (Mamdani, 1996). Indirect rule was first introduced by the British to Nigeria, Uganda and Tanganyika in the early 20th century, after which it was emulated by the French after 1918, the Belgians in the 1930s and the Portuguese in the 1950s. Moreover, even in settler colonies, most colonial states did not extend the administrative apparatus of their institutions beyond the capital city. Therefore, areas outside the capital were typically more influenced by local governance apparatuses than by the colonial national government (Herbst, 1997). Thus, sub-national governments have – in one way or another – played a long-spanning role in organising people within African societies.

Studying sub-national institutions in Africa becomes even more important once we understand that institutional quality persists over time. Tabellini (2008), for instance, found that variations in culture influenced differences in the performance of governments. Institutional culture – a broad and complex topic – involves certain normative values and morality, which can be passed down from generation to generation. Culture can dictate what is considered right or wrong. It governs how people act and how governments themselves behave (Duranton et al., 2009). Therefore, if there is a long history of sub-national governance in African states, 'institutional culture' may persist over the years and impact how sub-national governments currently operate.

Thus, given both the recent trend towards devolution and the history of sub-national governance which may have shaped the institutional culture of present-day institutions; sub-national governments deserve more attention. This will help us better understand the institutional architecture of African states – the role that sub-national institutions play in driving regional economic development; the drivers of SNGQ; and what can be done to improve sub-national governance. This is therefore a major motivation for this PhD.

2.2 The regional impact of national institutions in African countries

National governments, however, still play an important role in African countries – yet their regional impact in Africa has remained under-studied. Again, due to data availability constraints – whereby there is a lack of official sub-national data – it has been difficult to quantify the impact of national governments on spatial inequality *within* African provinces.

Spatial inequality is widely considered to be associated with negative economic development outcomes. For instance, studies have found that it leads to conflict and crime (Østby et al., 2009), fragmentation between urban and rural areas (Galor and Moav, 2004), uneven experiences of poverty reduction across countries (Te Velde and Morrissey, 2005), and overall lower levels of economic growth (Achten and Lessmann, 2020). Moreover, high levels of inter- and intra-regional inequality have been associated with growing political cleavages, particularly where local income differences reflect different ethnic or nationalist groups (Kanbur and Venables, 2005). Based on this, a wide range of literature interrogates patterns of spatial inequality, its causes, and its consequences (see Guo et al., 2020; Lee and Luca, 2019; Rodríguez-Pose & Tselios, 2009; Glaeser et al., 2009).

Africa specifically has experienced increased spatial inequality in recent times. Average regional income inequality within African countries (measured through the Gini coefficient) has increased every year since 2009, and grew from 0.32 to 0.38 between 1992 and 2013 (Mveyange, 2018). A new set of research has been using satellite imagery of night-time luminosity as a proxy for economic activity (see Lessman and Seidel, 2017; Alesina et al, 2016), as a method of overcoming the paucity of official data on spatial inequality. These studies have focussed on inequality at the *country-level* by comparing variations in economic activity between sub-national regions. This however overlooks the drivers of spatial inequality

at the *sub-national* level – in other words spatial inequality *within* African provinces. These prior studies assume that if certain cities or municipalities within a province benefit from either regional favouritism or natural endowments, then the entire province benefits. This, however, is an assumption that needs to be reconsidered given the sheer size of African provinces. The average African province is 37,000 square kilometres – roughly the size of the Netherlands. Thus, if certain cities or municipalities *within* a province benefit from the regional favouritism of national governments or favourable natural endowments, it is likely that this would cause inequality within provinces.

Further investigating the role of national governments in creating spatial inequality is warranted in the African context given the long history of regional favouritism. This favouritism has involved national governments implementing policies that benefit particular cities due to nepotism, clientelism and corruption. For example, in Zaire (now Democratic Republic of Congo), former president, Mobutu Sese Soko, transformed his former hometown, Gbadolite, (which had 1,500 residents during the 1970s) into a lavish city with five-star hotels, three palaces and a 3.2km runway for a Concorde jet (Wrong, 2000). Similarly, in 1983, former Ivory Coast president, Félix Houphouët-Boigny, declared his hometown, Yamoussoukro, as the nation's capital. He built palaces, an airport that could also land a Concorde, and the world's largest church at a cost of $300 million USD (Ahlerup and Isaksson, 2015).

Thus, if (local) policy makers wish to address inequalities that have been caused or exacerbated by national governments, the first step is to develop a better understanding of within-province spatial dynamics. As previously discussed, most African countries have provincial-level governments which are responsible for driving significant changes to regional economic development. Thus, if local policymakers have a way to measure within-province spatial inequality in the absence of official statistics; as well as have an understanding of what drives these inequalities; they will be better equipped to implement redistributive policies to ensure that city-level endowments or favouritism can spill over and benefit the wider province. This, therefore, serves as motivation for the third paper in this PhD, whereby we develop a new measure of *within-province* spatial inequality.

3. Overview of the PhD

3.1 Paper 1 – Quality of sub-national government and regional development in Africa

The first paper in this PhD, published in the Journal of Development Studies (2021), investigates the *impact* of sub-national government quality on regional economic development. In this paper, my co-authors and I create a novel index of sub-national government quality for 356 regions across 22 African countries. This index is constructed using large-scale survey data from Afrobarometer. We measure regional economic activity using high resolution satellite imagery of night-light luminosity as a proxy for GDP. To address causality concerns, we instrument sub-national government quality with data on the institutional quality of pre-colonial societies (given institutional culture persists over time, as discussed previously). Our results show a positive and significant relationship between sub-national government quality and regional economic development, even when controlling for the quality of national-level institutions. We therefore find that better sub-national governments are a powerful but often overlooked determinant of development in Africa.

3.2 Paper 2 – Examining the drivers of sub-national government quality in African regions: the role of armed conflict

Where the first paper of this PhD focussed on the impact of SNGQ, this paper extends the analysis by examining one of the causes of SNGQ – armed conflict. Paper 1 found that variations of sub-national government quality (SNGQ) impact economic activity in African regions. However, given data availability constraints, little has been historically done to understand what drives deteriorations in SNGQ. I aim to fill this gap in the literature by examining the impact of armed conflict on SNGQ in 460 regions across 27 African countries between 2013-2018. Despite Africa experiencing more armed conflict than any other continent over the past 20 years, little is known about how and to what extent this has impacted institutional quality. I use conflict data from the Upsala Conflict Data Program and assess its impact on SNGQ using the index constructed in paper 1. To determine causality, I instrument armed conflict with exogenous changes in world agricultural prices as reductions in agricultural revenue lowers the opportunity cost of farmers engaging in armed conflict.

The results demonstrate that armed conflict has a negative, significant and causal impact on SNGQ in African regions. I also find that this reduction in SNGQ is caused by a deterioration in the quality of services that sub-national governments provide, rather than an upsurge in corruption. This is because sub-national governments need to direct resources towards crisis response, and away from its usual services. Finally, contrary to the existing literature, I find that an upsurge in armed conflict does not impact national government quality. This may be because national governments are better resourced than sub-national governments. Therefore, when violent conflicts occur, the cost of crisis response is proportionally lower for national governments than it is for sub-national governments.

3.3 Paper 3 – Spatial inequality within African provinces: a story of national government quality, regional favouritism, and geographical endowments

As discussed in section 1.2, there are growing concerns about the causes and consequences of spatial inequality in much of the world, with Africa being no exception. The dominant view is that geographical factors are the main cause of spatial inequality in the African context. However, a different strand of research highlights the impact of national governments on spatial inequality. Due to data limitations, most of the existing research has focussed on examining spatial inequality at the country level by comparing variations in wealth between African provinces. This, however, is a significant issue given the sheer size of African provinces.

The average African province is approximately 37,000 square kilometres – almost 25 times the size of London. It should therefore not be assumed that policies which favour a particular city, or geographical endowments that benefit a certain area, affect entire provinces equally. Instead, it is likely that these policies and geographical endowments cause spatial inequality *within* provinces.

This paper, co-authored with Neil Lee, therefore investigates the relationship between national government quality and spatial inequality within the provinces of 52 African countries. We create a new measure of within-province inequality using high-resolution satellite data of night-light luminosity, and measure government quality using data from the World Governance Indicators.

We find that national government quality matters just as much as geographical endowments in explaining spatial inequality within provinces. Our results show that better national government quality reduces spatial inequality within African regions – a finding we confirm using an instrumental variable approach based on historic European settler mortality rates.

3.4 Paper 4 – Bureaucratic insulation vs accountability: interventions to improve service delivery in Kampala

While papers 1 and 2 focus on the impacts of government quality on regional economic development and spatial inequality respectively, and paper 3 focuses on the drivers of SNGQ; this paper focuses on what can be done to improve government quality – specifically service delivery. I do so by qualitatively examining a citizen feedback intervention conducted by an NGO, SEMA, in Kampala.

Service delivery in places such as Kampala, Uganda, are marred by inefficiency, corruption, and negligence. Research has suggested that a lack of resources and capacity are primary factors in driving poor service delivery. However, once resource and capacity constraints have been addressed, there is an ongoing debate on how service delivery can be further improved.

One argument suggests that bureaucratic insulation – in other words, autonomy – is fundamental to improving government services. This is because government officials, once insulated from influences of corruption (either top-down from politicians, or bottom-up from citizens), are enabled to act in the most effective way. The other argument, driven by principal-agent theories, suggests that increasing accountability to political leaders and citizens ensures that government officials act in the most effective way.

I attempt to shed light on this debate by examining whether accountability interventions can improve service delivery in settings which do not have bureaucratic insulation. I examine this qualitatively by analysing SEMA's citizen feedback initiative in Kampala. The analysis shows that interventions designed to improve accountability can in fact play an important role in improving service delivery. It does so by establishing incentives for government officials to perform better, while also creating an evidence base so officials can lobby for more resources. However, such interventions on their own are ultimately unable to tackle systemic forms of corruption, which may be sewn into the fabric of government institutions and everyday life.

Thus, to adequately target structural issues such as corruption, accountability interventions may need to be followed by measures to improve bureaucratic insulation.

4. Conclusion

In summary, this PhD attempts to provide a holistic examination on the role of institutions and regional economic development within African countries. I have focussed on the *impacts* of institutional quality on regional development and spatial inequality (papers 1 and 3), the *determinants* of SNGQ – particularly the role of armed conflict and the channels through which it impacts government quality (paper 2), and finally *interventions* that can be adopted to improve government quality and service delivery (paper 4).

It is my hope that this research will be helpful to policymakers and researchers alike – particularly within a context of increasing devolution, whereby sub-national governments will be increasingly responsible for driving the development agenda of African regions. For instance, I show that in the event of armed conflict an increase in transfers from central governments to sub-national governments can help mitigate the deterioration in local service delivery (paper 3). If this does not take place and SNGQ reduces, there is likely to be an associated decrease in regional economic activity (paper 1). This reduction in SNGQ may also be a barrier to sub-national governments – as they will be less able to develop effective redistributive policies that mitigate the regional favouritism displayed by national governments (paper 2). Moreover, to address some of the more structural problems around improving service delivery, an adequate incentive system should be introduced so that government officials are induced to increase their performance (paper 4).

Moreover, historically, one of the main barriers to studying sub-national institutions and regional economic development in African regions has been the absence of official sub-national statistics. To address this data paucity, this PhD has developed a number of tools which can aid policymakers in measuring, evaluating and monitoring the quality of institutions and their impact on regional development. For instance, we have created the first index of sub-national government quality using large-scale survey data from Afrobarometer, we have used

high-resolution satellite imagery on night-time luminosity as a proxy for regional GDP,[1] and we have also used this data to provide a novel index of within-province spatial inequality.

This research opens up many further questions which should be studied in the future. For example, what is the impact of SNGQ on employment, inflation or innovation within African regions? How does SNGQ impact the returns on aid funding? Importantly, what are some of the other determinants of SNGQ aside from armed conflict? Can sub-national governments truly insulate themselves from the influence of national governments?

While I have used novel data in the ensuing analyses, this is barely scratching the surface of what is possible. The analyses could be extended by using other proxies for regional economic development in Africa. For instance, new research coming out of Stanford's AI lab, has been using machine vision techniques and convolutional neural networks on daytime satellite imagery to obtain new measures of household consumption in African countries (Jean et al., 2016). Such measures can be a useful complement to night-light images, in the absence of official statistics. Moreover, new satellite providers, such as CG Satellite are providing luminous images that are 500 times the resolution of the VIIRS DNB images used in this analysis. Once the cost of such images becomes more favourable to researchers, this will open up avenues for improving the accuracy of satellite-derived GDP estimates.

Moreover, as more sub-national governments begin digitising and publicising official documents – such as budget papers – researchers will be able to come up with further measures of sub-national government quality (Ouedraogo and Sy, 2020). For example, by comparing where and how fiscal resources are being spent by local governments (Ebdon, 2003). Similarly, given the acceleration of efforts to capture data on institutional quality in African regions (e.g. the expansion of Afrobarometer surveys and the World Bank's Ease of Doing Business indicators), it is likely that we can obtain a better understanding of the spatial dynamics of sub-national government quality in African regions. For instance, recent research has found that national government quality deteriorates the further citizens are from the national capital in African countries (Michalopoulos and Papaioannou, 2014); and that voting patterns in European regions indicate that quality of institutions may vary between regions in the periphery

[1] This PhD has used VIIRS DNB satellite data, rather than the traditional DMSP-OLS data that is used in spatial economics studies. VIIRS data has twice the resolution of DMSP-OLS data.

and those in the core (Stein et al., 2020; Rodríguez–Pose, 2018). As such, future studies should take inspiration from these studies to examine whether sub-national government quality varies *within* a given region in Africa. For instance – is local service delivery worse in more remote areas? Or does sub-national government quality decay with distance from regional capitals?

Thus, with technology and data collection methods rapidly improving, it is just a matter of time till richer datasets are produced, and further investigations into African sub-national institutions are made possible. It is therefore my hope that this PhD demonstrates what can be done in data sparse environments; and that it serves as the beginning of a long line of studies that shed light on sub-national institutions and economic development in African regions.

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Paper 1 – Quality of Sub-national Government and Regional Development in Africa

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Abstract

Despite widespread interest in government quality and economic development, the role of sub-national government has been largely overlooked. This represents an omission in Africa, given ongoing processes of devolution in much of the continent. In this article, we consider the impact of sub-national government institutions on economic development in 339 regions across 22 African countries. We create a novel index of sub-national government quality based on large-scale survey data and assess its impact on regional economies using satellite data on night light luminosity. To address causality concerns, we instrument sub-national government quality with data from pre-colonial societies. Our results show a positive and significant relationship between sub-national government quality and regional economic development, even when controlling for the quality of national-level institutions. Better sub-national governments are a powerful but often overlooked determinant of development in Africa.

1. Introduction

Quality of government (QoG) – sometimes defined as 'the impartiality of institutions that exercise government authority' (Rothstein & Teorell, 2008, p. 165) – is increasingly seen as important for economic development. Higher quality government implies better provision of public goods, improved processes of resource allocation, and more efficient democratic processes (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1999). It may improve trust in government, ensure the effective rule of law, and increase social capital (Rothstein, 2003). Based on these ideas, a series of studies have found that quality of government matters at a

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national level (for example Acemoglu, Johnson, & Robinson, 2001; Acemoglu & Robinson, 2012; Easterly, 2001; Rodrik, Subramanian, & Trebbi, 2004; Rothstein, 2011), and policymakers have launched a host of initiatives aiming to improve governance (Langbein & Knack, 2010).

The vast majority of studies on quality of government have focused on national government. Sub-national or regional government quality has attracted far less attention. However, in recent years a smaller subset of research has increasingly sought to investigate how sub-national governments affect geographical differences in economic output and regional economic performance, using new indicators to measure sub-national government quality (for example Charron, Dijkstra, & Lapuente, 2014). A series of studies have considered variations in quality of sub-national government, finding it plays an important role in explaining sub-national differences in economic performance in Europe (Charron et al., 2014; Crescenzi, Di Cataldo, & Rodríguez-Pose, 2016; Rodríguez-Pose & Garcilazo, 2015; Rothstein, Charron, & Lapuente, 2013) and China (Cai & Treisman, 2005; Cole, Elliott, & Zhang, 2009; Rodríguez-Pose & Zhang, 2019).

However, research on sub-national government quality has mainly focused on Europe and Asia.[1] The rest of the world – especially the developing world – remains a black box. There has been a dearth of studies examining how local and regional institutions shape economic performance in Africa. This is a surprising omission for two reasons. First, sub-national government institutions have historically played an important role in African countries. The colonial history of many African states involved forms of 'indirect rule' that empowered local state apparatuses to govern on behalf of colonial empires (Mamdani, 1996a). This created 'a dependent but autonomous system of rule, one that combined accountability to superiors with a flexible response to the subject population, a capacity to implement central directives with one to absorb local shocks' (Mamdani, 1996a, p. 60). Given the scholarship which demonstrates how institutional culture persists over time, it is important to further investigate the role of modern-day sub-national institutions (Acemoglu & Robinson, 2012; La Porta et al., 1999; North, 1990; Tabellini, 2008; Young, 1994). Second, over the past two decades, many African states have been undergoing an accelerated process of devolution (see Bratton, 2012; Erk, 2015). While the experience of different African states has been diverse (for example Olowu, 2003; Snyder, 2001), sub-national governments have become increasingly responsible for driving the development agenda in many African countries. This

has raised concerns that variations in the performance of sub-national governments can create significant inequalities in economic outcomes (Wilfart, 2018).

Notwithstanding this importance of sub-national government institutions in much of Africa, there is little quantitative evidence on their importance for economic development. This paper addresses this gap. It produces for the first time a sub-national government quality index for many regions in Africa. The index, constructed using Afrobarometer survey data, covers 339 regions in 22 countries across Africa. This is then used to estimate the impact of sub-national government quality on regional GDP, as measured by satellite images of night-time luminosity – an increasingly used proxy for GDP, which overcomes data availability issues and avoids problems of data comparability between states (see Henderson et al., 2012). To overcome any issues of endogeneity, and to establish a causal relationship between government quality and economic performance, we use data on the political decentralisation of pre-colonial African societies as an instrument for modern-day sub-national government quality.

Our analysis shows a positive and significant relationship between sub-national government quality and differences in regional wealth in African countries. The findings are robust to a large set of controls including geography, topography, natural resources, central government quality, infrastructure, FDI, and education levels. One concern is that better economic performance may influence sub-national quality of government. However, the relationship we identify seems to be causal, as the results hold in instrumental variable (IV) regressions. Given that these results exist independently of national government quality, we argue for a greater focus on the role of sub-national government institutions in economic development, particularly given ongoing processes of devolution.

The rest of the paper is structured as follows. Section 2 reviews the literature examining the relationships between government quality and economic development, with a focus on Africa. Section 3 provides an overview of the data, and Section 4 presents some descriptive analysis, while section 5 provides the results of our regression models. In Section 6 a range of robustness tests are undertaken, and we conclude in Section 7.

2. Quality of sub-national government and economic development in Africa

The importance of national government institutions – particularly government quality – for economic development has become widely researched (for example La Porta et al., 1999; Rothstein, 2011; Rothstein & Teorell, 2008). In line with most of this literature, this paper's conceptualisation of 'government institutions' refers to the official architecture of government agencies, bureaucratic structures and personnel. This architecture is responsible for delivering services and creating and enforcing the rules and incentives that shape political, social and economic interaction. While a number of African countries and regions may have formal non-governmental institutions, such as ethnic tribes or kingdoms (for example Uganda's Buganda Kingdom) that have some governance functions, we do not include these in our definition of present-day 'sub-national government institutions'.

Our definition of 'quality of government' builds on Rothstein and Teorell (2008). According to them, government quality involves impartiality in the exercise of public authority. Impartiality is understood as a procedural norm which is separate to the development and content of policies. A government with good quality can be thought of as possessing low levels of corruption, high levels of trust and accountability to its citizens, and as able to deliver services effectively. Therefore, while democracy is important for government quality, it is not a synonym for it.

The emerging consensus is that national-level government institutions have played, and will continue to play, a fundamental role in explaining variations in national economic development (Knack & Keefer, 1995; Mauro, 1995). This is because governments are responsible for protecting property rights, meeting the needs of their people by providing basic public services, and preserving the rule of law. These three elements, when taken together, are responsible for creating the overall environment for economies to prosper (Acemoglu, Johnson, & Robinson, 2005). Thus, if formal government institutions only protect the property rights of a small elite, then investment and participation from other groups may be disincentivised or crowded out (Acemoglu & Robinson, 2005). These issues can then compound and result in pervasive corruption, rent-seeking, insider-outsider problems, clientelism, nepotism and, subsequently, culminate in an overwhelming reduction in economic activity (Rodríguez-Pose & Storper, 2006).

Some, however, have been less convinced about the role of government institutions in explaining variations in economic development. For example, Glaeser, La Porta, Lopez-de-Silanes, and Shleifer (2004) argue that human capital matters more than institutions, as authoritarian regimes have witnessed improvements in economic performance over time. In contrast, Diamond (1998) takes a much longer perspective. While acknowledging the role of 'idiosyncratic cultural factors' in promoting economic development in places such as China (1998, p. 11), he argues that differences in development may be deeply rooted in history (even going back to periods before the existence of formal institutions). He makes a grand historical argument that the foundations of modern-day economic activity have been shaped by Neolithic geographical endowments (for example plant and animal species) that influenced agricultural productivity. Agricultural productivity, in turn, increased population density, promoted specialisation of labour and industry, and led to innovative activity. As a result, this endowment advantage led to some regions becoming more economically prosperous than others.

So far, most research on government institutions has considered the national level. Yet, to fully understand the role of government institutions in spurring economic activity, we need to examine all parts of a country's governmental architecture. This means studying the role of sub-national governments – core institutions which have been previously overlooked by the majority of studies that focus solely on the national level. This is a surprising omission given the 'global trend to devolution' (Rodríguez-Pose & Gill, 2003) and the so-called 'devolution revolution' which has taken place over the past three decades through decentralisation of policy-making and government services (Snyder, 2001).

Devolution can be understood as the process whereby a central government formally cedes power to lower tiers of government – such as sub-national governments or local councils (Ribot, 2002). The process may be undertaken to improve democratic representation, better match public resources to local needs, or enhance local service delivery. Devolution is underpinned by the assumption that sub-national governments are better placed to understand the preferences of the people they represent (Rodríguez-Pose & Gill, 2003; Tiebout, 1956). As a result, there has been an upsurge in literature which examines the impact of decentralisation on the quality of governments (for example Faguet, 2014; Prud'Homme, 1995; Treisman, 2002, 2007).

In addition to the global trend towards devolution, research has stressed the importance of examining sub-national units – particularly in the domain of comparative politics

(Snyder, 2001). This is because sub-national analyses allow researchers to better understand the spatially uneven nature of political and economic processes. This therefore improves the ability to understand, describe and theorise about such complex processes.

Hence, a smaller subset of literature has emerged which uses quantitative methods to investigate the role of sub-national governments in promoting economic activity. While some studies examine Asian countries (Cai & Treisman, 2005; Cole et al., 2009; Rodríguez-Pose & Zhang, 2019), most of this literature has focused on Europe. Charron et al. (2014) conducted the first comprehensive cross-regional examination of sub-national government quality and regional economic activity in Europe. They created a sub-national government quality index covering 172 European regions in 18 countries. To produce this index, they compiled a survey of 34,000 Europeans at a regional level, with parameters based on the World Governance Indicators. They found strong evidence that high-quality regional governments are associated with higher levels of GDP and better health and education outcomes. However, issues of endogeneity and reverse-causality may have affected their findings. Rodríguez-Pose and Garcilazo (2015) addressed those concerns through an IV analysis, using literacy rates in the Austro-Hungarian Empire from 1880 as an instrument for regional government quality. They found a positive, significant, and causal relationship between European sub-national government quality and regional innovation. Moreover, they found that sub-national government institutional quality in European regions trumped more traditional determinants of economic activity and growth, such as education, innovation, and infrastructure provision.

In Africa, sub-national government quality may play a similar – if not enhanced – role. Nevertheless, similar studies to those conducted in Europe and Asia on African regions have largely been absent. This is a significant oversight for two reasons. First, like in other parts of the world, African countries have been undergoing accelerated processes of devolution since the 1990s. As often national governments lacked the capacity to impose effective government, finding it hard to levy taxes, particularly in rural areas (Herbst, 1997), decentralisation was sold as a solution to address existing governance problems. Many African countries have undergone processes of decentralisation, so sub-national governments have become increasingly responsible for planning and implementing regional economic development. This represents a shift away from the previous dominant belief that central governments should entirely drive the agenda (Handley, Higgins, Sharma, Bird, & Cammack, 2009). Given their growing role in policymaking, African regional governments deserve to be examined more closely.

Second, sub-national government institutions have historically played an important role in African societies. The colonial era in Africa frequently saw European empires exercise power indirectly by empowering local state apparatuses – typically Native Authorities – to rule on their behalf (Mamdani, 1999, p. 867). These local apparatuses were frequently organised around pre-existing ethnic or religious groups and communities. Locals were appointed as 'chiefs' or 'administrators' to organise society in lieu of direct rule by permanent colonial settlers (Mamdani, 1996b, p. 52). According to Mamdani (1999, p. 869), this form of rule was expanded by the British originally from the colony of Natal to Nigeria, Uganda, and the territory of Tanganyika in the early 20th century, after which it was subsequently 'emulated' by the French after 1918, the Belgians in the 1930s, and the Portuguese in the 1950s. Moreover, according to Herbst (1997, p. 122), most colonial states did not extend the administrative apparatus of national governments beyond the capital city. Therefore, areas outside the capital city were influenced more by local governance arrangements than by national governments. Sub-national governments – in one form or another – have therefore played a long-spanning role in organising people within African societies. These patterns of devolution can still be picked up in patterns of decentralisation today (Ali, Fjeldstad, Jiang, & Shifa, 2019).

It becomes even more important to evaluate sub-national African institutions once we understand the effect pre-colonial and colonial local administrations have on present-day sub-national governments. A wide range of research has demonstrated that institutional culture persists over long periods of time (Acemoglu & Robinson, 2012; La Porta et al., 1999; North, 1990; Young, 1994). Our definition of 'institutional culture' builds on Tabellini (2010), whereby he sought to explain why some governments, which on paper share similar bureaucracies, laws and resources; act in very different ways. He found that variations in culture influenced differences in government performance. Culture is a broad and complex topic, involving as common factors a set of normative values and morality, which can be passed down between generations. Culture therefore dictates what people view as being 'right' or 'wrong'. It governs peoples' voting decisions and how bureaucracies themselves function. For example, if there is a normalised culture of corruption, this may filter through to how governments act.

Building on this literature on cultural persistence, Duranton, Rodríguez-Pose, and Sandall (2009), argue that the relationship between historical government institutions and present-day government institutions is based upon shared social and cultural traits, which persist over time

and still determine differences in development. These findings make the political centralisation of pre-colonial African societies a useful instrument for present-day sub-national government quality. Michalopoulos and Papaioannou (2013a) have reported that political centralisation of pre-colonial ethnic institutions determines present-day differences in economic development in Africa. We therefore hypothesise that pre-colonial African societies may have affected local state apparatuses during colonial rule, which, in turn, influenced modern-day sub-national government. As indicated by Murdock (1959) and Herbst (2000), many pre-colonial societies had forms of organised bureaucracies, property rights, and norms and processes for dispute resolution. Our identification strategy rests on the assumption that high levels of political centralisation (in other words a more top-down government architecture) in pre-colonial societies have led to higher levels of sub-national government quality in African regions.

Despite the important role of sub-national government institutions, few studies have examined sub-national government quality in Africa. These studies have tended to find nuanced results which show the importance of local variation in sub-national government quality. For example, Smith's ethnographic study (2012) investigated factors which lead to a deterioration in the quality of sub-national governments. He found that donor-funded development projects played a central role in reinforcing clientelism and patronage networks in Nigeria's Abia State. Tidemand et al. (2014) demonstrated that inequality in funding provided to Tanzanian local government authorities led to an increase in unequal service delivery within the country. Meanwhile, Knutsen, Kotsadam, Olsen, and Wig (2017) found that an influx of revenue from opening new mines caused sub-national government officials in Sub-Saharan Africa to demand further bribes.

While these studies have made important contributions to understanding the role of sub-national governments in African settings, our paper builds on this literature in three ways. First, it goes beyond individual case studies and attempts to identify the economic implications of sub-national government institutions by examining 339 regions in 22 countries. Second, the use of econometric methods allows us to conduct a cross-country and cross-regional study. Finally, we consider the causal impact – something which has been overlooked in the African institutional literature.

3. Measuring sub-national government quality in Africa

To overcome this gap in existing knowledge, we build a model linking differences in sub-national government quality with regional economic development. Given the absence of official sub-national data on GDP for most African countries, we exploit satellite data on night-time luminosity as the dependent variable. To measure sub-national institutional quality, we create a new index using Afrobarometer data.

3.1. Quality of sub-national government

The explanatory variable of interest is a newly developed index of sub-national government quality. This is created using Rounds 5 (2013) and 6 (2015) of the Afrobarometer surveys. The surveys cover around 200,000 individuals in nationally representative samples across 37 different African countries.[2] Interviews are geocoded and can be traced to both their administrative level 1 regions (for example provinces) and administrative level 2 regions (for example municipalities). All respondents are randomly selected, such that every adult citizen has an equal chance of being surveyed (Afrobarometer, 2014). Furthermore, samples are distributed across urban and rural areas in proportion to their share of the national population.[3]

We construct the sub-national index for a total of 22 African countries: Algeria, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Egypt, Gabon, Ghana, Guinea, Kenya, Lesotho, Liberia, Malawi, Morocco, Mozambique, Namibia, Niger, Nigeria, Senegal, South Africa and eSwatini (Swaziland at the time of surveying). However, due to data availability issues, a handful of regions were omitted. Some of these are low population density or desert regions of Algeria (Adrar, Tindouf, Tamanghasset, and Naama) and Egypt (Al Wadi, Al Jadid, and Shamal Sina), alongside areas experiencing conflict (Boko Haram-ravaged states of Yobe, Borno, and Adamwa in northeastern Nigeria), and a small number of relatively low-population regions in Malawi (Nsanje), Namibia (East and West Kavango) and Guinea (Faranah). We also exclude countries such as Uganda and Zimbabwe which do not have second tiers of government.

Perhaps the most important definition of QoG comes from Rothstein and Teorell (2008). They argue that QoG can be thought of both in terms of inputs, or the access to public authority, and outputs, or manner in which exercise of authority occurs. They suggest that impartiality is at the core of QoG, based on the idea that high QoG allows citizens to trust that their dealings

with the government will be removed from special considerations, preferences, or pre-existing relationships. Because of this, QoG is inversely related to corruption, which entails special treatment, positively connected to both trust and the extent to which local actors are willing to contact government agencies. While Rothstein and Teorell (2008) separate out policy effectiveness from quality of government, they note that both are likely to be related. Given that other seminal studies of QoG have also considered effectiveness (La Porta et al., 1999), we argue that it is important to consider these measures in any indicator of QoG.

Building on these theoretical ideas, we select eight questions from Afrobarometer to measure sub-national quality of government (see Supplementary Table A2). These include the level of corruption of sub-national government officials (for example frequency of bribes); the trust respondents have in sub-national officials; the perceived performance in office of local government actors; and the quality of the services they are responsible for. The responses to these questions are pooled into a subjective sub-national regional government quality index, which reflects – in line with the OECD's Handbook on Constructing Composite Indicators (Nardo et al., 2005) – the opinions of African citizens about their regional government institutions.

Although the number of surveyed individuals varies by region and survey round, there is a mean value of approximately 200 respondents for each (admin 1) region per round.[4] By combining rounds 5 and 6, we end up with an average of around 400 respondents per region. To construct the index of sub-national government quality, some steps are taken. First, we standardise the scale of each question. Each question is given an equal weighting and the scores combined to form a sub-national government quality rating for reach respondent. These measures are then averaged at a regional level. The resulting index is rescaled to form a number between 0 (low government quality) and 100 (high government quality).

More specifically, the index was therefore constructed as follows:

$$SNGQ_r = \frac{\sum_{i=1}^{n} x_i}{n}$$

Where

$$x = \frac{\sum_{i=1}^{8} q_i}{8}$$

$SNGQ$ is the sub-national government quality index for each region r, x is the individual-level sub-national government quality rating, q is the response to each of the eight Afrobarometer

questions, and n is the total number of Afrobarometer respondents in each region. The Appendix provides further detail on the methodology behind the index.

3.2. GDP data

The dependent variable is the log GDP levels from 2015. However, most African countries do not publish official sub-national GDP data. To address this shortcoming, we use satellite data of night-time light luminosity, following Henderson, Storeygard, and Weil (2012), who found that night lights are an accurate indicator of sub-national economic activity (other examples include Russ et al., 2018; Tanaka & Keola, 2017). We use data from the Visible Infrared Imaging Radiometer Suite Day/Night Band (VIIRS-DNB), which provide greater resolution than the Defence Meteorological Satellite Program's Operational Linescan System (DMSP-OLS) data typically used in spatial economics studies. VIIRS data are available every 15 arc seconds for each pixel area (approximately 0.5 km × 0.5 km). Gas flares, moonlight, and sunlight (potential sources of noise) have been filtered out, such that just electric lighting is measured. The data are highly sensitive to low levels of visible light, which is important when deriving economic activity indicators for more rural (and thus less-electrified) areas (Ou, Liu, Li, Li, & Li, 2015) in Africa. To adjust for the population of each region and to ensure that the night light emissions are not driven purely by a population effect, we use log population as a control variable (as per Michalopoulos & Papaioannou, 2018) using the UN's Gridded Population of the World database to ensure that our night light data are not simply driven by a population effect.

3.3. Geographic data

We also use several geographic, topographic, and climate controls. The geographic controls are log average distance to gold mines from GOLDATA; log average distance to water from the GSHHG Database; log average distance to national borders, calculated using GADM Shapefiles; and log average distance to petroleum sites, from the Peace Research Institute Oslo. These controls account for any locational advantage that may affect GDP.

Our topographic controls include log average ground slope and log average elevation data from the Consortium for Spatial Information. These measures are important in addressing any variations in terrain and ruggedness that could impact regions.

We also control for log average yearly temperature of each region using data the University of Delaware's Climate Data Archive. This control accounts for other regional disparities that may affect the cultivability of a regions' land, which in turn would affect its GDP levels.

3.4. Further economic data

Several economic controls are also included. These consist of employment and education levels, which are calculated from round 5 and 6 of the Afrobarometer surveys; infrastructure, proxied through a road density measure (that is the percentage of a region covered by roads) and calculated using raster data from OpenStreetMap; and (log) greenfield and brownfield Foreign Direct Investment data from Orbis (2018). These measures account for exogenous economic factors behind variations in regional GDP.

3.5. Institutional data at national level

We include a measure of national-level devolution: the World Bank's Administrative Decentralisation Index (Ivanyna & Shah, 2012). This measures the regulatory control regional governments have over their own functions by looking at whether governments can conduct their own policies regarding hiring, firing, setting terms of employment. It then measures the resources of regional governments by looking at the ratio of regional government employment to national government employment (excluding health, education, and police sectors). A continuous composite index of between 0 and 1 is then calculated for each country.

As a further institutional check, we control for levels of central government quality using the Government Effectiveness measures of the World Bank's 2015 World Governance Indicators. As a robustness test, we use three alternative measures of central government quality: Transparency International (2015) Corruptions Perception Index, and IHS Markit (2015a, 2015b) Government Instability Index, and their Political Risk Index. Central government quality controls are used to account for variations in national-level institutions that would impact GDP levels.

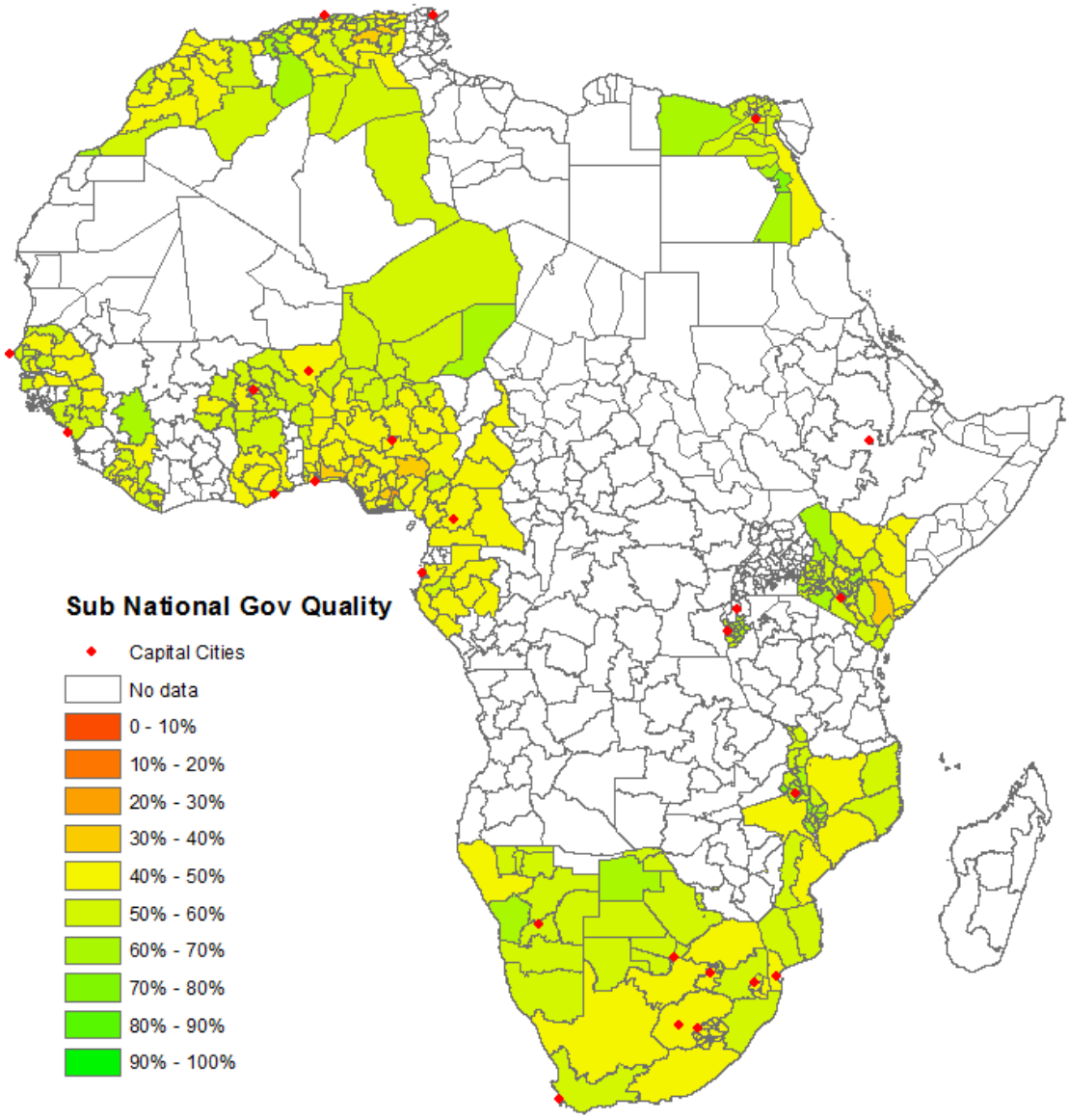
Institutional quality is often higher closer to the main administrative and/or commercial capital cities (for example Michalopoulos and Papaioannou, 2013a). This is because agglomeration effects appear to be most prominent in capital cities – they have greater resource endowments and larger labour pooling effects; a strong foundation for better quality institutions. Knowledge flows can spill over onto neighbouring areas, and these knowledge flows have been found to experience distance decay effects (Rodríguez-Pose & Crescenzi, 2008). Thus, regions near

capital cities may benefit from such spillovers. Especially in Africa, regions near capital cities may also benefit from the widely observed favoured treatment of capitals, which generally receive a preferential allocation of resources to harness political rents (for example Ades & Glaeser, 1995; Lee & Luca, 2019). Therefore, to address questions about whether the results are driven by capital cities, we include a capital city dummy variable.

4. Sub-national government quality and regional GDP

Mapping the 2013–2015 sub-national government quality index for the 22 African countries included in the analysis uncovers a high degree of variation in government quality across African regions. Figure 1 provides a cross-sectional illustration of this variation. The subjective opinions of Africans about their regional institutions point to a greater level of satisfaction in western Kenyan states such as Nandi, West Pokot, and Turkana; Erongo in western Namibia; North-West District in Botswana; Diffa in eastern Niger; El Bayadh, Saida, and Mascara Provinces in northwestern Algeria; as well as parts of Egypt such as Matrouh, Qena, and Aswan. The highest dissatisfaction is found across southern Nigeria, including Abia, Ogun, and Benue states; parts of northern Algeria such as Batna, Oum el Bouaghi, and Annaba; as well as Tana River in Eastern Kenya. There is no evidence in the government quality index of a polarisation between capitals and the rest of the country – for example Dakar ranks highly in the case of Senegal, but Rabat, Gauteng province, Maputo, Niamey, or Accra are perceived to have lower government qualities than the average of Morocco, South Africa, Mozambique, Niger, and Ghana, respectively. Nor is there a marked urban/rural pattern. Many rural areas in, for example, northeastern Kenya, northern Ghana, southern Egypt, and northern Mozambique perform better than other more densely populated areas in their countries, while this trend does not hold for Guinea, Senegal, Namibia, or Niger.

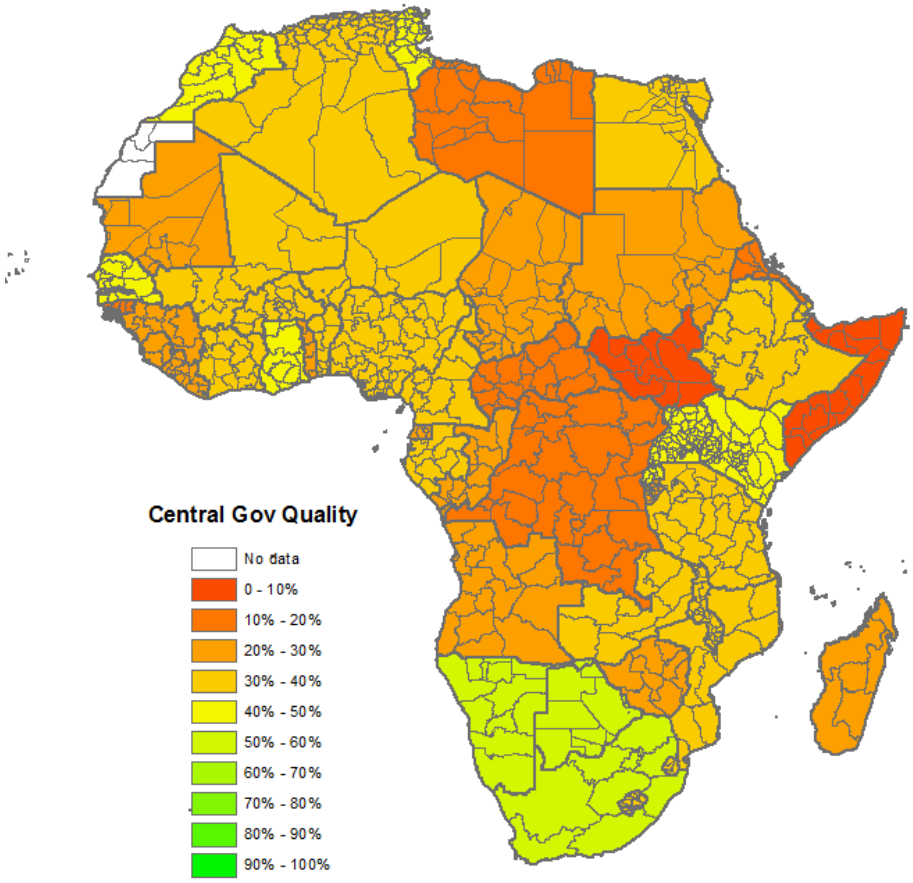
Figure 1: Sub-National Government Quality, 2013-15



Source: Afrobarometer, pooled 2013 and 2015

Differences in sub-national government quality also do not necessarily reflect differences in cross-national government quality. Figure 2 provides an illustration of national government quality (measured through the World Bank's 2015 World Governance Indicator, which is calculated from a wider range of data sources including expert surveys – see Kraay, Kaufmann, & Mastruzzi, 2010). This allows for a comparison between regional government quality with the quality of corresponding national institutions. The best levels of national government quality are found towards Southern Africa, with Botswana, Namibia, and South Africa topping the ranks. Burundi, Guinea, and Liberia have the worst government quality among the countries involved in the analysis. There is some divergence between regional and central government quality, which in part may be because many of the variables we use are specifically related to citizen perceptions at a local level; the measure of Central Government Quality is instead reliant on expert surveys.

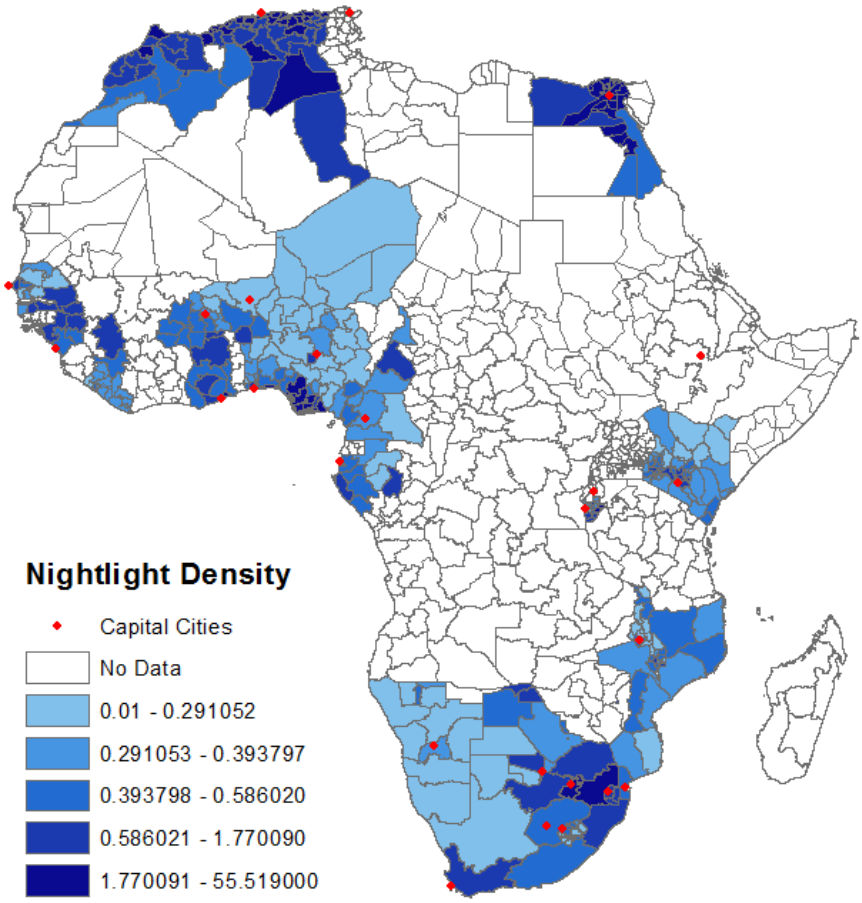
Figure 2: Central Government Quality, 2015



Source: World Governance Indicators, 2015

Figure 3 provides a descriptive overview of regional-level measures of nightlight density – our proxy for GDP levels. We can see several administrative level 1 regions with high night light density in Northern Africa. These regions include Cairo, Alexandria, and Qalyubia in Egypt; Algiers and Oran in Algeria; or Casablanca in Morocco. Moreover, a number of Southern African regions such as Gauteng in South Africa and Gaborone in Botswana similarly emit high levels of night lights. In West Africa, Rivers, an oil-rich state in Southern Nigeria; and Dakar in Senegal have high levels of GDP. Finally, Mombasa in Kenya has the highest level of regional GDP in East Africa. Rural states in Nigeria, such as Taraba and Ebonyi, as well as Inhambane in Mozambique and Kasungu in Malawi have some of the lowest levels of regional GDP in our sample. This pattern reflects a familiar geography of GDP throughout African sub-national regions. We would expect that regions with higher population levels would possess higher levels of nightlight density. Therefore, it is important to account for levels of population when conducting our analysis.

Figure 3: Nightlight Luminosity (GDP) 2015



Before anything can be directly inferred from these figures, we need to account for sources of endogeneity, such as omitted variables bias and reverse causality. To do so, we first use an OLS model, followed by a Two-Stage Least Squares (2SLS) Instrumental Variable (IV) model, with the political centralisation of pre-colonial ethnic societies as an instrument for current day sub-national government quality.

5. The model and the econometric analysis

5.1 The model

In the first instance, we use a reduced form OLS model that measures the impact of sub-national government quality on GDP. Our analysis is based on variants of the following specification:

$$lnY_{rc} = \alpha + \beta SNGQ_{rc} + \mathbf{X'}_{rc}\varphi + u_{rc} \quad (1)$$

lnY_{rc} is the level of GDP in 2015 for region *r* in country *c* as measured in satellite data on nighttime light density. SNGQ is our sub-national government quality index which has been created from rounds 5 and 6 of Afrobarometer, and **X** is a vector of numerous covariates which affect GDP levels. These are the various economic, geographic, topographic, climate, and institutional controls discussed previously. We cluster standard errors at the country level. Appendix Table 1 provides a further overview of the data and their sources.

5.2 Econometric analysis

OLS results

Overall, the OLS results displayed in Table 1 match our initial expectations: sub- national government quality is positively associated with GDP. We run two sets of regressions – with standard errors clustered at the region and country level. Columns (1 and 3) show that in the entire sample, there is a positive relationship between sub-national government quality and regional economic performance (when controlling for a range of location and topographic factors). Our controls include central government quality, suggesting that the effect of sub-

national government quality is independent of this, and a range of other covariates, such as infrastructure, education, employment, and the stock of FDI, are considered.

Table 1: OLS estimates of impact of sub-national government quality on GDP

VARIABLES	(1)	(2)	(3)	(4)
	Log GDP	Log GDP	Log GDP	Log GDP
Sub National Gov Qual	0.0152**	0.0208***	0.0152**	0.0208**
	(0.007)	(0.006)	(0.007)	(0.008)
Log Population	0.1610***	0.1355***	0.1610**	0.1355**
	(0.040)	(0.037)	(0.059)	(0.058)
Devolution Index	−1.1065***	−1.1554***	−1.1065***	−1.1554***
	(0.251)	(0.246)	(0.332)	(0.302)
Log Temperature	−0.4420	−0.4632	−0.4420	−0.4632
	(0.441)	(0.420)	(0.367)	(0.326)
Central Gov Qual	0.0249***	0.0255***	0.0249**	0.0255**
	(0.008)	(0.008)	(0.011)	(0.011)
Employment	−0.1427	−0.1701*	−0.1427	−0.1701
	(0.091)	(0.087)	(0.106)	(0.103)
Education	0.9272**	0.6961*	0.9272	0.6961
	(0.435)	(0.411)	(0.547)	(0.553)
Infrastructure	−0.0185**	−0.0248***	−0.0185	−0.0248
	(0.008)	(0.008)	(0.015)	(0.015)
Log FDI	0.0572***	0.0505***	0.0572***	0.0505***
	(0.011)	(0.010)	(0.015)	(0.015)
Capital City Dummy		0.9099***		0.9099***
		(0.257)		(0.220)
Constant	6.1393***	5.7890***	6.1393*	5.7890*
	(1.916)	(1.847)	(3.098)	(2.980)
Location Controls	Yes	Yes	Yes	Yes
Topographic Controls	Yes	Yes	Yes	Yes
Observations	339	339	339	339
R^2	0.5791	0.6103	0.5791	0.6103
Adjusted R^2	0.560	0.591	0.560	0.591

The table reports cross-regional, cross-country OLS estimates linking regional development with sub-national government quality. The dependent variable is log of GDP as measured in night light density. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are clustered by region in regressions 1–2 and country in 3–4. Location controls include log distance from national borders, log distance from water, log distance from petroleum deposits and log distance from gold deposits. Topographic controls include log elevation and log slope.

In line with previous results by Rodríguez-Pose and Ezcurra (2011), greater regional autonomy is, however, not associated with high GDP. This may be a consequence of hasty decentralisation processes, lack of resources to conduct independent policies, limited capacity by local governments, or a combination of all three. Moreover, decentralisation processes may be too recent to have made an impact.

An important concern is that our results may be skewed by the location of capital cities. To address this, in columns (2 and 4) we add a capital city dummy. When we account for regions with capital cities, we see that sub-national government quality remains positively associated with regional GDP at the 1 per cent significance level.[5]

In sum, a statistically significant relationship between regional government quality and GDP exists across Africa, even when controlling for factors such as education, infrastructure, and national government quality. We would expect to see a high degree of correlation between sub-national governments and regional economic performance because more-developed areas are likely to have greater resources, higher reserves of human capital and, therefore, better quality institutions. We are more interested, however, in examining whether sub-national government quality drives economic performance. To do so, we need to undertake an identification strategy which establishes causality and addresses endogeneity resulting from omitted variables bias.

5.3 Identification strategy

To address causality concerns we use an IV model. The instrument is the level of political centralisation of pre-colonial African societies – that is the 'Jurisdictional Hierarchy of Local Communities'. The data is obtained from anthropologist George P. Murdock's Ethnographic Atlas, a database of 1167 societies that were mapped, coded, and published in the Journal of Ethnology. This database has been widely used in recent institutional literature focusing on African economic performance (for example Gennaioli & Rainer, 2007; Michalopoulos & Papaioannou, 2013b; Nunn, 2008; Nunn & Wantchekon, 2011; Sinding Bentzen, Hariri, & Robinson, 2019). The variable attributes the value of 0 to groups 'lacking any form of centralized political organization', 1 for 'petty chiefdoms', 2 for 'large paramount chiefdoms/small states', and 3 or 4 for 'large states'. For our index of political centralisation, we combine all 'large states' into a single category, and therefore use four values to represent the four categories.

The Ethnographic Atlas data were constructed from a team of fieldworkers as well as archival research (Murdock, 1967).6 For each ethnic group Murdock identified the earliest period for which satisfactory data existed prior to widespread European colonisation in order to describe their characteristics (Gennaioli & Rainer, 2007). Murdock's dataset for Africa does not attempt to capture the full complexities of centuries of local community administrative organisations. Instead, it measures the level of local community centralisation on the eve of widespread

European colonisation, based on existing work which shows that that pre-colonial political institutions still matter for political structures now (Sinding Bentzen et al., 2019).

We determine which pre-colonial African societies corresponds to current day administrative regions by overlaying them to identify the area of intersection (see Figure 4). In cases where more than one society fits into a region, we assigned a weighting of jurisdictional hierarchy levels based on the percentage of intersection (see Figure 5). We have dropped observations where there are missing values in Murdock's map although this does not have a significant impact on the OLS estimates provided in Table 1.

Figure 4: Intersection of pre-colonial societies with current administrative boundaries

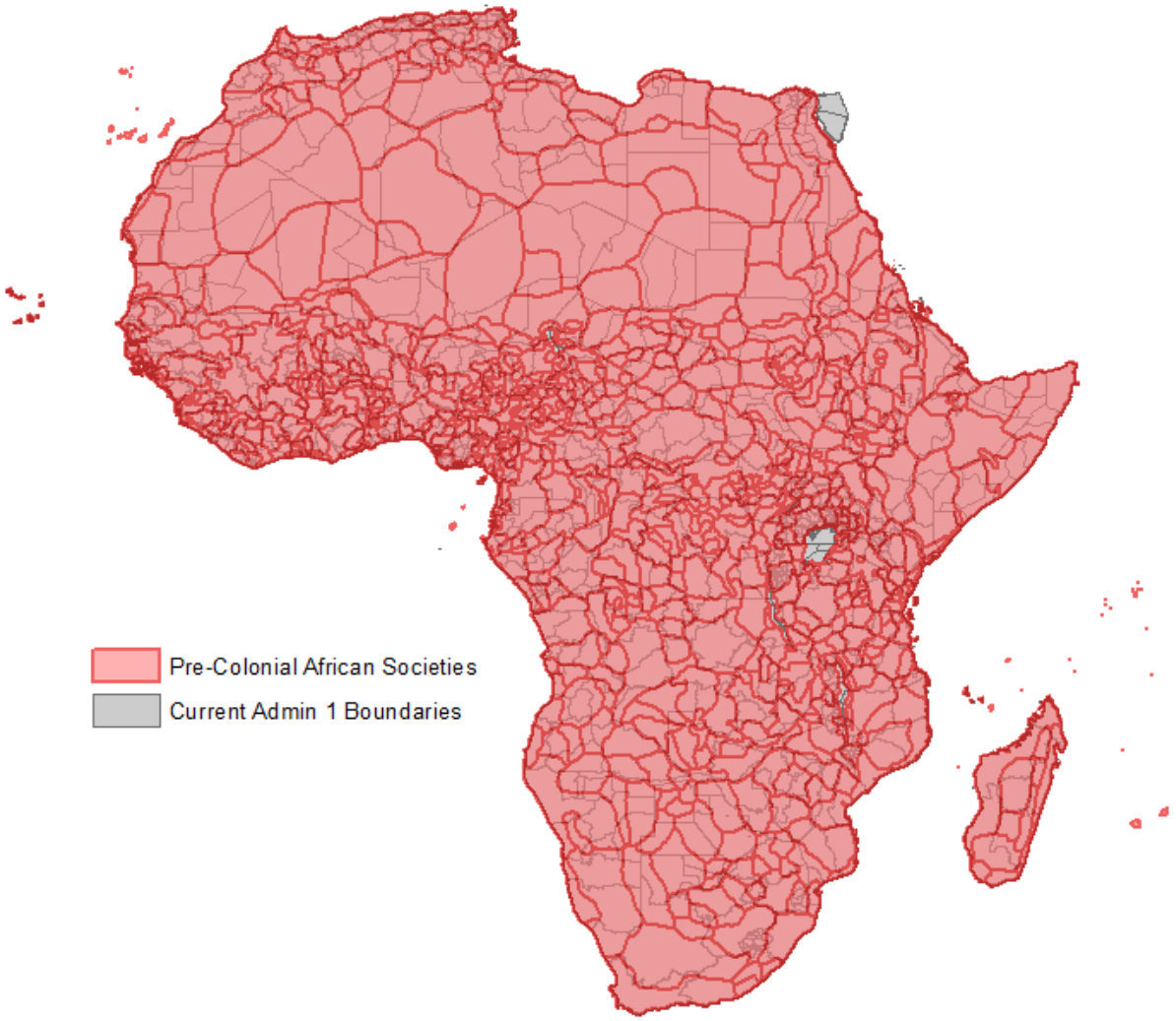
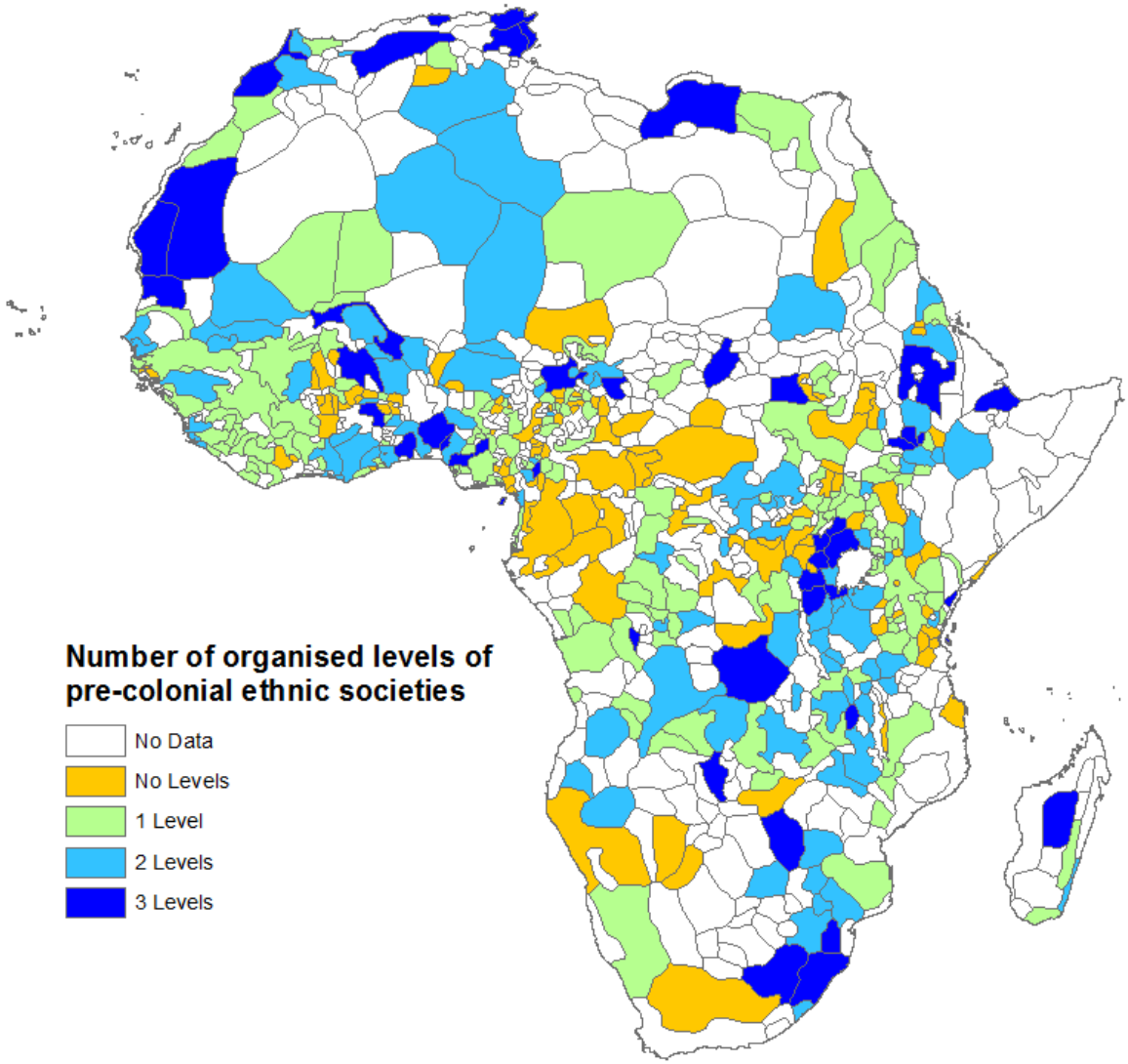


Figure 5: Levels of jurisdictional hierarchy in pre-colonial societies



The second stage estimating equation involves variations on the following:

$$SNGQ_{rc} = \alpha + \emptyset C_{rc} + \mathbf{X'}_{rc}\varphi + u_{rc} \quad (1)$$

Here we treat sub-national government quality (SNGQ) as endogenous and data on the centralisation of pre-colonial African societies, C, as an exogenous variable.

Table 2 reports a significant and causal impact of sub-national government quality on regional economic performance. Column (1) demonstrates that sub-national government quality exerts a significant impact on regional economic activity when controlling for location, climate, and topographic factors. Adding in central government quality in column (2) does not have a major impact on the significance and magnitude of this relationship. In column (3) we similarly see that this causal relationship holds when controlling for economic factors. Finally, in column

(4) we use the capital city dummy to assess whether our previous results were driven by regions hosting the capital cities of a country. We see that this also does not have a large impact on the magnitude and significance of the relationship between sub-national government quality and regional GDP.

5.4 Instrumental variable results

Table 2. IV estimates of impact of sub-national government quality on GDP

	(1)	(2)	(3)	(4)
VARIABLES	Log GDP	Log GDP	Log GDP	Log GDP
Sub National Gov Qual	0.178***	0.167***	0.149***	0.156***
	(0.0481)	(0.0423)	(0.0408)	(0.0427)
Log Population	0.209***	0.205***	0.155**	0.136**
	(0.0732)	(0.0707)	(0.0619)	(0.0614)
Devolution Index	1.582***	−2.090***	−1.849***	−1.912***
	(0.579)	(0.544)	(0.480)	(0.500)
Log Temperature	−0.622	−0.304	−0.0882	−0.175
	(0.389)	(0.204)	(0.210)	(0.194)
Central Gov Qual		0.0472***	0.0280***	0.0275***
		(0.00982)	(0.0105)	(0.0106)
Employment			0.0798	0.00902
			(0.168)	(0.172)
Education			0.915	0.358
			(0.840)	(0.823)
Infrastructure			0.0223	0.0122
			(0.0167)	(0.0155)
Log FDI			0.0318*	0.0246
			(0.0174)	(0.0172)
Capital City Dummy				1.257***
				(0.355)
Constant	−5.419	−5.222	−4.058	−4.221
	(4.312)	(3.578)	(3.112)	(3.082)
Location Controls	Yes	Yes	Yes	Yes
Topographic Controls	Yes	Yes	Yes	Yes
First stage F-test	21.48	21.82	21.91	20.85
Anderson-Rubin P-Value	0.000	0.000	0.000	0.000
Observations	241	241	238	238
R^2	−0.243	−0.060	0.131	0.142

The table reports cross-regional, cross-country 2SLS IV estimates associating regional development with sub-national government quality. Dependent variable is log of GDP as measured in night light density. Standard errors clustered by country in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Location controls include log distance from national borders, log distance from water, log distance from petroleum deposits and log distance from gold deposits. Topographic controls include log elevation and log slope. First-stage results are displayed in Appendix Table 3.

Of note are the coefficient and significance of central government quality. In column (2) central government quality has a positive and significant relationship with regional GDP, however the magnitude of this relationship is much smaller than sub-national government quality. As more controls are added in columns (3) and (4), central government quality becomes less significant and the magnitude of the relationship diminishes. While this may seem unexpected given the long literature on the importance of central government quality, this finding aligns more with the work of Michalopoulos and Papaioannou (2013b), who used regression discontinuities in African regions and found that national-level institutions had close to zero effect on regional economic activity. It also supports the work of political scientists, such as Herbst (2000), who challenged the widespread assumption regarding the sole importance of present-day national-level institutions in explaining economic performance within African contexts.

To meet the exclusion restrictions of a valid instrument, we need to ensure that the instrument is relevant and exogenous. The instrument of jurisdictional hierarchy of pre-colonial societies is relevant, as the first stage f-tests are greater than 10 (the rule of thumb for instrument relevance). However, given that the f-test is less than 25 in all cases, we have employed the Anderson-Rubin test which is robust to weak instruments. In each case, the Anderson-Rubin p-value is well under 0.05, thereby indicating that our results still hold. Regarding instrument exogeneity, we have previously discussed the extensive literature, which suggests that institutional culture persists over time. We address these and other concerns in the robustness tests section below. As with any instrument, it is important to caveat this finding – the results here are consistent with a causal explanation, but they can never prove it.

6. Robustness tests

6.1. Instrument exogeneity in IV estimates

In Supplementary Table A4 we examine whether our instrument acts through central government quality as well as sub-national government quality. This would render our instrument endogenous. To test this theory, we run the instrument through central government quality and find that the f-test is less than 2, thereby indicating that it is not a valid instrument for national-level institutions. This finding upholds our initial assumption that pre-colonial societies influenced the make-up of local-level institutions during colonialism, which in turn affected sub-national institutions following independence.

Another potential concern is that colonisation and the creation of colonial borders were influenced by the quality of pre-colonial institutions. In other words, colonial powers decided to settle in areas which had higher quality proto-local governments. If this were the case, then pre-colonial institutional quality may be endogenous. However, a range of literature has disputed this, arguing that colonial borders were created exogenously (in the late 19th century, culminating in the 1884–1885 Berlin Conference) at a time when Europeans had limited knowledge of local conditions (Michalopoulos & Papaioannou, 2016).

However, it is possible that Europeans may have known more about coastal regions – especially in Western Africa – prior to 1884. To address this concern, in Supplementary Table A5, we drop all coastal regions from our analysis and re-run our IV estimates. Again, we find no major changes in the magnitude or significance of sub-national government quality's impact on GDP.

6.2. Alternative measures of central government quality

Given the existence of several central government quality indicators, we repeat our IV analysis using different measures. This is to ensure that we do not rely on a single measure of central government quality that biases the results. In addition to the World Governance Indicators, we use Transparency International's Corruptions Perceptions Index, IHS Markit's Government Instability Index, and IHS Markit's Political Risk Index. The results of these analyses are presented in Supplementary Table A6. No significant discrepancies with our original findings are in evidence. Sub-national government quality still has a positive, significant, and causal impact on regional economic performance, while the instrument again satisfies the exclusion restriction with all first-stage F-tests larger than 10.

6.3. Estimations with alternative time period

In Supplementary Table A7, we repeat the analysis using data from 2016 instead of 2015. This is to ensure our results remain consistent over different cross-sections. Given that the sub-national government quality index is constructed using data from 2013 to 2015, we can only repeat the analysis with data after 2015. The latest available year of VIIRS night lights data comes from 2016, which therefore restricts us to analysing 2015 and 2016 cross-sections.

While we see some variances in the OLS results – with Sub-National Government Quality becoming insignificant in column (1), once controlling for capital cities the significance returns. Nonetheless, the IV results remain unchanged across all permutations which indicates

a positive, significant, and causal relationship between sub-national government quality and regional GDP in 2016.

6.4. Estimations without low-sample regions

Our final check addresses the concern that the results may be driven by regions with a low number of observations in Afrobarometer. We repeat the basic regression (given in Table 1, Column 2) using alternative samples of the data. The full regression table appears in Supplementary Table A8. We run the model excluding regions with <50 observation and then those with <100 observations. The coefficient is close in both cases to that in the full model (0.021): 0.018 and statistically significant at the 5 per cent level, when excluding those with <50 observations; and 0.016 and significant at the 10 per cent level, when excluding those with <100). Given that the coefficient remains similar in magnitude, the reduction in statistical significance may result from the smaller sample size and imprecision added in the weighting process. We cautiously conclude that our results are not likely to be biased in a major way by low-observation regions.

7. Conclusion

This paper has addressed a significant gap in the literature regarding the role of sub-national governments in influencing the economic performance of African regions. Despite near-consensus that government institutions matter for economic performance, few studies have considered sub-national government institutions – especially outside of Europe and Asia. While African states have a varied history of sub-national government institutions and apparatuses (Olowu, 2003), sub-national governments have tended to be relatively and increasingly important, given the more recent trends towards devolution. Given this, the lack of evidence on the relationship between sub-national government quality and economic development represents an important gap. To properly understand the role of institutions in promoting economic activity, research should go beyond the traditional analyses of national-level government institutions to fully account for variations in sub-national government quality in Africa.

In this paper, we have addressed this gap by creating a new index of sub-national government quality for 339 African regions. The index was then used to investigate the relationship between quality of sub-national government and regional GDP, as proxied by night light

density. We employ data on the level of jurisdictional hierarchy of pre-colonial societies as an instrument for sub-national government quality. This instrument was found to be relevant and exogenous, thereby meeting the criteria for the exclusion restriction.

The principal finding is that sub-national government quality has a positive, statistically significant, and robust relationship with regional economic development in Africa. These results hold when controlling for a wide range of other factors that may be correlated with GDP (for example education levels, infrastructure endowments, and FDI). The instrumental variable analysis suggests that this effect is causal, rather than due to more developed localities having better government. Moreover, we find that sub-national government quality has an effect, independent of national government quality. This finding may be somewhat controversial, as it goes against some of the more prominent theories explaining economic activity that see national government institutions as fundamental to economic performance (for example Acemoglu et al., 2005). However, it is consistent with more recent research by Michalopoulos and Papaioannou (2013b), who established through regression discontinuity designs that national-level government institutions did not have as large an impact on regional economic activity than was previously believed.

The results have implications for both academic work and policy. Outside the European and Asian cases, academic work on government institutions – and, therefore, most development policies – has tended to focus on the national-level context. However, in Africa like elsewhere in the world, sub-national government institutions fulfil a range of important functions that are at the heart of differences in development. Hence, sub-national government quality shapes past and future development prospects, even in a context where decentralisation and regional autonomy have not yielded the expected economic returns. For policy, these results highlight the importance of building capacity, increasing voice, transparency, and accountability, and stemming corruption at a sub-national level. Focusing on these issues at national level does not suffice. If the sub-national government dimension continues to be overlooked, it is likely that most governmental improvements at the national level will end up diluted and the benefits will not reach ordinary citizen.

Our research opens up several potential avenues for examination. One question is the extent to which sub-national government quality influences economic performance in the context of better (or worse) national government quality (particularly if sub-national governments may in some cases be a substitute for national governments). A second would be to identify the exact

mechanisms that impact sub-national government quality or decomposing the index and determining the channels through which sub-national government quality affects GDP. Moreover, if sub-national government quality matters for regional economic performance, then what are its effects on other important economic factors such as spatial inequalities, productivity, innovation, or employment? In order to fully grasp how institutions impact important economic indicators, we must extend our understanding of the impacts of sub-national government quality.

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Appendix Table A1

Variable	Definition	Source
Sub-National Government Quality	Index of sub-national government quality (author's calculation)	Afrobarometer Rounds 5 and 6
Night time light emissions (GDP)	Log of night light density measured using the Visible Infrared Radiometer Suite (VIIRS)	National Oceanic and Atmospheric Administration
Distance to gold mines	Log average distance to gold mines (kms)	GOLDATA (Balestri, 2013)
Distance to water	Log average distance to water (kms)	GSHHG Database
Distance to national borders	log average distance to national borders (kms)	GADM
Distance to petroleum	log average distance to petroleum sites (kms)	PRIO
Slope	log average ground slope (degrees) from Shuttle Radar Topography Mission dataset at 500m resolution	Consortium for Spatial Information
Elevation	log average elevation (metres) from Shuttle Radar Topography Mission dataset at 500m resolution	Consortium for Spatial Information
Temperature	Monthly average of daily mean temperature (2015 and 2016)	University of Delaware's Climate Data Archive
Employment	Afrobarometer Question: "Employment status?" Responses: 0=No (not looking), 1=No (looking), 2=Yes, part time, 3= Yes, full time, 9=Don't know, 98=Refused to answer, -1=Missing.	Afrobarometer Rounds 5 and 6
Education	Afrobarometer Question: "What is your highest level of education?" Responses: 0=No formal schooling, 1=Informal schooling only (including Koranic schooling), 2=Some primary schooling, 3=Primary school completed, 4=Intermediate school or Some secondary school / high school, 5=Secondary school / high school completed , 6=Post-secondary qualifications, other than university e.g. a diploma or degree from a polytechnic or college, 7=Some university, 8=University completed, 9=Post-graduate, 99=Don't know [Do not read], 98=Refused to answer, -1=Missing	Afrobarometer Rounds 5 and 6
Infrastructure	Index of road density (percentage of total area) - authors' calculations.	OpenStreetMap
Foreign Direct Investment	$ millions	Orbis
Population	Log population levels	UN's Gridded Population of the World database (NASA, 2017)

Central Government Quality	Government Effectiveness Score (0-100)	World Governance Indicators
Corruptions Perception Index	Central government corruption levels (0=very corrupt, 100= not corrupt)	Transparency International
Government Instability Index	Government instability of central governments (0 = stable, 10= unstable)	IHS Markit (2015a)
Political Risk Index	Political risk rating of central government (0 = low risk, 10= high risk)	IHS Markit (2015b)
Devolution Index	Administrative decentralization index (0 = not decentralized, 1=completely autonomous sub-national governments)	Ivanya and Shah (2012)

APPENDIX TABLE A2

Afrobarometer questions used to create the index of sub-national government quality

Question	Min. response	Max. response
Trust		
How much do you trust each of the following, or haven't you heard enough about them to say: Your Metropolitan, Municipal or District Assembly?	1	4
During the past year, how often have you contacted any of the following persons about some important problem or to give them your views: A local government councillor?	1	4
Corruption		
How many of the following people do you think are involved in corruption, or haven't you heard enough about them to say: Local government councillors?	1	4
How many of the following people do you think are involved in corruption, or haven't you heard enough about them to say: Tax Officials (e.g. Ministry of Finance officials or Local Government tax collectors)	1	4
Performance		
Do you approve or disapprove of the way the following people have performed their jobs over the past twelve months, or haven't you heard enough about them to say: Your Elected Local Government Councillor?	1	4
Service Delivery		
How much of the time do you think the following try their best to listen to what people like you have to say: Local government councillors?	1	4
What about local government? I do not mean the national government. I mean your Metropolitan, Municipal or District Assembly. How well or badly would you say your local government is handling the following matters, or haven't you heard enough about them to say: Maintaining local roads?	1	4
What about local government? I do not mean the national government. I mean your Metropolitan, Municipal or District Assembly. How well or badly would you say your local government is handling the following matters, or haven't you heard enough about them to say: Maintaining local market places?	1	4

APPENDIX TABLE A3: First-Stage IV Results

VARIABLES	(1) Sub Nat Gov Qual	(2) Sub Nat Gov Qual	(3) Sub Nat Gov Qual	(4) Sub Nat Gov Qual
Pol_centralisation	2.161***	2.211***	2.167***	2.122***
	(0.466)	(0.473)	(0.463)	(0.465)
Devolution Index	10.81***	12.05***	10.54***	10.49***
	(2.168)	(2.249)	(2.306)	(2.300)
Log Population	-0.965***	-0.979***	-0.853**	-0.782**
	(0.331)	(0.337)	(0.337)	(0.338)
Log Temperature	0.875	0.273	0.254	0.493
	(0.882)	(0.837)	(0.889)	(0.894)
Central Gov Qual		-0.0924*	-0.0585	-0.0557
		(0.0543)	(0.0650)	(0.0650)
Infrastructure			-0.220***	-0.187**
			(0.0748)	(0.0752)
Log FDI			0.148	0.165
			(0.102)	(0.101)
Employment			-1.917**	-1.676*
			(0.944)	(0.965)
Education			-0.349	1.230
			(4.571)	(4.580)
Capital City Dummy				-3.552***
				(1.275)
Constant	56.83***	57.74***	53.45***	52.78***
	(10.86)	(10.79)	(10.56)	(10.50)
Location Controls	Yes	Yes	Yes	Yes
Topographic Controls	Yes	Yes	Yes	Yes
Observations	241	241	238	238

Appendix Table A4 – IV Estimates (instrumenting through central government quality)

VARIABLES	(1) Log GDP	(2) Log GDP	(3) Log GDP
Central Gov Qual	0.456	0.399	0.399
	(0.385)	(0.298)	(0.300)
Devolution Index	-6.489	-5.156	-5.195
	(5.409)	(3.571)	(3.600)
Log Population	0.169	0.255	0.245
	(0.215)	(0.204)	(0.203)
Log Temperature	2.445	0.787	0.743
	(4.016)	(1.696)	(1.708)
Sub National Gov Qual	0.0656	0.0344	0.0381
	(0.0419)	(0.0245)	(0.0249)
Infrastructure		-0.122	-0.128
		(0.0973)	(0.0982)
Log FDI		-0.118	-0.122
		(0.136)	(0.137)
Employment		-1.407	-1.446
		(1.014)	(1.025)
Education		1.461	1.170
		(1.668)	(1.647)
Capital City Dummy			0.660
			(0.788)
Constant	-3.522	-1.654	-1.735
	(13.41)	(8.952)	(8.952)
Location Controls	Yes	Yes	Yes
Topographic Controls	Yes	Yes	Yes
First stage F-test	1.10	1.54	1.54
Observations	241	238	238
R-squared	-5.566	-2.983	-2.972

The table reports cross-regional, cross-country 2SLS IV estimates associating regional development with sub national government quality. Dependent variable is log of GDP as measured in night light density. Standard errors clustered by country in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Location controls include log distance from national borders, log distance from water, log distance from petroleum deposits and log distance from gold deposits. Topographic controls include log elevation and log slope

Appendix Table A5 – IV Estimates (excluding coastal regions)

VARIABLES	(1) Log GDP	(2) Log GDP	(3) Log GDP
Sub National Gov Qual	0.116***	0.0859**	0.0840***
	(0.0422)	(0.0341)	(0.0324)
Devolution Index	-1.565***	-1.181***	-1.179***
	(0.584)	(0.444)	(0.399)
Log Population	0.119*	0.0751	0.0586
	(0.0663)	(0.0549)	(0.0522)
Log Temperature	-1.575***	-1.359***	-1.398***
	(0.521)	(0.496)	(0.452)
Central Gov Quality	0.0476***	0.0258**	0.0271**
	(0.0129)	(0.0118)	(0.0109)
Infrastructure		0.0140	0.00330
		(0.0153)	(0.0135)
Log FDI		0.0447***	0.0348***
		(0.0156)	(0.0133)
Employment		-0.156	-0.221*
		(0.125)	(0.119)
Education		1.083	0.692
		(0.756)	(0.687)
Capital City Dummy			1.312***
			(0.364)
Constant	4.341	6.484*	7.383**
	(4.170)	(3.365)	(3.057)
Location Controls	Yes	Yes	Yes
Topographic Controls	Yes	Yes	Yes
First stage F-Test	14.49	18.65	18.63
Observations	185	182	182
R-squared	0.220	0.428	0.502

The table reports cross-regional, cross-country 2SLS IV estimates associating regional development with sub national government quality. Dependent variable is log of GDP as measured in night light density. Standard errors clustered by country in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Location controls include log distance from national borders, log distance from water, log distance from petroleum deposits and log distance from gold deposits. Topographic controls include log elevation and log slope

Appendix Table A6 – Alternate Measures of Central Government Quality

VARIABLES	(1) Log GDP	(2) Log GDP	(3) Log GDP
Sub National Gov Qual	0.155***	0.152***	0.149***
	(0.0416)	(0.0452)	(0.0424)
Devolution Index	-1.777***	-1.570***	-1.553***
	(0.484)	(0.476)	(0.460)
Log Population	0.268***	0.168***	0.186***
	(0.0779)	(0.0634)	(0.0629)
Log Temperature	-0.0595	-0.169	-0.174
	(0.178)	(0.275)	(0.249)
Infrastructure	0.00743	0.0336**	0.0335**
	(0.0180)	(0.0166)	(0.0165)
Log FDI	0.0258	0.0392**	0.0379**
	(0.0177)	(0.0182)	(0.0171)
Employment	0.0318	0.166	0.141
	(0.160)	(0.187)	(0.178)
Education	0.747	0.860	0.849
	(0.859)	(0.858)	(0.841)
Corruption Perceptions Index	0.0492***		
	(0.0131)		
Government Instability Index		-0.0860	
		(0.127)	
Political Risk Index			-0.167
			(0.121)
Constant	-6.628*	-3.880	-3.474
	(3.446)	(3.522)	(3.364)
Location Controls	Yes	Yes	Yes
Topographic Controls	Yes	Yes	Yes
First stage F-test	20.75	18.39	20.00
Observations	234	238	238
R-squared	0.116	0.088	0.122

The table reports cross-regional, cross-country 2SLS IV estimates associating regional development with sub national government quality. Dependent variable is log of GDP as measured in night light density. Standard errors clustered by country in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Location controls include log distance from national borders, log distance from water, log distance from petroleum deposits and log distance from gold deposits. Topographic controls include log elevation and log slope. Individual fixed effects for living conditions and occupation.

Appendix Table A7 – Alternative Cross-Section

VARIABLES	(1) lnviirs	(2) lnviirs	(3) lnviirs	(4) lnviirs	(5) lnviirs
Sub National Gov Qual	0.0101	0.0157***	0.134***	0.108***	0.113***
	(0.00615)	(0.00590)	(0.0350)	(0.0306)	(0.0320)
Central Gov Qual	0.0186***	0.0195***	0.0360***	0.0227***	0.0228***
	(0.00675)	(0.00640)	(0.00749)	(0.00809)	(0.00799)
Devolution Index	-0.817***	-0.861***	-1.551***	-1.333***	-1.364***
	(0.248)	(0.242)	(0.461)	(0.386)	(0.395)
Log Population	0.271***	0.245***	0.315***	0.253***	0.234***
	(0.0391)	(0.0368)	(0.0609)	(0.0513)	(0.0505)
Employment	-0.118	-0.150*		0.0254	-0.0432
	(0.0932)	(0.0897)		(0.139)	(0.142)
Education	1.244***	1.091***		1.556***	1.225**
	(0.369)	(0.348)		(0.565)	(0.526)
Infrastructure	-0.0249***	-0.0308***		0.00458	-0.00399
	(0.00926)	(0.00922)		(0.0139)	(0.0133)
Log FDI	0.0525***	0.0447***		0.0286*	0.0208
	(0.0118)	(0.0108)		(0.0153)	(0.0145)
Log Temperature	-0.216	-0.234	-0.133	0.131	0.0568
	(0.339)	(0.316)	(0.156)	(0.162)	(0.144)
Capital City Dummy		0.929***			1.095***
		(0.265)			(0.301)
Constant	4.551***	4.198***	-4.761	-3.706	-3.703
	(1.579)	(1.492)	(3.115)	(2.588)	(2.532)
Location Controls	Yes	Yes	Yes	Yes	Yes
Topographic Controls	Yes	Yes	Yes	Yes	Yes
First stage F-Test	-	-	21.92	22.78	21.8
Observations	339	339	241	238	238
R-squared	0.647	0.675	0.306	0.482	0.505

The table reports cross-regional, cross-country OLS (1)-(2) and 2SLS IV (3)-(6) estimates associating regional development with sub national government quality. Dependent variable is log of GDP as measured in night light density. Standard errors clustered by country in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Location controls include log distance from national borders, log distance from water, log distance from petroleum deposits and log distance from gold deposits. Topographic controls include log elevation and log slope.

Appendix Table A7 – Results excluding low-observation regions

VARIABLES	(1) lnGDP	(2) lnGDP
Specification	Excluding regions with < 50 observations	Excluding regions with < 100 observations
Sub National Gov Qual	0.0188**	0.0162*
	(0.00785)	(0.00946)
Central Gov Qual	0.0180**	0.0132
	(0.00736)	(0.00878)
Employment	-0.201**	-0.0938
	(0.0926)	(0.103)
Education	1.044**	2.018***
	(0.480)	(0.694)
Log FDI	0.0441***	0.0311**
	(0.0107)	(0.0121)
Capital City Dummy	0.836***	0.782***
	(0.255)	(0.267)
Devolution Index	-0.885***	-0.636**
	(0.252)	(0.273)
Log Population	0.174***	0.223***
	(0.0443)	(0.0609)
Log Temperature	-1.614***	-1.214***
	(0.416)	(0.464)
Constant	9.417***	6.925***
	(1.952)	(2.358)
Topographic Controls		
Observations	291	211
R-squared	0.628	0.624

Paper 2 - Examining the Drivers of Sub-National Government Quality in African Regions: The Role of Armed Conflict

Abstract

Paper 1 suggests that variations of sub-national government quality (SNGQ) impacts economic activity in African regions. However, given data availability constraints, little has been done to understand what drives deteriorations in SNGQ. This paper aims to fill this gap in the literature by examining the impact of armed conflict on SNGQ in 460 regions across 27 African countries between 2013-2018. Despite Africa experiencing more armed conflict than any other continent over the past 20 years, little is known about how and to what extent this has impacted institutional quality. I use conflict data from the Upsala Conflict Data Program and assess its impact on SNGQ using data from Afrobarometer. To address causality concerns, I instrument armed conflict with exogenous changes in world agricultural prices as reductions in agricultural revenue lowers the opportunity cost of farmers engaging in armed conflict. The results demonstrate that armed conflict has a negative, significant and causal impact on SNGQ in African regions. I also find that this reduction in SNGQ is caused by a deterioration in the quality of services that sub-national governments provide, rather than an upsurge in corruption. This is because sub-national governments need to direct resources towards crisis response, and away from its usual services. Finally, contrary to the existing literature, I find that an upsurge in armed conflict does not impact national government quality. This may be because national governments are better resourced than sub-national governments. Therefore, when violent conflicts occur, the cost of crisis response is proportionally lower for national governments than it is for sub-national governments.

1. Introduction

In paper 1, we found that lower levels of sub-national government quality (SNGQ) negatively impacts economic development in African regions (Iddawela et al., 2021). As such, SNGQ – defined here as impartiality, respect for private property rights, freedom from official corruption, and the ability to provide high quality services to citizens (Rothstein and Teorell, 2008; Fan et al., 2009) – is an important part of a country's overall institutional architecture that directly impacts regional economic activity (Rodríguez-Pose & Di Cataldo, 2014; Meyer and Revilla Diez, 2015). Given these new insights, policymakers need to better understand what factors influence a region's SNGQ. The lack of research on such factors is particularly surprising in light of recent studies that investigate the determinants of SNGQ in Europe (e.g. Charron and Lapuente, 2013; Sundström & Wängnerud, 2016), and in South America (e.g. Niedzwiecki, 2016). This paper aims to address this gap in the literature by examining one particular driver of SNGQ in African regions – armed conflict.

A clearer understanding of how armed conflict affects SNGQ is warranted for two reasons. First, SNGQ plays a central role in determining sub-national economic development and wealth levels in African regions. This is because many African countries have experienced ongoing devolution over the past two decades, which has seen sub-national governments becoming more responsible for driving development agendas (see Bratton, 2012; Erk, 2015). Furthermore, sub-national government institutions have historically played an important role in African countries. For instance, the colonial history of many African states involved a form of 'indirect rule', whereby sub-national institutions (e.g. tribes and chieftaincies) would rule on behalf of colonial powers (Mamdani, 1996: 60). Given the important and historical role of sub-national government institutions, academics and policymakers alike need to better understand the factors that drive variations in SNGQ.

Second, armed conflict is sadly pervasive in many African countries. The Uppsala Conflict Data Program's Georeferenced Events Database (UCDP GED) shows that Africa has experienced more armed conflict-related deaths since 1989 than any other continent. Given this prevalence of armed conflict, we have seen a number of studies examining the relationship between armed conflict and economic outcomes. For example, see Alesina et al. (2016) and Kyriacou (2013) who found that conflict has led to ethnic fragmentation in African countries. Yet despite this set of research, little has been done to (1) study the (causal) relationship

between armed conflict and SNGQ in African regions, and (2) understand the channels through which conflict impacts SNGQ. Extending this research to the sub-national level will help develop a better understanding of African government institutions – specifically what affects SNGQ and what policymakers can subsequently do to improve it.

I address this gap in the literature by first creating an index of SNGQ for 460 African administrative level-1 (admin 1) regions across 27 countries. I use newly available data from Afrobarometer Round 7 and follow the approach outlined in Iddawela et al. (2021) to create this index. As such, I create SNGQ measures for each region in 2013, 2016 and 2018. Using this SNGQ measure, I assess the impact on armed conflict (measured in terms of the number of conflict-related fatalities using the UCDP GED dataset) for each admin 1 region (e.g. provinces).

While conflict may make it more difficult to govern, endogeneity through reverse causality is a primary concern. This is because regions with poor government quality may be unable to address structural issues that lead to armed conflict (e.g. famine, or an absence of rule of law). To determine the causal impact of armed conflict on SNGQ, the identification strategy uses exogenous changes in world agricultural prices as an instrument for armed conflict. Following the method outlined by McGuirk and Burke (2020), I calculate a producer price index (PPI) that measures a basket of world food prices for goods that are produced in African regions. The logic behind this instrument is that a reduction in PPI (i.e. a drop in global agricultural commodity prices) will raise the incidence of civil conflict by reducing the opportunity cost of fighting for agricultural producers. In other words, if the price of agricultural products drops and potential revenue from farmers reduces, then the opportunity cost for farmers to engage in civil conflict is lower. Given that African economies are predominantly agricultural (and that agricultural products represent a higher average share of household production in Africa than in any other continent), I propose that changes in world agricultural prices should affect levels of conflict (and thereby SNGQ) throughout each country in the sample.

The analysis yields three main results. First, as expected, armed conflict has a negative, significant and causal impact on SNGQ in African regions. Second, in examining the specific channels, we see that the reduction in SNGQ is caused by a reduction in the quality of services that sub-national governments provide. This is because sub-national governments need to direct resources towards crisis response, and away from its usual services. Moreover, it appears

that an increase in armed conflict does not impact either the level of corruption in sub-national governments, or the level of trust citizens have in their sub-national government officials. Thus, contrary to the existing literature (see Bratton and Chang, 2006; and Brinkerhoff et al., 2012), armed conflict does *not* seem to impact the legitimacy of (sub-national) governments. Finally, an upsurge in conflict does not appear to affect NGQ. This is likely because national governments have significantly more resources than sub-national governments. Therefore, when violent conflicts occur, the cost of crisis response is proportionally higher for sub-national governments than for national governments. As a result, the service delivery of national governments is not affected as much as it is for sub-national governments.

In carrying out the analysis, this paper is structured as follows: section 2 provides an overview of the existing literature and situates the study within this, section 3 elaborates the theoretical model underpinning the relationship between conflict and SNGQ, section 4 describes the data sources and provides some descriptive analyses, section 5 provides the results, section 6 discusses the identification strategy of using PPI as an instrument for conflict and provides the results of our 2SLS estimation, section 7 discusses robustness tests, while section 8 concludes.

2. Existing Literature

This paper is situated at the intersection of two areas of academic literature on economic development in Africa – that which examines the relationship between armed conflict and government quality, and that which examines the drivers of government quality.

2.1 Literature on the relationship between armed conflict and government quality

The World Bank's 2011 World Development Report background paper focuses on institutions and service delivery within conflict affected states (Baird, 2011). It argues that "much of the basic infrastructure to deliver services is often damaged or destroyed, with severe shortages of trained personnel and supplies" (Baird, 2011:6). Improved service delivery therefore helps raise living standards but, through providing basic infrastructure, also improves the legitimacy of governments. Moreover, the report suggests that armed conflict upends social order, and this typically leads to the systematic exclusion of certain groups along ethnic, religious, political and gender lines (ibid).

Conflict's impact on ethnic fragmentation is upheld by Alesina et al. (2016), who explore the causes and impacts of ethnic inequality across 173 countries using ethnic fragmentation data from ethno-linguistic maps. As part of their results, they find that ethnic polarisation is significantly related to conflict – as ethnic-based conflict leads to lasting ethnic divisions within a society. Ethnic inequality, in turn, affects institutional development as it becomes challenging for states to implement policies and deliver services in areas characterised by ethnic tensions. Moreover, ethnic minorities that hold power in governments may delegitimise the state, and thus lead to a reduction in the government's ability to provide services. This aligns with Kyriacou (2013), who also suggests that violent conflict and ethnic inequality are inherently related. Kyriacou examines the impact of ethnic inequality on institutional equality by examining a panel of 29 developing countries using Demographic and Health Surveys data to measure ethnic group inequalities. He finds that greater inequalities between ethnic groups undermines institutions in two ways. First, because institutions are seen as legitimising corruption in the eyes of disadvantaged ethnic groups, and second because the advantaged groups attempt to maintain their privileges. As a result, ethnic group inequalities, which in part stem from armed conflict, are seen to reduce government quality.

By focusing specifically on the African context, Bratton and Chang (2006), build on these findings by arguing that conflict does not just lead ethnic minorities to lose confidence in governments, but instead most citizens lose confidence. As a result, state legitimacy (and therefore the government's ability to effectively deliver services), will only be restored if governments can regulate conflict within its borders, protect citizens from criminals, and mitigate illegal challenges to electoral rule. In other words, following the outbreak of conflict, citizens lose trust in their government. Trust will only be regained once law and order and the rule of law are established. These findings align with Brinkerhoff et al. (2012), who study the impact of conflict on service delivery and state legitimacy in Iraq. They find that armed conflict impacts the government's ability to fulfil three main functions: provide security, deliver basic public goods and services, and manage political participation. With limited capacity following armed conflict, governments struggle to effectively provide public goods and services that are at a level satisfactory to most citizens. This poor service delivery, combined with the inability to provide security, results in citizens not accepting or supporting the government – in other words the government loses legitimacy. Once governments lose legitimacy, they often use repression and coercion to maintain power. This further entrenches the loss of legitimacy and deterioration in government quality.

To summarise, the literature which examines the relationship between armed conflict and institutions has mainly focussed on the national level. The research suggests that armed conflict leads to a reduction in national government quality in three ways: by losing legitimacy and the trust of citizens, deteriorating the quality of services provided, and governments turning to corruption and coercion to maintain power following the loss of legitimacy.

2.2 Literature on the drivers of government quality

National government quality (NGQ) is broadly understood as involving impartiality, the respect for private property rights, freedom from official corruption, and the ability to provide high quality services to citizens (Rothstein and Teorell, 2008; Fan et al., 2009).

The literature on institutions broadly analyses the drivers of NGQ in two distinct ways. First, many studies have sought to understand the drivers of government quality through the lens of historical factors such as colonial settler patterns (Acemoglu et al., 2001), protestant traditions (La Porta et al., 1999), long-run exposure to democratic systems (Treisman, 2000), and historical literacy rates (Tabellini, 2010). The central argument of this strand of literature is that historical factors have influenced 'institutional culture', and this culture has in turn persisted over time – thereby affecting present-day government quality levels. 'Institutional culture', as defined by Tabellini (2010), involves a common set of normative values and morality, which can be passed down from generation to generation. In this way, institutional culture is an important factor that influences behaviours and what society views as 'right' or 'wrong'. It therefore plays a role in governing people's voting decisions and how government agencies function. Thus, as Acemoglu et al. (2001) find, countries which had been colonised by European settlers, obtained European-style institutions that protected property rights and promoted the rule of law. As a result, this institutional culture has been passed down along the years to impact the quality of governments in the present day. This finding has been confirmed by studies such as Michalopoulos and Papaioannou (2013), who use measures of pre-colonial institutional quality in African countries from the work of George Murdock, and assess the impact of early institutions on modern-day economic activity using nightlight satellite imagery as a proxy for economic development. Similarly, Treisman (2000), examines a large panel of countries and examines measures of perceived corruption compiled from business risk surveys from the 1980s and 1990s. He finds that countries that had historical exposure to British rule

and the common law legal system were “less corrupt” than other countries. He attributes this to the ‘legal culture’ that was passed on from British institutions onto other countries.

The second group of literature examines the impact of different political regimes on government quality. Bäck and Hednius (2008), analyse democracy levels for 193 countries from 1970 to 2003, using data from Freedom House and Polity. They find that NGQ is higher in strongly authoritarian states than in states that are partially democratised, and that government quality is highest in fully democratic systems. They argue that these results may be driven by the monarchies of the Middle East, that have vast and profitable natural resources. These states are authoritarian, but have managed to introduce well-functioning bureaucratic systems. However, partially democratic systems (i.e. countries that are transitioning to bureaucracy) are caught in between. Similarly, Charron and Lapuente (2010), in analysing 125 countries using data on records of corruption as well as citizens’ perceptions of corruption, find that government quality improves when there are political leaders who have the power to make reforms and a citizenry that demands longer-term structural changes over short-term gains. In addition, once certain wealth thresholds are reached, they argue that there is a greater demand from citizens for better quality government institutions. Poorer countries, however, are argued to have less of an incentive for longer-term improvements in government institutions as they are more concerned with short-terms factors (e.g. immediate improvements in service delivery).

Keefer (2007), on the other hand, uses rule of law data from the International Country Risk Guide, for 113 countries from 1975-2000. He finds that the age of democracy is an important factor in determining NGQ. He argues that younger democracies are more corrupt, have less rule of law, and have worse quality bureaucracies than older democracies. As a result, they lack the political credibility of more established democratic systems.

Despite the number of studies focussed on the drivers of NGQ, the number of studies doing so for SNGQ are far more limited. Like the NGQ studies preceding it, Charron and Lapuente (2013) investigate why SNGQ varies across European regions. They find similarities with the NGQ research – namely that regional path dependencies are a primary driver of SNGQ. They argue that regions which belonged to historical regimes (from the 17th to 19th centuries) that had limited checks and balances, created an environment for clientelism to emerge. This has subsequently affected present-day SNGQ levels. Corrado and Rossetti (2018), build on this

analysis by focussing specifically on the drivers of SNGQ in Italy. They employ panel data on crimes perpetrated by public officials against the public administration from 2000 to 2011. Like Charron and Lapuente, they find that cultural conditions impact instances of corruption. In other words, regions in which people appear to be more honest appear to have lower incidences of corruption.

Ward and John (2013), on the other hand look at factors aside from culture and history. They adopt spatial regression analyses in looking at local government quality in the UK and find that SNGQ spills over from localities. This is because policymakers appear to both learn from neighbours, and compete with them – as neighbouring regions vie to obtain more resources from national governments. Bubbico et al. (2017) extend this analysis to Europe-wide sub-national governments using data on competitive pressures. They similarly find that SNGQ spills over from region to region due to a competition effect. In other words, 'good policies' and good-quality service delivery can be influenced by that of neighbouring governments – particularly when performance is incentivised by having to compete for limited resources from national governments. Moreover, Di Berardino et al. (2018), examine the drivers of SNGQ in Italian provinces and find that high skilled internal migration can boost SNGQ. This is because provincial governments are able to draw on a larger pool of human capital, which in turn improves the delivery of local services.

While these studies focus purely on European sub-national governments, the literature focused on the determinants of African SNGQ is far more nascent. Knutsen et al. (2017) analyse over 90,000 Afrobarometer survey responses to questions on local corruption, along with spatial data on 496 industrial mines in African regions. They find that mining activity causes local corruption to increase. This may be because revenue from mining activity in Africa is generally opaque – it therefore lays the seeds for corruption to take place with a smaller likelihood of being discovered. Moreover, it is well known that mining is a high-profit industry, and thus individuals who are part of the 'bribery market' (e.g. corrupt officials), may flock to these areas to extract rents. These findings are validated by Konte and Vincent (2019), who similarly analyse over 100,000 respondents from Afrobarometer between 2005 and 2015. They argue that mining activity leads to a reduction in the quality of local government services that are provided to citizens in African regions. They find that mines that were established in areas with poor SNGQ, experienced a further deterioration in both corruption and the trust that citizens have in their local government officials. Isaksson and Kotsadam (2018), on the other hand,

focus on aid inflows. They analyse almost 100,000 Afrobarometer responses on local government corruption and geolocated Chinese aid projects in Africa. They find that Chinese aid investment leads to an increase in local government corruption in African regions. They hypothesise that aid funding increases the number of resources that are "up for grabs", which subsequently stimulates corrupt activity among local actors.

In summary, this paper is situated at the intersection of two areas of academic literature on economic development in Africa – studies which examine the relationship between armed conflict and government quality, and studies which examine the drivers of government quality. This paper adds to this literature in two ways. First, by examining whether armed conflict impacts sub-national government quality in African regions in ways that are similar to how conflict impacts national government quality (e.g. through reducing trust in the government, deteriorating service delivery, or increasing corruption). Second, it adds to the literature on the drivers of SNGQ in African regions (which have so far focused on the impacts of mining and aid on local corruption).

3. Theoretical Framework

Given the prevalence of armed conflict in Africa, it is important to study its impact on the quality of institutions – specifically SNGQ. In this section, I outline a theoretical framework that attempts to capture how an increase in conflict can lead to a reduction in SNGQ.

Each sub-national government g has a finite amount of resources y. For each region r, y is obtained according to:

$$y_r = x_r + t_r + a_r$$

Where x is resources obtained by direct transfers from national governments[3], t is taxation, and a is aid received from donors.

Each g attempts to maximise their chances of being reappointed for another term in office. Appointment can either involve being appointed directly by the national government or by

[3] Most sub-national governments in Africa receive the vast majority of their funding through direct transfers from central governments (Fjeldstadt et al., 2014).

being democratically elected in local government elections. The probability of being reappointed is highest when there is the least amount of civil unrest or civil conflict within a jurisdiction (see Lynch et al., 2019; and Salehyan and Linebarger, 2015)[4]. Low levels of civil unrest are relevant to citizen-satisfaction. If there is civil unrest, this leads to a lower likelihood of voters not re-electing governments, or for national governments to forgo re-appointing sub-national government officials in the fear that sub-national unrest can spread to nation-wide unrest.

Throughout g's term in office, it is faced with four main decisions $d \in \{1, 2, 3, 4\}$ about how to allocate their limited budget. The optimal allocation of budget is the one which maximises chances of re-appointment. As such, g can: (1) spend resources on crisis response, (2) spend resources on institution building (e.g. improving accountability or transparency in government), (3) spend resources on delivering services to citizens, and (4) embezzling funds for private gain (i.e. corruption).

Based on existing research on embezzlement in the African context (see Lierl, 2016), I view (4) as being relatively inelastic (this assumption is tested in the empirical analysis below). Furthermore, the size of a sub-national government's budget is influenced by the size of its economy, and the size of its population. These two factors should therefore be accounted for in order to avoid biasing results.

From this, we can arrive at two main propositions.

Proposition 1: In the event of conflict, sub-national governments are likely to divert money away from service delivery and institution building towards crisis response. This will result in a reduction in the quality of services that are provided to citizens.

[4] These papers argue that civil unrest leads to popular discontent in governments and this in turn leads to a lower probability of re-election, as has been evidenced in the case of Kenya, Ghana and Uganda. However, while the probability of re-election is lower, re-election can take place particularly in more authoritarian regimes where the opposition is supressed by the ruling party (e.g. Uganda).

Proposition 2: National governments have much larger pools of resources than sub-national governments.[5] Therefore, in the event of conflict, the reduction in the quality of services provided by national governments will be much less than the reduction in the quality of services provided by sub-national governments.

4. Data

4.1 Sub-National Government Quality

The dependent variable is an index of sub-national government quality. This index is created using data from Rounds 5 (2013), 6 (2015) and 7 (2018) of the Afrobarometer surveys in a panel, that follows the approach outlined in Iddawela et al. (2021).

Afrobarometer involves surveying a clustered, stratified, multi-stage area probability sample of 1,200 or 2,400 individuals in each country. Sampling is conducted with probability proportionate to population to ensure that respondents in larger regions have a higher probability of being included in a sample.

Given the availability of data, I have constructed the sub-national index for a total of 27 African countries: Benin, Botswana, Burkina Faso, Cameroon, Cape Verde, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique, Namibia, Nigeria, Niger, Sao Tome and Principe, Senegal, Sierra Leone, South Africa, E-Swatini, Tanzania, Togo and Zambia.

Eight of the questions in each survey relate to sub-national government quality. Specifically, these topics include the level of corruption of sub-national government officials (e.g. frequency of bribes paid); the level of trust respondents have in their sub-national government officials; the perceived performance in office of local government officials; and the quality of the services they are responsible for delivering. The responses to these questions are pooled together into a subjective sub-national regional government quality index, which reflects – in

[5] By 'larger pools of resources', I mean both access to taxation/aid revenue and access to borrowing. Moreover, it is worth noting that sub-national governments cannot draw on a wider tax base from other regions. National governments on the other hand can offset tax losses by drawing on tax revenue from regions that do not experience conflict. In other words, national governments are able to mitigate risk through its wider tax base.

line with the OECD's Handbook on Constructing Composite Indicators (Nardo et al., 2005) – the opinions of African citizens about their regional government institutions. I provide a list of these questions in Appendix Table A2.

While perceptions measures are not perfect – as a decrease in government quality (e.g. through embezzlement or increased corruption) may occur without the public knowing, it is currently the best possible method of measuring government quality. Moreover, it is the most widely accepted measure of sub-national government quality in the institutional literature (e.g. see Charron et al., 2014; Rodríguez-Pose & Di Cataldo, 2014; and Rodríguez-Pose & Garcilazo, 2015).

To construct the index of sub-national government quality, a number of steps have been taken. First, I standardised the scale of each question. Each question was subsequently given an equal weighting, after which I combined the scores to form a sub-national government quality rating for reach respondent. These measures were then aggregated up to the regional level to form the average level of sub-national government quality. The index was then rescaled to read in terms of standard deviations from the mean.

The index was therefore constructed as follows:

$$SNGQ_r = \frac{\sum_{i=1}^{n} x_i}{n}$$

Where

$$x = \frac{\sum_{i=1}^{8} q_i}{8}$$

$SNGQ$ is the sub-national government quality index for each region r, x is the individual-level sub-national government quality rating, q is the response to each of the eight Afrobarometer questions, and n is the total number of Afrobarometer respondents in each region. The Appendix provides further detail on the methodology behind the index.

4.2 Administrative Units

The main explanatory variable is the number of conflict related deaths in an administrative-level 1 area (e.g. provinces). All admin-1 governments in the sample are responsible for providing services to citizens. Countries where admin-1 regions are just an administrative layer

without any governance functions, such as Uganda and Libya, are not excluded. The mean square area of each admin-level 1 area in the sample is 33,955 square kilometres, while the mean population is approximately 1.5 million. Summary statistics are provided in Appendix Table A4. I use polygons for each admin 1 unit from the Database of Global Administrative Areas (GADM).

4.3 Conflict Data

Conflict data is obtained from the Uppsala Conflict Data Program's Georeferenced Events Database (UCDP GED). For an event to be recorded in UCDP GED, it must involve "the use of armed forced by organised actors against another organised actor, or against civilians, resulting in at least 1 direct death…at a specific location and for a specific temporal duration" (Sundberg and Melander, 2013)[6]. I therefore exclude smaller-scale homicides or some incidents of non-organised crime from the definition of 'conflicts'.

UCDP GED obtains conflict data from online media reports. They utilise at least one global newswire source (e.g. AFP, Reuters or Xinhua) and supplement with BBC Monitoring (which provides local news reports). In areas which may not have a lot of international media coverage, they supplement using other mediums such as radio reports. Analysts then verify the accuracy of the reports and remove duplicate reports to arrive at the figures presented in the UCDP GED database. This results in an average of 12,000 new events added to the database every year (UCDP, 2019).

4.4 Other Data

A range of other data is used as control variables in the analysis. Given lower levels of economic development could lead to civil unrest, I use satellite imagery of night light luminosity as a proxy for sub-national GDP levels. The data is from the Visible Infrared Imaging Radiometer Suite Day/Night Band (VIIRS-DNB). VIIRS data is available every 15 arc seconds for each pixel area (approximately 0.5km × 0.5km). The likelihood of civil unrest could be lower in regions that have smaller populations. I therefore use population data from the UN's Gridded Population of the World as a control. Furthermore, agricultural areas that lack adequate precipitation and droughts could lead farmers to armed conflict (McGuirk and

[6] This definition is to ensure that one-off homicides are not conflated with 'armed conflict'.

Burke, 2020). I therefore control for precipitation and temperature using mean precipitation data and mean temperature data from the University of Delaware's Climate Data Archive. Finally, to measure the impact of armed conflict on NGQ, I use the World Governance Indicator's Government Effectiveness scores. Further detail on control variables is provided in Appendix Table A1.

4.5 Overview of SNGQ and Conflict

Figure 1: Average SNGQ (2013-2018)

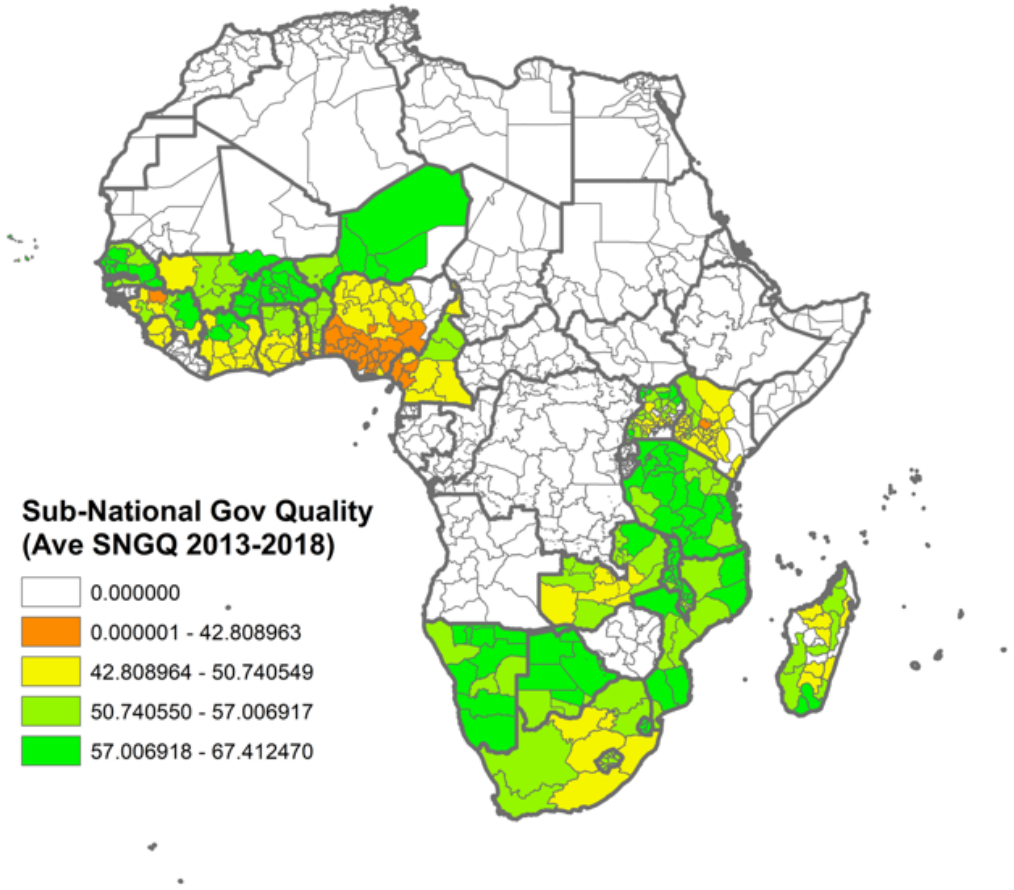

Figure 1 above shows quantiles of SNGQ on a scale of 0 (poor SNGQ) to 100 (high SNGQ). The highest SNGQ rating is 67.4/100. The SNGQ measures have been averaged across the three years of Afrobarometer data in our sample (i.e. 2013, 2015 and 2018). We can see higher levels of SNGQ in Southern African states such as South Africa, Namibia, Botswana and Malawi, as well as in Tanzanian regions in East Africa. Further, parts of West Africa such Niger and Burkina Faso have higher levels of SNGQ. There appears to be some clustering at

the country level[7]. Lower levels of SNGQ, on the other hand, are found in southern Nigeria, central Kenya and northern Guinea.

Figure 2: Conflict-related Deaths (2013-2018)

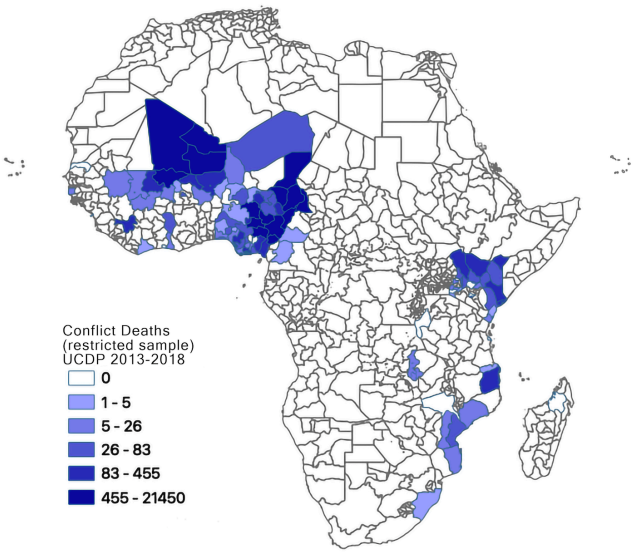

Figure 3: Full Sample (2013-2018)

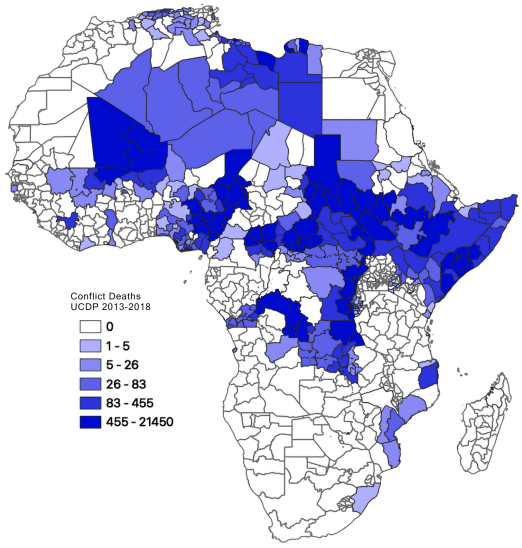

Figure 2 (same sample as Figure 1)[8] and Figure 3 (full UCDP sample) show the admin 1 regions throughout Africa which have experienced conflict-related deaths between 2013-2018, as reported by the UCDP GED dataset. We can see that high levels of conflict deaths are found in east Africa – in Somalia (e.g. through Al-Shabaab), Ethiopia (e.g. Tigray Liberation Front) and South Sudan (from the civil war with Sudan); in Central Africa (Central African Republic and the Democratic Republic of Congo, which are being driven by the ongoing Central African Republic Civil War, and the ongoing Kivu conflict in DRC), as well as in parts of West Africa (Mali, Niger and Nigeria, which experience armed conflict due to the ongoing Malian civil war, and from the likes of Boko Haram in Nigeria and Niger).

5. Model specification and results

5.1 Econometric specification

[7] I address this country-level clustering in the regressions using country-year fixed effects.
[8] Figure 2 shows aggregated conflict data for the same sample of countries as in Figure 1 (i.e. those that are restricted to being covered by Afrobarometer). Figure 3 shows the full sample of conflict deaths for all African countries.

I first use a reduced form OLS model to measure the relationship between armed conflict and SNGQ. The analysis is based on the following specification:

$$(1) \qquad SNGQ_{rct} = \alpha + \beta lnDeaths_{rct} + \mathbf{X'}_{rct}\varphi + \gamma_{ct} + u_{rct}$$

Where $SNGQ_{rct}$ is the index of sub-national government quality for region r in country c in time t, measured in standard deviations from the mean. $lnDeaths_{rct}$ is the log number of armed conflict related deaths in each region for the time period. γ_{ct} is country × year fixed effects, $\mathbf{X'}_{rct}\varphi$ is a vector of covariates discussed previously (and elaborated in Appendix Table 1), while u_{rct} is the error term. The analysis is a panel from 2013, 2015 and 2018 (the rounds for which Afrobarometer data is available).

5.2 Results

5.2.1 Ordinary Least Squares Estimation

Table 1: OLS Estimates of the relationship between conflict and SNGQ

VARIABLES	(1) SNGQ	(2) SNGQ	(3) SNGQ
lnFatalities	-0.010**	-0.009**	-0.009**
	(0.004)	(0.004)	(0.004)
lnGDP		-0.102***	-0.103***
		(0.027)	(0.0276)
lnPopulation			0.0167
			(0.0339)
Constant	1.230	0.803	0.696
	(1.230)	(1.152)	(1.304)
Climate controls	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes
Observations	1,225	1,225	1,225
R-squared	0.603	0.609	0.609

The table reports cross-regional, cross-country OLS estimates associating conflict deaths with sub national government quality. Dependent variable is an index of SNGQ using Afrobarometer data from round 5, 6 and 7. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature.

The OLS results reported in Table 1 indicates that, as expected, conflict related fatalities are lower in regions with higher SNGQ. In other words, there is a negative and significant relationship between conflict deaths and SNGQ for the African regions in the sample. A one

unit increase in log fatalities is associated with a slight (0.01) decrease in SNGQ (measured in standard deviations) across all permutations in columns (1) to (3).

However, in order to assess the channels through which this relationship takes place, in Table 2, the SNGQ index is disaggregated into three constituent parts: (1) the quality of services provided by sub-national governments, (2) the level of corruption in sub-national governments, and (3) the level of trust citizens have in their sub-national government officials.[9]

Table 2: OLS Estimates of the relationship between Conflict and the decomposed SNGQ index

VARIABLES	(1) Service	(2) Corruption	(3) Trust
lnFatalities	-0.218***	0.032	-0.050
	(0.0587)	(0.038)	(0.0838)
lnGDP	0.748	0.793**	-1.539***
	(0.506)	(0.305)	(0.424)
lnPopulation	0.712	-0.106	0.126
	(0.547)	(0.264)	(0.435)
Constant	41.950***	42.720***	64.450***
	(14.130)	(10.590)	(15.510)
Climate controls	Yes	Yes	Yes
Country X Year FE	Yes	Yes	Yes
Observations	1,225	1,225	1,225
R-squared	0.473	0.544	0.600

The table reports cross-regional, cross-country OLS estimates associating conflict deaths with the quality of service delivery (column 1), the level of sub-national corruption (column 2), and the level of trust citizens have in sub-national government officials (column 3). Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature.

In column (1), we see that service delivery is worse in places that experience conflict fatalities. In other words, fatalities are negatively and significantly associated with a reduction in the quality of services that are provided by sub-national governments. However, an increase in conflict fatalities does not appear to be associated with an increase in corruption (column 2), or a reduction in the level of trust citizens have in their sub-national government officials. This finding appears to align with the theoretical framework outlined previously - namely, that an

[9] Afrobarometer survey questions used to produce these indexes are contained in Appendix Table A2.

increase in conflict may result in governments diverting resources away from services towards crisis management (to reduce the impact of conflict). However, contrary to the literature (see Bratton and Chang, 2006; and Brinkerhoff et al., 2012), it appears that an increase in armed conflict does not impact government legitimacy – i.e. trust citizens have in their sub-national governments. It also appears that the level of corruption is relatively inelastic – hence the level of trust in sub-national government officials does not appear to be associated with an upsurge in conflict.

Table 3 provides an overview of the relationship between conflict and NGQ across African states.

Table 3: OLS Estimates of the relationship between Conflict and NGQ

	(1)	(2)	(3)
VARIABLES	NGQ	NGQ	NGQ
lnFatalities	0.00273	0.00224	0.00288
	(0.00983)	(0.00987)	(0.00978)
lnGDP		0.0323	0.0362
		(0.0341)	(0.0343)
lnPopulation			-0.0166
			(0.0397)
Constant	3.020	3.071*	3.284*
	(1.829)	(1.814)	(1.942)
Climate controls	Yes	Yes	Yes
Region x Year FE	Yes	Yes	Yes
Observations	3,828	3,828	3,828
R-squared	0.378	0.380	0.382

The table reports cross-regional, cross-country OLS estimates associating conflict deaths with national government quality (measured using the World Governance Indicators' Government Effectiveness Index). Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature. Region x Year fixed effects refer to macro-regions in Africa (e.g. North, South, East, West, Central and Islands).

This analysis uses a full sample of 51 African countries that are contained in the World Governance Indicators (WGI). Given the frequency of the WGI data, the analysis has been expanded to include every year between 2012 and 2018. From this, we can see that there does not appear to be any significant relationship between NGQ and conflict fatalities across all permutations in columns (1) to (3). To ensure that the results are not biased by the larger sample, I use the same sample of countries and the same time period that were used in Tables

1 and 2. The results, reported in Appendix Table A10, show that the results remain unchanged – that there does not appear to be a significant relationship between NGQ and conflict deaths.

The lack of relationship between NGQ and armed conflict may occur because, as outlined in the theoretical framework, national governments have a much larger budget with which to respond to crises. As a result, the quality of services is not impacted as heavily as it is for sub-national governments. In other words, the proportion of funds sub-national governments reallocate for crisis response is higher than for national governments.

5.3 Identification Strategy

5.3.1 Balance tests

In determining the impact of armed conflict on SNGQ, endogeneity through reverse causality needs to be addressed. In other words, there is the possibility that low levels of SNGQ leads to armed conflict. This is because better quality governance protects property rights (Maves and Braithwaite, 2013), can mitigate ethnic fragmentation (Easterly, 2001), and can mediate the impacts of events like water shortages on armed conflict (Gizelis and Wooden, 2010).

In order to test this idea of whether SNGQ has led to armed conflict, I first conduct balance testing to determine whether there are significant differences in SNGQ for sub-national regions that experience armed conflict and regions that do not experience armed conflict. I also look at differences in GDP, population, precipitation and temperature.

The balance tests (presented in Appendix Table A4) examine SNGQ levels in 2013 (the earliest period in the sample), and regions that experienced armed conflict in 2018 (the last year in the sample). If there is reverse causality, we would expect to see regions with low levels of SNGQ in 2013 go on to experience high levels of armed conflict in 2018.

All countries in the sample except Kenya do not have a statistically significant difference in SNGQ for regions that experienced conflict in 2018 and regions that did not experience conflict. This appears to suggest that SNGQ does not cause armed conflict to take place. Nonetheless, given the descriptive evidence of reverse causality in Kenya, I adopt an instrumental variables approach to obtain the causal impact of armed conflict on SNGQ.

5.3.2 2SLS IV Model

The instrument used is a producer price index (PPI) which, following the methodology of McGuirk and Burke (2020), captures exogenous shocks to world agriculture commodity prices. It follows that an increase in the PPI would lead to higher income levels for farmers (as the price of their crops is higher). As a result, the opportunity cost of participating in armed conflict becomes higher for farmers. Conversely, a reduction in the PPI would lead to more incidents of conflict given the lower opportunity cost to farmers.

It is important to note that most sub-national governments in Africa receive the vast majority of their funding through direct transfers from central governments (Fjeldstadt et al., 2014).[10] These transfers are set through the national government budget process the previous fiscal year. Therefore, a reduction in agricultural revenue does not result in an immediate reduction in sub-national governments' resources.

5.3.3 Constructing the instrument

The PPI is created by combining temporal variation in world agriculture prices with high-resolution spatial-variation in crop-specific agricultural land. The spatial data is obtained from the M3-Cropland Project (Ramankutty et al., 2008). The M3 Project involves combining two different satellite data sources (the MODIS landcover product and the GLC2000 dataset), to create a high-resolution (at a resolution of 5-minutes) global dataset on land used for crop production. I aggregate this data to the admin-1 level to determine the percentage of land used for crop production in each region. The PPI is then calculated by combining this crop coverage with a vector of 11 different crop prices as follows:

$$PPI_{rct} = \sum_{j=1}^{n} (P_{jt} \times N_{jrc}) \quad (2)$$

Where crops $j \ldots n$ is the set of 11 major agricultural crops that feature in the M3-Cropland dataset. P is the price of each crop, and N is the crop share of the land in each region r. Global crop prices are taken from the IMF *International Financial Statistics* series and the World Bank's *Global Economic Monitor.* Further details are provided in Appendix Table 3.

[10] E.g. Local governments in Liberia receive 100% of resources from the national government, 92% of sub-national governments funding in Botswana comes from national governments, 88% in Uganda, 78% in Nigeria, etc.

For the PPI to satisfy the exclusion restriction, we need to be certain that world agriculture prices are truly exogenous to local conflicts in African regions. African production of most commodities in the basket of PPI is significantly lower compared to the rest of the world. According to the FAO, the African continent is responsible for producing just 16% of global food supply (FAO, 2013). Furthermore, the entire African continent accounted for just 3.9% of global wheat production, and 5.3% of global sugar cane production in 2017 (FAO Stat, 2020). As a result, it appears unlikely that any shocks or events in an African admin 1 region will produce a noticeable effect on world agriculture prices. Moreover, the World Bank (2015) provides a number of reasons for spikes in global agricultural prices. For example, changes to global wheat prices are attributed to weather shocks in the Pacific that have been driven by El Nino, while rice prices were increasing given drier weather conditions in supplier countries such as Thailand and the Philippines. It is therefore unlikely that weather patterns in Thailand could affect levels of conflict in an African region aside from through an effect on world agriculture prices.

The specification also involves controlling for sub-national GDP levels (to ensure that PPI does not affect conflict through GDP), population, and climate controls. As such, the first stage estimating equation is as follows:

$$lnDeaths_{rct} = \alpha + \beta PPI_{rct} + \mathbf{X'}_{rct}\varphi + \gamma_{ct} + u_{rct} \quad (3)$$

Where $lnDeaths_{rct}$ is the log number of armed conflict related deaths in each region r in country c in time t. βPPI is the producer price index, calculated for each region in each time period. γ_{ct} is country × year fixed effects, $\mathbf{X'}_{rct}\varphi$ is a vector of covariates including log GDP, log population, and climate controls, while u_{rct} is the error term.

5.42SLS Results

Table 4: IV Estimates of the relationship between Conflict and SNGQ

VARIABLES	(1) SNGQ	(2) SNGQ	(3) SNGQ
lnDeaths	-0.285**	-0.282**	-0.286**
	(0.143)	(0.142)	(0.142)
lnPopulation		0.00580	0.0121
		(0.0334)	(0.0334)
lnGDP			-0.0587
			(0.0508)
Climate controls	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
F-test	5.59	5.56	5.63
Anderson-Rubin P-Value	0.0007	0.0007	0.0005
Observations	1,225	1,225	1,225

The table reports cross-regional, cross-country IV estimates measuring the impact of conflict deaths on sub-national government quality (measured in standard deviations). Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature.

Table 4 appears to suggest that there is a negative and causal relationship between conflict deaths and sub-national government quality across the sample. Column (1) demonstrates that conflict exerts a significant impact on sub-national government quality when controlling for climate factors and using country-year fixed effects. Adding in log population (to control for higher incidents of conflict being reported in more populated areas) does not have a meaningful impact on the significance and magnitude of this relationship. Finally, in column (3) we similarly see that this causal relationship holds when controlling for log GDP levels (measured in night-time luminosity) for each region. The first stage results are reported in Appendix Table A6.

To meet the exclusion restrictions of a valid instrument, the instrument must be relevant and exogenous. PPI appears to be a weak instrument as the first stage f-tests are less than 10 (the rule of thumb for strong instruments). However, in order to address this, I use the Anderson-Rubin test which is robust to weak instruments (Andres and Stock, 2005). In each case, the Anderson-Rubin p-value is well under 0.05, which indicates that the results are relevant and therefore hold. Regarding instrument exogeneity, as discussed above, it is unlikely that food production in African regions affects global agriculture prices. It is therefore likely that the

only way changes in global agriculture prices can affect SNGQ is through armed conflict. To address any concerns that global agriculture prices can affect SNGQ through GDP levels, I control for this in column (3) above and find that the results do not change in any meaningful way.

Table 5: IV Estimates of Relationship between Conflict and NGQ

VARIABLES	(1) NGQ	(2) NGQ	(3) NGQ
lnDeaths	0.376	4.603	-4.133
	(0.744)	(75.09)	(22.56)
lnPopulation		-1.506	1.247
		(24.05)	(6.896)
lnGDP			0.666
			(3.414)
Climate controls	Yes	Yes	Yes
Region x Year FE	Yes	Yes	Yes
First Stage F-test	0.29	0.00	0.03
Anderson-Rubin P-Value	0.173	0.135	0.142
Observations	3,828	3,828	3,828

The table reports cross-regional, cross-country 2SLS estimates associating conflict deaths with national government quality (measured using the World Governance Indicators' Government Effectiveness Index). Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature. Region x Year fixed effects refer to macro-regions in Africa (e.g. North, South, East, West, Central and Islands).

In Table 5 I examine whether there is a causal relationship between conflict deaths and national government quality. It appears that, as in the OLS specification, there is no significant relationship. Moreover, the first stage F-test for all three specifications in Columns (1) – (3) are less than 1, and all Anderson-Rubin P-values are greater than 0.05. This suggests that the instrument does not meet the exclusion restriction for NGQ. First stage results are reported in Appendix Table A7.

5.5 Robustness Tests

In order to test the sensitivity of the results, I conduct two further robustness tests, the results of which are located in the appendix. One concern is that I include more countries in the NGQ analysis (Tables 3 and 5) than I do in the SNGQ analysis (Tables 1 and 4). This is because the World Governance Indicators database contains more countries than the Afrobarometer

dataset. To address any concerns that the larger sample size biases the result, I restrict the sample to the same countries I use in the SNGQ analyses. The results, provided in Appendix Tables A8 (OLS) and A9 (IV), demonstrates that the results hold. In other words, armed conflict does not appear to impact NGQ.

Second, to ensure that I have not added in any biases in the creation of the SNGQ index, I use principal component analysis to combine the de-composed measures of trust, corruption and service delivery into a new SNGQ index. This technique is used to address issues of collinearity between the three de-composed measures. The results, contained in Appendix Table A10, shows that, across all permutations, the results hold and conflict deaths appear to have a causal, negative and significant impact on SNGQ.

6. Conclusion

In this paper I have sought to examine one of the determinants of varying SNGQ across African regions – armed conflict. Despite emerging studies that establish the relationship between sub-national government quality and regional economic performance across African countries, given previous data limitations, little work has been done to understand the drivers of SNGQ. Given this upsurge in studies examining the impact of SNGQ, as well as the ongoing prevalence of armed conflict in African countries, it is important to try and understand whether armed conflict has any significant impact on the institutional architecture across African countries.

To examine the impact of armed conflict on SNGQ, I employ newly released data from Afrobarometer round 7 to create a panel of SNGQ measures across 460 African admin 1 regions in 30 countries for 2013, 2015 and 2018. I measure conflict related deaths through the UCDP GED dataset. To establish the direction of causality, I subsequently use a PPI measure to capture global agricultural prices as an instrument for conflict deaths. It appears that an increase in PPI leads to a reduction in conflicts as the opportunity cost for farmers to participate in conflict becomes higher. This instrument appears to be relevant, exogenous and satisfies the exclusion restriction.

The main finding of this research is that conflict does appear to deteriorate SNGQ. In other words, there is a negative, significant and causal relationship between armed conflict and SNGQ. These results hold when controlling for a range of factors such as GDP, population,

temperature and precipitation within an admin-1 region. Additionally, contrary to the literature which suggests that armed conflict affects the legitimacy of governments (by reducing the level of trust citizens have in governments); I find that the channel through which conflict affects SNGQ is through a reduction in the quality of services provided by sub-national governments. This appears to be because sub-national governments are required to re-direct limited resources away from service delivery towards crisis response. This explains why there does not appear to be a relationship between NGQ and conflict. In other words, given that national governments have more resources at their disposal, re-directing funds towards crisis response has a much more limited effect on national governments' service delivery. This finding similarly diverges from the existing literature which have argued that armed conflict reduces the quality of national governments through a reduction in legitimacy (Bratton and Chang, 2006; and Brinkerhoff et al., 2012).

The main takeaway for policymakers from this research is that when armed conflict arises, national governments could increase transfers to relevant sub-national governments in order to help them maintain the quality of the services they provide. This will help mitigate the effect of sub-national governments having to strip funding away from local services to fund crisis response efforts.

This analysis on the drivers and determinants of SNGQ within African countries can be seen as opening up further avenues for examination. More work is required to fully understand what drives variations in SNGQ. For example, further research can examine the impact of ethnic fragmentation on sub-national governments, or how the role of tribal institutions affects SNGQ. Given the impact SNGQ has on regional economic performance in Africa, such studies can inform how best to improve institutional quality and thereby improve economic development in African regions.

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Appendix Table A1

Variable	Definition	Source
Sub-National Government Quality	Index of sub-national government quality (author's calculation)	Afrobarometer Rounds 5, 6 and 7.
Nighttime light emissions (GDP)	Log of night light density measured using the Visible Infrared Radiometer Suite (VIIRS)	National Oceanic and Atmospheric Administration
Temperature	Monthly average of daily mean temperature (2012 - 2018)	University of Delaware's Climate Data Archive
Precipitation	Monthly average of daily mean precipitation (2012 - 2018)	University of Delaware's Climate Data Archive
Population	Log population levels (2012-2018)	UN's Gridded Population of the World database (NASA, 2017)
Central Government Quality	Government Effectiveness Score (0-100)	World Governance Indicators

Appendix Table A2

Afrobarometer questions used to create the index of sub-national government quality

Question	Min. response	Max. response
Trust		
How much do you trust each of the following, or haven't you heard enough about them to say: Your Metropolitan, Municipal or District Assembly?	1	4
During the past year, how often have you contacted any of the following persons about some important problem or to give them your views: A local government councillor?	1	4
Corruption		
How many of the following people do you think are involved in corruption, or haven't you heard enough about them to say: Local government councillors?	1	4
How many of the following people do you think are involved in corruption, or haven't you heard enough about them to say: Tax Officials (e.g. Ministry of Finance officials or Local Government tax collectors)	1	4
Performance		
Do you approve or disapprove of the way the following people have performed their jobs over the past twelve months, or haven't you heard enough about them to say: Your Elected Local Government Councillor?	1	4
Service Delivery		
How much of the time do you think the following try their best to listen to what people like you have to say: Local government councillors?	1	4
What about local government? I do not mean the national government. I mean your Metropolitan, Municipal or District Assembly. How well or badly would you say your local government is handling the following matters, or haven't you heard enough about them to say: Maintaining local roads?	1	4
What about local government? I do not mean the national government. I mean your Metropolitan, Municipal or District Assembly. How well or badly would you say your local government is handling the following matters, or haven't you heard enough about them to say: Maintaining local marketplaces?	1	4

Appendix Table A3

Price variables used in calculation of the Producer Price Index

Crop	Description	Source
Cocoa	International Cocoa Organization cash price, CIFUS and European ports, US$ per metric ton	IMF
Coffee 1	Robusta, International Coffee Organization New York cash price, ex-dock New York, US cents per pound	IMF
Coffee 2	Other Mild Arabicas, International Coffee Organization New York cash price, ex-dock New York, US cents per pound	
Maize	U.S. No.2 Yellow, FOB Gulf of Mexico, U.S. price, US$ per metric ton	IMF
Oil palm	Malaysia Palm Oil Futures (first contract forward) 4-5 percent FFA, US$ per metric ton	IMF
Rice	5 percent broken milled white rice, Thailand nominal price quote, US$ per metric ton	
Sorghum	Sorghum (US), no. 2 milo yellow, f.o.b. Gulf ports, US$ per metric ton	World Bank
Soybean	Chicago Soybean futures contract (first contract forward) No. 2 yellow and par, US$ per metric ton	
Sugar 1	Free Market, Coffee Sugar and Cocoa Exchange (CSCE) contract no.11 nearest future position, US cents per pound	IMF
Sugar 2	U.S. import price, contract no.14 nearest futures position, US cents per pound (Footnote: No. 14revised to No. 16)	IMF
Tea	Mombasa, Kenya, Auction Price, From July 1998, Kenya auctions, Best Pekoe Fannings. Prior, Lon-don auctions, c.i.f. U.K. warehouses, US cents per kilogram	IMF
Tobacco	Any origin, unmanufactured, general import, cif, US$ per metric ton	World Bank
Wheat	No.1 Hard Red Winter, ordinary protein, FOB Gulf of Mexico, US$ per metric ton	IMF

Appendix Table A4

Summary statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Population	1380	1,553,409	2,522,760.00	20	14,044,555
Sq. Area	1380	33,955	69,487	4	536,790
Fatalities	1380	8	63	0	1,805
SNGQ	1380	56.17	8.35	28.57	82.42

Appendix Table A5

Balance Tests

These tables examine differences between regions (within the same country) that experience armed conflict in 2018, and regions that do not. SNGQ data is from 2013 (the earliest year in our sample).

Algeria

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	-0.04	0.15	0.11	0.28
GDP	4.82	3.37	1.44	0.71
Population	974532.23	608387.23	366145	0.12
Precip	46.75	47.45	-0.69	0.95
Temp	17.42	18.75	-1.32	0.27

Kenya

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	0.47	0.39	0.08	0.01
GDP	0..57	1.08	-0.51	0.4
Population	849942.76	1112152.34	-265209.58	0.15
Precip	101.93	83.22	18.71	0.09
Temp	20.42	22.62	-2.2	0.05

Burundi

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	-1.36	-1.34	-0.02	0.87
GDP	0.67	0.62	0.06	0.87
Population	585189.5	628086.17	-42896.67	0.69
Precip	89.14	77.53	11.6	0.05
Temp	19.57	20.39	-0.82	0.43

Nigeria

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	-0.47	-0.42	-0.06	0.42
GDP	1.57	1.4	0.16	0.85
Population	4957342.13	4350628.71	606713.42	0.39
Precip	105.76	103.01	2.75	0.86
Temp	27.44	27.05	0.39	0.09

Sudan

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	-1.74	-1.85	0.11	0.75
GDP	0.21	0.39	-0.18	0.21
Population	1896319.3	2468546.5	-572227.2	0.39
Precip	27.77	31.2	-3.44	0.8
Temp	28.64	28.63	0.06	0.92

Tunisia

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	1.21	1.2	0.01	0.14
GDP	3.47	0.78	2.69	0.54
Population	454862.37	441281.3	13481.07	0.93
Precip	34.76	17.95	16.81	0.24
Temp	19.64	19.96	-0.32	0.76

Tanzania

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	-0.35	-0.3	-0.06	0.5
GDP	0.42	1.99	-1.57	0
Population	1563496.78	3190069.84	-1626573.1	0.03
Precip	80.16	80.62	-0.46	0.98
Temp	23.49	26.03	-2.54	0.12

Mali

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	-0.38	-0.68	0.3	0.02
GDP	6.43	0.64	5.79	0.19
Population	2547301.48	2511187.04	36114.44	0.93
Precip	110.06	69.43	40.63	0.05
Temp	27.67	28.84	-1.17	0.01

Burkina Faso

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	-0.43	-0.35	-0.08	0.37
GDP	0.44	0.77	-0.33	0.2
Population	1136878.77	1719270.08	-582391.3	0.07
Precip	77.97	65.67	12.3	0.11
Temp	28.56	29.19	-0.63	0.09

Niger

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	-0.45	-0.45	0.01	0.98

GDP	0.89	0.21	0.68	0.61
Population	1962297.1	3341692.83	-1379395.7	0.27
Precip	32.54	33.91	-1.37	0.92
Temp	29.14	30.07	-0.92	0.11

Cameroon

Variable	No-Conflict	Conflict	Difference	p-value
SNGQ	-0.35	-0.34	-0.01	0.94
GDP	0.39	0.35	0.04	0.76
Population	2094317.14	2515054.24	-420737.1	0.64
Precip	151.35	148.62	2.73	0.95
Temp	24.55	25.12	-0.57	0.68

Appendix Table A6

First-Stage IV Results

VARIABLES	(1) lnDeaths	(2) lnDeaths	(3) lnDeaths
PPI	-0.0000104**	-0.0000105**	-0.0000106**
	(0.0000044)	(0.0000045)	(0.0000045)
lnPopulation		0.0349277	0.017741
		(0.0955215)	(0.0928803)
lnGDP			0.16452
			(0.1492086)
Climate controls	Yes	Yes	Yes
Region x Year FE	Yes	Yes	Yes
First Stage F-test	5.59	5.56	5.63
Observations	1,225	1,225	1,225

The table reports first-stage results of the cross-regional, cross-country IV estimates measuring the impact of conflict deaths on sub-national government quality (measured in standard deviations). Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature.

Appendix Table A7

First-Stage IV Results

VARIABLES	(1) lnDeaths	(2) lnDeaths	(3) lnDeaths
PPI	4.16e-06	3.93e-07	-4.01e-07
	(7.73e-06)	6.44e-06	(2.18e-06)
lnPopulation		0.3226489*	0.3073727***
		(0.1942499)	(0.0404705)
lnGDP			0.1539778**
			(0.0661191)
Climate controls	Yes	Yes	Yes
Region x Year FE	Yes	Yes	Yes
First Stage F-test	0.29	0.00	0.03
Observations	3,828	3,828	3,828

The table reports first-stage results of the cross-regional, cross-country IV estimates measuring the impact of conflict deaths on national government quality (measured in standard deviations). Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature.

Appendix Table A8

Restricted sample for NGQ (OLS)

VARIABLES	(1) NGQ	(2) NGQ	(3) NGQ
lnDeaths	-0.00755	-0.00775	-0.00587
	(0.00554)	(0.00571)	(0.00520)
lnGDP		0.0159	0.0308
		(0.0405)	(0.0305)
lnPopulation			-0.0736*
			(0.0417)
Constant	0.880	0.899	1.867
	(1.642)	(1.636)	(1.796)
Climate Controls	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
Observations	1,215	1,215	1,215
R-squared	0.365	0.366	0.407

The table reports cross-regional, cross-country OLS estimates associating conflict deaths with national government quality (measured using the World Governance Indicators' Government Effectiveness Index). Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature. Region x Year fixed effects refer to macro-regions in Africa (e.g. North, South, East, West, Central and Islands).

Appendix Table A9

Restricted sample for NGQ (2SLS)

VARIABLES	(1) NGQ	(2) NGQ	(3) NGQ
lnDeaths	-0.150	-0.0939	-0.146
	(0.507)	(0.251)	(0.101)
lnGDP		0.0394	0.0602*
		(0.101)	(0.0308)
lnPopulation			-0.0321
			(0.0342)
Climate Controls	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
First stage F-test	0.11	0.25	2.38
Observations	1,215	1,215	1,215
R-squared	-2.664	-0.950	-2.484

The table reports cross-regional, cross-country 2SLS estimates associating conflict deaths with national government quality (measured using the World Governance Indicators' Government Effectiveness Index). Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature. Region x Year fixed effects refer to macro-regions in Africa (e.g. North, South, East, West, Central and Islands).

Appendix Table A10

Alternative SNGQ Index (2SLS result)

VARIABLES	(1) SNGQ	(2) SNGQ	(3) SNGQ
lndeath	-0.302**	-0.296**	-0.299**
	(0.141)	(0.137)	(0.136)
lnpop		0.0139	0.0184
		(0.0373)	(0.0367)
lnviirs			-0.0423
			(0.0536)
Climate Controls	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes
First-stage F-test	7.46	7.69	7.77
Anderson-Rubin P-Value	0.00	0.00	0.00
Observations	1,208	1,208	1,208
R-squared	-2.375	-2.289	-2.334

The table reports cross-regional, cross-country IV estimates measuring the impact of conflict deaths on an alternative measure of sub-national government quality (created using principal component analysis). Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. Climate controls include mean precipitation and mean temperature.

Paper 3 – Spatial Inequality within African Provinces: A Story of National Government Quality, Regional Favouritism, and Geographical Endowments

Yohan Iddawela and Neil Lee

Abstract

There is growing concern about the causes and consequences of spatial inequality in much of the world, with Africa being no exception. The dominant view is that geographical factors are the main cause of spatial inequality in the African context. However, a different strand of research highlights the impact of national governments on spatial inequality. Due to data limitations, most of the existing research has focussed on examining spatial inequality at the country level by comparing variations in wealth between African provinces. This, however, is a significant issue given the sheer size of African provinces. The average African province is approximately 37,000 square kilometres – almost the size of the Netherlands. Therefore, it should not be assumed that policies which favour a particular city, or geographical endowments that benefit a certain area, affect entire provinces equally. Instead, it is likely that these policies and geographical endowments cause spatial inequality *within* provinces. This paper therefore investigates the relationship between national government quality and spatial inequality within the provinces of 52 African countries. We create a new measure of within-province inequality using high-resolution satellite data of night-light luminosity, and measure government quality using data from the World Governance Indicators. We find that national government quality matters just as much as geographical endowments in explaining spatial inequality within provinces. Our results show that better national government quality reduces spatial inequality within African regions – a finding we confirm using an instrumental variable approach based on historic European settler mortality rates.

1. Introduction

There is growing concern about inter and intra-regional inequalities in much of the world. Studies have found that spatial inequality has led to conflict and crime (Østby et al., 2009), an entrenched divide between urban and rural areas (Galor and Moav, 2004), uneven reduction in poverty across countries (Te Velde and Morrissey, 2005), and lower economic growth (Achten and Lessmann, 2020). High levels of inter- and intra-regional inequality have been linked to growing political cleavages, particularly where local income differences map onto ethnic or nationalist groups (Kanbur and Venables, 2005). Based on this, a wide range of literature interrogates patterns of spatial inequality, its causes, and its consequences (see Guo et al., 2020; Lee and Luca, 2019; Rodríguez-Pose & Tselios, 2009; Glaeser et al., 2009). While there is some disagreement about whether spatial inequality is a temporary phenomenon which declines in ensuing stages of development (e.g. Williamson, 1965; and Kuznet, 1955), there is broad agreement that inequality poses significant problems for countries and regions alike.

Africa is no exception to these concerns. Average regional income inequality within African countries (measured through the Gini coefficient) has increased from 0.32 to 0.38 between 1992 and 2013 (Mveyange, 2018). Moreover, income inequality in Africa has increased each year since 2009 (ibid). The academic literature examining the drivers of spatial inequality is split into two schools of thought. One school of thought suggests this income inequality is primarily driven by variations in geographical factors such as the quality of land and climate (e.g. Moradi and Baten, 2005; and Frankema, 2010). In contrast, a different strand of research suggests inequality is primarily spurred by the quality of national institutions (e.g. Trotter, 2016; Adeleye et al., 2017). This school of thought has been influenced by the upsurge in literature that has found the importance of national government institutions in explaining levels of economic development in the broader global context (e.g. Acemoglu et al. 2001; Easterly, 2001; Rodrik et al., 2004; Rothstein, 2011; Acemoglu and Robinson, 2012).

Much of the existing research on Africa has focussed on inequality at the *country-level* by comparing variations in economic activity between sub-national regions (e.g. see Lessman and Seidel, 2017; Alesina et al., 2016). This however overlooks the drivers of spatial inequality at the *sub-national* level – in other words spatial inequality *within* African provinces. These prior studies assume that if certain cities or municipalities within a province benefit from either regional favouritism or natural endowments, then the entire province benefits. This, however,

is an assumption that needs to be reconsidered given the sheer size of African provinces. The average province is 37,000 square kilometres – 25 times the size of London. Thus, if certain cities or municipalities *within* a province benefit from regional favouritism or natural endowments, it is likely that this would cause inequality within provinces.

In fact, in the African context, the history of poor national government quality has involved regional favouritism that benefits particular cities rather than entire provinces. For instance, in Zaire (now Democratic Republic of Congo), former president, Mobutu Sese Soko, transformed his former hometown, Gbadolite, (which had 1,500 residents during the 1970s) into a lavish city with five-star hotels, three palaces and a 3.2km runway for a Concorde jet (Wrong, 2000). Similarly, in 1983, former Ivory Coast president, Félix Houphouët-Boigny, declared his hometown, Yamoussoukro, as the nation's capital. He built palaces, an airport that could also land a Concorde, and the world's largest church at a cost of $300 million USD (Ahlerup and Isaksson, 2015). While in Burundi, the country's fifth five-year plan involved funnelling 98% of government funding to the capital city and the area surrounding former President Pierre Buyoya's homeland of Rutovu (Ngaruko and Nkurunziza, 2000). Although this area was initially one of the poorest in Burundi, it has now become one of the best endowed in terms of education infrastructure and hospitals (Nkurunziza and Ngaruko, 2004).

Given the city-specific favouritism displayed by certain African governments, this paper goes beyond the existing studies by examining whether government quality impacts inequality *within* provinces. We do so by measuring variations in economic activity between administrative level 2 regions (i.e. municipalities). Furthermore, to address the existing academic debate on the drivers of spatial inequality, we compare the impact of national institutions to that of geographical factors.

Understanding these *within-province* spatial dynamics are important for both policy and research. As discussed in Paper 1, most African countries have provincial-level governments, which are responsible for driving significant changes to regional economic development (Iddawela et al., 2021). Thus, if local policymakers have (1) a robust measure of within-province spatial inequality in the absence of official statistics, and (2) an understanding of what drives these inequalities; they will be better equipped to implement adequate redistributive policies that ensure city or town-level endowments spill over and benefit the wider province.

We subsequently make three main contributions to the literature. First, we create a new measure of spatial inequality within African provinces using high-resolution satellite data. Examining spatial inequality within the African context has historically been challenging due to data limitations as official sub-national economic indicators are largely absent. To address this limitation, the likes of Alesina et al. (2016), Mveyange (2015), and Lessman and Seidel (2017), have used night-time luminosity (measured through the DMSP-OLS satellite data from NOAA) as the basis for spatial inequality measures. Our study diverges from this work by, for the first time, providing a measure of spatial inequality within provinces by using high-resolution satellite images of night light luminosity (measured through VIIRS-DNB satellite data)[11].

Second, we look at the impact of national government institutions on spatial inequality within African provinces. Countries with poor government quality have been found to engage in regional favouritism, clientelism, and to inefficiently allocate resources (Ezcurra & Rodríguez-Pose, 2014). However, despite this, little work has been done to quantify the impact of government quality on spatial inequality within African provinces. We determine the causal relationship between national government quality and spatial inequality through a 2SLS instrumental variables model. We use European settler mortality rates, as used by Acemoglu et al. (2001), as an instrument for national government quality.

Third, we compare the role of national government quality to geographical factors in explaining spatial inequality within African provinces. Research suggests that variations in geographical endowments may play an important role in driving and entrenching spatial inequality within Africa (Moradi and Baten, 2005; and Frankema, 2010). We therefore create a range of measures to capture variations in geographical endowments across African sub-national regions. We subsequently look at whether levels of spatial inequality are associated more with national government quality than with variations in geographical endowments.

We find three main results. First, we find that an increase in national government quality is associated with a reduction in spatial inequality within African provinces. Second, using our

[11] VIIRS satellite data is approximately double the resolution of the DMSP-OLS satellite data which is traditionally used in spatial economics research. Given the number of remote and regional areas in Africa, higher-resolution satellite images are more appropriate as they are highly sensitive to lower levels of visible light (Ou et al., 2015).

2SLS instrumental variables model, we see that the relationship between national government quality and spatial inequality appears to be causal. Finally, our results suggests that national government quality matters just as much as variations in geographical endowments when explaining spatial inequality within African regions. We obtain this result by creating an index of geographical variation using principal component analysis. We find the relationship between our index of geographical variation and spatial inequality is significant, as is the relationship between national government quality and spatial inequality.

The rest of the paper is structured as follows. Section 2 reviews the literature examining spatial inequality and its drivers. Section 3 provides an overview of the data and presents some descriptive analysis. Section 4 provides the results of our regression models. In Section 5 a range of robustness tests are undertaken, and finally we conclude with Section 6.

2. Spatial inequality in African regions

We draw on Kanbur and Venables (2005, p.8) by defining spatial inequality as variations in income-related inequality between smaller units within larger spatial units (Kanbur and Venables, 2005, p.8). In other words, spatial inequality involves aggregating a collection of individuals into spatial units (such as municipalities) and measuring variation between these units. Spatial inequality, defined as such, has been rising over the past two decades within African regions (Mveyange, 2018).

The academic literature on the drivers of inequality within Africa mainly focusses on country-level spatial inequality, rather than within-province inequality. Nonetheless, the majority of this existing literature predominantly bifurcates into two groups which debate the main causes of spatial inequality. On the one hand are those who argue that variations in institutional quality is one of the primary drivers (Ezcurra and Rodríguez-Pose, 2014; Henderson, 2010; Holder and Raschky, 2014). On the other hand are those arguing that variations in geographical factors are the primary driver (Maddison, 1995; Easterly, 2007; Naudé and Krugell 2006). This paper aims to add to this literature by examining the within-province spatial dynamic, and understanding whether national institutional quality matters as much as geographical factors in explaining spatial inequality.

2.1 Institutions and Spatial Inequality

In analysing a cross-country sample of 46 countries (including South Africa but no other African countries) over a ten-year period, Ezcurra and Rodríguez-Pose (2014) provide evidence that countries with better national government quality experience lower levels of spatial inequality. They condition their findings on GDP per capita to account for the Kuznets curve (whereby inequality increases with initial growth in economic activity but reduces over time). The channels by which institutional quality affects spatial inequality have been explored in subsequent papers.

It appears that regional favouritism of poor-quality institutions is likely to play a major role in driving spatial inequality. Regional favouritism takes place when leaders or elected officials favour certain cities over others. Henderson (2010) argues that national governments may implement policies that favour certain regions or cities within a country. In other words, they direct place-based policies that benefit one or more cities over the rest. The status of being a 'favoured' city incentivise firms to relocate there and absorb economic activity from neighbouring regions. As a result, these cities have more economic activity than non-favoured cities; thereby contributing to spatial inequality. While favouritism in developed countries may take place primarily due to economic reasons such as better access to capital markets and better fiscal conditions (ibid), favouritism in countries with poor institutional quality typically takes place due to nepotism and patronage (i.e. in the form of ethnic or family connections to the leader). Holder and Raschky (2014), for instance, examine a panel of 38,426 subnational regions from 126 countries between 1992 to 2009. They find that areas which are the birthplace of current political leaders experience higher degrees of economic activity. Moreover, they find that regional favouritism is heightened in a context of low institutional quality. Dreher et al. (2017) build on this by examining the African context specifically. They analyse data of 117 African leaders' birthplaces and ethnic groups and compare this to Chinese funded aid projects across 3,097 regions between 2000-2012. They find that, in countries where leaders have more autocratic control, their birthplaces receive significantly more aid funding than other (subnational) regions. Moreover, given Chinese aid plays an important role in spurring local economic development, spatial inequality between birthplaces and other regions becomes further entrenched. Similarly, Burgess et al. (2015) study data on road construction in Kenyan districts from 1963-2011 (a period of fluctuating transitions in and out of democracy). They find strong evidence of regional favouritism as areas that share the ethnicity of the president

obtain double the amount of funding for road construction than other regions. However, they argue that as institutional quality strengthens and the government transitions into democracy, regional favouritism disappears. These findings are consistent with Kramon and Posner (2016), who study educational data on over 50,000 Kenyans, as well as ethnic information of Kenya's presidents, cabinet ministers and bureaucrats dating back to the period of colonisation. They find that sharing an ethnicity with the president or the minister of education leads to greater educational outcomes. This is because more resources are directed to these areas by the key decision makers.

Similar findings take place with regards to corruption within national governments. Candau (2008) creates a structural model demonstrating that, in countries which lack democracy, 'urban giants' – i.e. large concentrations of wealth in urban areas – are more likely to emerge. This is because of the limited redistributive role of the state. Democracy, however, acts as a redistributive force and reduces spatial inequality. Moreover, corrupt officials, who embezzle money prevent resources from being used for redistributive purposes, and instead channel that into personal expenditure in regions where they live – typically the capital. This then intensifies spatial inequality between the capital and the periphery. Gupta et al. (2001), provides evidence of this. They find that a one standard deviation increase in corruption heightens income inequality (measured through the Gini coefficient) by 11 points. They argue that corruption works by government officials using public funding for private gain. This subsequently interferes with the allocation of resources and redistribution of income – thereby creating spatial inequality.

However, aside from corruption and ethnic favouritism, institutions also play a fundamental role in developing place-based policies to address existing spatial inequalities. Trotter (2016), for instance, uses panel data from 46 sub-Saharan African countries between 1990 and 2010, and finds that higher quality national institutions (that are characterised by democratic forms of government), have more equitable roll out of electricity infrastructure throughout the country. Moreover, Todes and Turok (2018) study place-based policies in South Africa post-Apartheid. They find that poor quality national institutions that lack a clear overarching vision and policy framework, are ultimately unable to efficiently address spatial inequality. Thus, in order to implement policies that successfully address spatial inequality, high quality institutions are found to develop clear strategies that address regional imbalances in economic opportunities.

Thus, in summary, this school of thought finds that institutional quality is fundamental to addressing spatial inequality. This is because better quality institutions do not participate in regional favouritism driven by ethnic or familial ties to a region; they also reduce corruption which impedes upon the redistributive function of the state; and finally better quality institutions are able to introduce policies that address regional imbalances in economic opportunities.

2.2 Geography and Spatial Inequality

The other strand of literature argues that variations in geography are the main driver of spatial inequality. Diamond (1998) for instance argues that differences in development predate the existence of formal institutions. Instead, he argues they have been shaped by historical geographical endowments – for example plant and animal species, that in turn influenced agricultural productivity. As agricultural productivity boomed, a growing population could be maintained. Through this, agglomerations formed, which subsequently led to some regions experiencing economic activity while other regions with less favourable geographical endowments did not.

With regards to Africa specifically, Maddison (1995) examined five major periods in African history – ranging from the precolonial era, the onset of colonial rule to WWI, the world wars and the great depression, late colonial rule to independence, and post-independence. He argues that institutional quality of African countries varies significantly throughout all periods of analysis. However, despite this temporal variation of institutional quality, African regions have performed worse (in terms of economic activity) than other regions. As a result, he suggests this reflects geographic and environmental differences between African countries and the rest of the world. Bloom and Sachs (1998) build on this by arguing that variations in climate, soils, topography, disease ecology, temperature and precipitation are fundamental in driving the economic performance of African regions – particularly because African economies are predominantly agricultural. Temperature and precipitation in agricultural economies are fundamental because it regulates photosynthetic potential of crops. They also argue that the most fertile areas in Africa are found at high altitudes because of lower temperatures, higher rainfall and volcanic soils that are nutrient rich. Thus these areas have an economic advantage over areas with worse geographical and environmental endowments.

These findings are confirmed by Easterly (2007), who uses cross-country data from 114 countries to show that variations in agricultural endowments predict inequality. He argues that the agricultural endowments which are particularly predictive of inequality are the abundance of land suitable for growing wheat and sugarcane. Over time, as variations in agricultural output translated into variations in agglomerations, studies are finding that other geographical factors, such as distance to ports and distance to natural resources is also predictive of spatial inequality in African countries. For instance, Naudé and Krugell (2006) investigate sub-national variations in economic growth for 354 magisterial districts in South Africa from 1998-2002. They find geographic factors such as distance from internal markets, and distance from international harbours play a significant role in explaining disparities in economic activity, thereby contributing to spatial inequality. Similar findings have been established by Mudiriza and Edwards (2021), who find that regional wage disparities across 354 regions in South Africa from 1996-2011 are driven by geographic factors such as transport costs (reflecting connectivity and distance to urban centres), mineral resource endowments, quality of agricultural land and climate conditions. In other words, economic performance of a region in South Africa depends on the natural endowments that permit agricultural activity (i.e. soil and climate factors) or the availability of natural resources, coupled with the ability to trade or export these products (e.g. distance to urban city centres).

A number of studies are also starting to emerge which examines the determinants of spatial inequality using satellite imagery of night-time luminosity (DMSP-OLS data), as luminosity is seen to be a reliable proxy for economic activity (Henderson et al., 2012). The use of this data has the advantage of extending previous studies by providing a full worldwide sample of regional economic activity that are measured in a consistent way. For instance, Lessman and Seidel examine regional inequality throughout the world and find that natural resources, transportation costs, and share of arable land in a region is correlated with regional inequality. Similarly, Mveyange (2018), builds on this approach by focussing his analysis on African regions. His study also upholds the previous literature in finding that fluctuations in temperature and precipitation have the potential to increase regional inequalities in the medium and long-run. He finds these results are heightened in low income and agriculture-intensive countries. The present paper extends this work by creating a measure of spatial inequality using higher resolution satellite imagery (VIIRS) as opposed to lower resolution satellite imagery (DMSP-OLS). We also focus on *within-province* inequality, rather than within-country

inequality. Furthermore, we explicitly examine the role of institutions and geography in driving spatial inequality.

To summarise, this school of thought argues that geographical and environmental endowments play the fundamental role in driving spatial inequality. This is particularly important in predominantly agricultural economies like those found in African regions. As a result, variations in the quality of soil, temperature, precipitation, as well as access to other markets are important factors that explain spatial inequality between regions.

Thus, these two schools of thoughts both provide evidence for the relevance of institutions and geography for spatial inequality. They are thus fiercely opposed to each other in arguing over the primacy of institutions vs the primacy of geographical endowments. Yet, despite this, the existing literature has focused their analysis on inequality at the national level. Given the sheer size of African provinces, understanding the spatial inequality dimension at the province-level is warranted. Especially given that many provinces possess governments that can implement policies to improve economic development (Iddawela et al., 2021) and offset imbalances in geographical endowments and regional favouritism of national governments.

This paper therefore aims to build on this existing literature by examining the dynamics of *within-province* spatial inequality, and by investigating the role of national institutional quality in driving such inequalities.

3. Data

3.1 Measuring Spatial Inequality

Our focus is on inequality *within* provinces (admin 1 regions). Previous studies, for example Lessman and Seidel (2017), calculate mean income levels for each province (see Figure 1), and subsequently create country-level spatial inequality measures (such as a Gini Coefficient) based on variations between provinces (see Figure 2).

Figure 1: Average income in each province

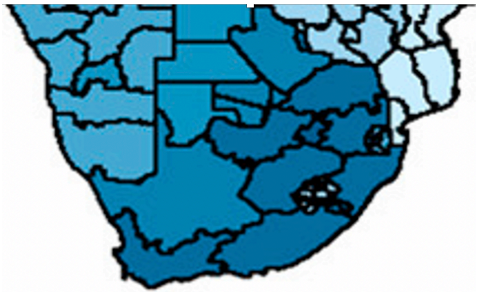


Figure 2: Country-level inequality

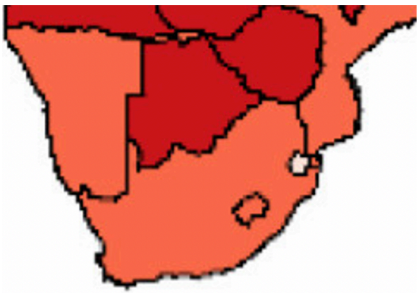


Figure 1 shows average income for each province in South Africa. Variations between provincial income levels are used to calculate a country-level inequality measure in Figure 2.

Provinces in Africa, however, are large spatial units. The average size of a province is 37,000 square kilometres – larger than countries like Belgium (see Appendix Table 2 for summary statistics). Therefore, we should not assume that acts of regional favouritism which benefit just one town within a large province, ultimately benefits the entire province. Similarly, given the sheer size of provinces, there are significant variations in geographical endowments between municipalities within a province (Naude and Gries, 2009; Lessman and Steinkraus, 2019). As a result, we examine whether government quality and geographical endowments create and exacerbate spatial inequality *within* provinces.

Given the lack of official sub-national data in African countries, we use satellite data of night light luminosity. This approach was popularised by Henderson et al. (2012), who found that night lights are an accurate indicator of economic activity. We however diverge with the vast majority of spatial inequality studies by using higher-resolution satellite images from the Visible Infrared Imaging Radiometer Suite Day/Night Band (VIIRS-DNB), rather than the lower-resolution Defence Meteorological Satellite Program's Operational Linescan System (DMSP-OLS). VIIRS data is available every 15 arc seconds for each pixel area (approximately 0.5km × 0.5km). We use the first available year of VIIRS data (2015) for the analysis.

To calculate a measure of spatial inequality for each province (admin 1 regions) in Africa, we first calculate luminosity per capita measures for each municipality (admin 2 region). We use population data from the United Nations' Gridded Population of the World (GPW) dataset, which provides pixel-level population estimates for 2015. We subsequently create a province-level Gini coefficient that measures variation between municipalities.

The Gini index is therefore constructed as follows:

$$G = \frac{1}{n}\left[n + 1 - 2\frac{\sum_{i=1}^{n}(n+1-1)y_i}{\sum_{i=1}^{n} y_i}\right]$$

Whereby we capture levels of development in municipalities, i, with log luminosity per capita y_i. We then construct a Gini coefficient for each province that reflects inequality across n number municipalities.

A primary concern when calculating spatial inequality measures is the modifiable areal unit problem (MAUP). This takes place when the same data, aggregated differently, yields different results. It is therefore important to aggregate luminosity per capita in a non-arbitrary way. Arbitrary methods of aggregation could involve dividing provinces into 'grids' (through 'fishnetting'), subsequently calculating luminosity per capita for each grid, and then finally determining a Gini coefficient based on variations between grids. The size of the grids will significantly affect the degree to which spatial inequality is observed. The smaller the grid, the higher the levels of observed inequality as a city is likely to fit within a single grid, while rural areas would not. Municipalities are more likely to have a non-arbitrary mix of agglomerations and rural areas as cities, in addition to their green belts. Furthermore, there is a risk that spatial inequality measures are simply reflecting the size of regions and the distribution of population. To address this, we control for area size of regions and distribution of population in our regression specifications. Therefore, to address the MAUP, we calculate luminosity per capita for non-arbitrary units – municipalities. Each province has, on average, nine municipalities nested within it.

We obtain data on the boundaries of provinces and municipalities from the database of Global Administrative areas (GADM). Since Libya does not have any recognised municipalities, we have excluded it from our analysis. Similarly, given the disputed status of Western Sahara, we have also excluded it.

Figure 3 provides an overview of the distribution of luminosity per capita measures for each municipality (categorised by quintiles). We can see that the highest level of luminosity per capita is observed in Southern Africa (South Africa, Namibia, Botswana and Zimbabwe), as

well as parts of Northern Africa (e.g. natural resource rich areas in Algeria, Morocco, Egypt, and Tunisia). The areas with the lowest level of luminosity per capita are found in Central Africa (Central African Republic, Chad and the Democratic Republic of the Congo), as well as in the Horn of Africa (Somalia, eastern Ethiopia and South Sudan).

Figure 3: Luminosity Per Capita (Municipalities)

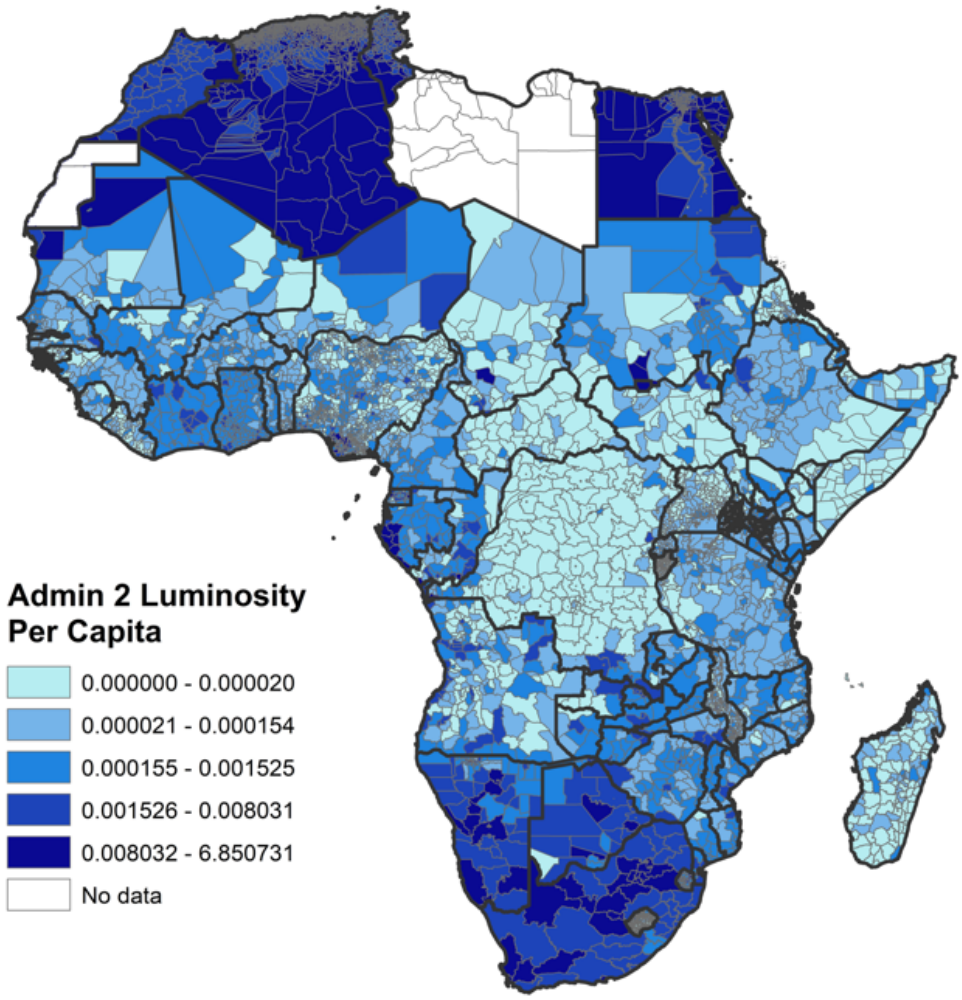
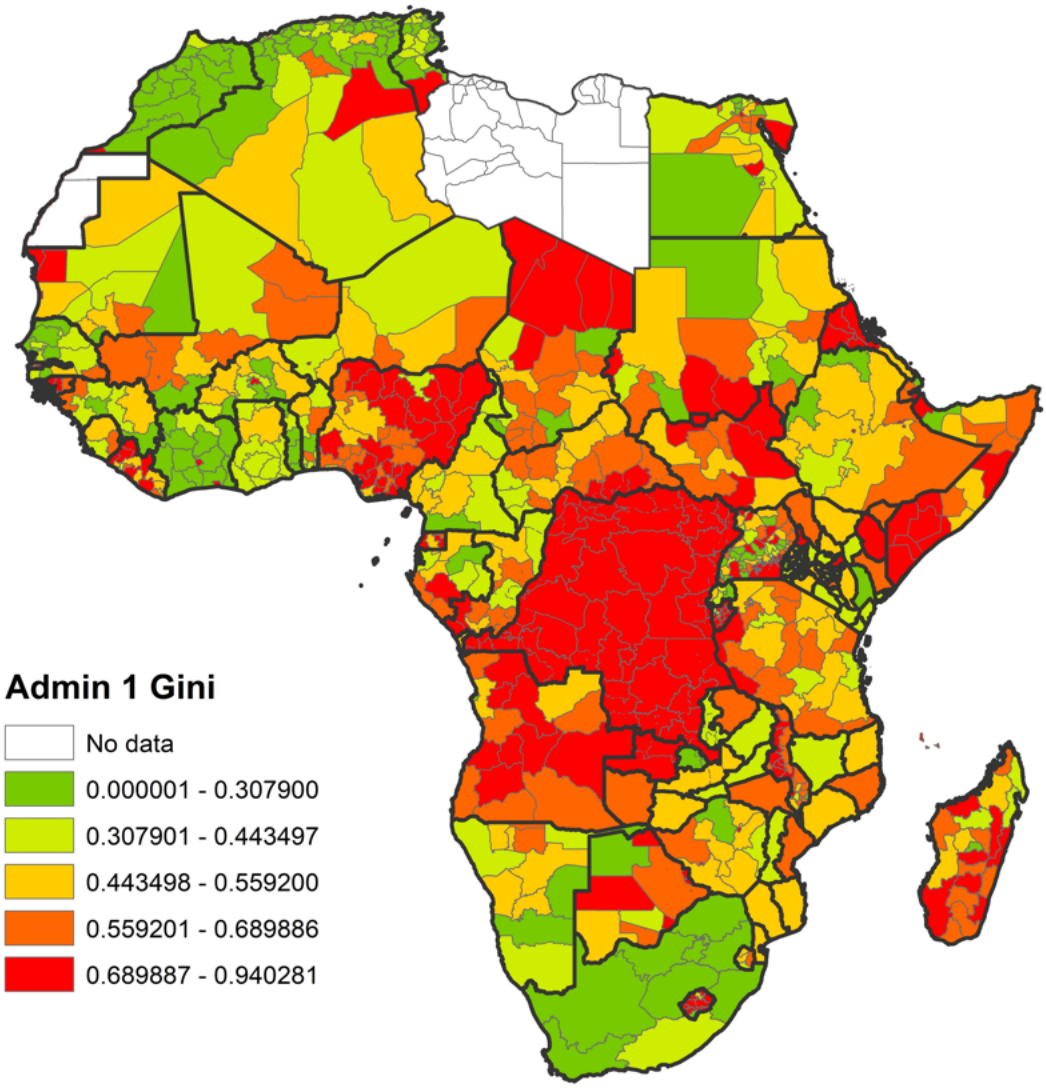


Figure 4 illustrates spatial inequality (based on the variations of municipal-level luminosity per capita levels seen in Figure 1 and categorised by quintiles). We see that the most spatially equal regions are in Southern Africa (South Africa and Namibia), parts of Western Africa (Ghana and Côte D'Ivoire) as well as parts of Northern Africa (regions in Morocco, Egypt, and Algeria). The areas with the lowest level of luminosity per capita are found in Central Africa

(Central African Republic and Chad), Somalia in Eastern Africa as well as Angola in Southern Africa.

Figure 4: Spatial Inequality (Provinces)



3.2 Other data

To determine whether variations in geographical features (e.g. natural resource endowments and climate) drives spatial inequality, we use a number of geographic, topographic, and climate controls. The geographic controls include the number of gold mines in a region, which is taken from GOLDATA; the number of gem mines, from GEMDATA; a crop suitability index from Galor and Özak (2016), and the number of petroleum sites, from the Peace Research Institute

Oslo. These control for variations in natural resource endowments, which may lead to spatial inequality.

The main topographic control is an index of terrain ruggedness from Nunn and Puga (2012). This helps us account for localised variation in terrain which Bloom and Sachs (1998) argue impacts patterns of economic development and therefore spatial inequality. We use two climate controls: mean precipitation data and mean temperature data from the University of Delaware's Climate Data Archive. This is to account for environmental variations which, as discussed in section 2, are argued to have impacted spatial inequality in African regions (Mveyange, 2018).

Furthermore, we measure national and sub-national government quality. For national government quality, we use the World Governance Indicators' Government Effectiveness Index. Variations in sub-national government quality may also exacerbate spatial inequality (Iddawela et al., 2021). To account for this, we use measures of the perceptions of local government corruption and trust in local government officials. These measures are taken from responses to the Afrobarometer survey (round 5). We aggregate and average the responses to these questions such that we have measures for corruption and trust at the provincial level.

In order to adequately capture the relationship between NGQ and spatial inequality, we control for variations in these factors between municipalities by creating Gini indexes for precipitation, ruggedness, temperature, area size and population following the same approach outlined in section 3.1. This ensures that our measure of spatial inequality is not biased by variations in climate, terrain, population and size of municipalities.

4. Model specification and results

4.1 Econometric specification

We first use a reduced form OLS model to measure the relationship between spatial inequality and NGQ. The analysis is based on the following specification:

$$InEquality_{rc} = \alpha + \beta NGQ_c + \mathbf{X'}_{rct}\varphi + \gamma_a + u_{rc} \quad (4)$$

Where $InEquality_{rc}$ is the spatial inequality within each province r (measured using Gini coefficients) in country c in 2015. NGQ_c is national government quality (measured through the World Governance Indicators' Government Effectiveness Index), $\mathbf{X'}_{rct}\varphi$ is a vector of covariates discussed previously which includes Gini coefficients for precipitation, ruggedness, temperature, region size and population (further detail is provided in Appendix Table 1), γ_a are region fixed effects (for Northern, Southern, Eastern, Western, and Central Africa, in addition to Islands) to account for any time-variant spatial heterogeneities, and u_{rct} is the error term. The analysis is for a cross-section of data from 2015.

4.2 Results

4.2.1 Impact of National Government Quality on Spatial Inequality

Table 1: Ordinary Least Squares (OLS) Results

	(1) Spatial Ineq	(2) Spatial Ineq	(3) Spatial Ineq	(4) Spatial Ineq
NGQ	-0.00449***	-0.00423***	-0.00476***	-0.00443***
	(0.000837)	(0.00114)	(0.000784)	(0.00112)
Precipitation	1.127*	1.002	0.881	0.886
(Gini coefficient)	(0.594)	(0.646)	(0.596)	(0.677)
Ruggedness	0.349***	0.327***	0.282***	0.271**
(Gini coefficient)	(0.0995)	(0.108)	(0.0938)	(0.108)
Temperature	-0.0536	0.0827	-0.0245	0.0574
(Gini coefficient)	(0.170)	(0.194)	(0.160)	(0.193)
lnArea	0.00930	0.00438		
	(0.0102)	(0.0114)		
Population	0.297***	0.313***	0.252***	0.268***
(Gini coefficient)	(0.0594)	(0.0742)	(0.0537)	(0.0659)
Petrol Sites	-0.0168	0.00595	-0.0179	-0.00495
	(0.0203)	(0.0215)	(0.0174)	(0.0198)
Gem Mines	0.00335	0.00369	0.00255	0.00241
	(0.00813)	(0.00799)	(0.00723)	(0.00688)
Gold Sites	-0.0128***	-0.0138***	-0.0107***	-0.0118***
	(0.00254)	(0.00288)	(0.00237)	(0.00267)
lnCrop Suitability	-0.00882	-0.00946	-0.00578	-0.00566
	(0.00959)	(0.0121)	(0.0113)	(0.0142)
Local corruption		0.000213		0.000250
		(0.00218)		(0.00203)
Local trust		0.000278		0.000651
		(0.00175)		(0.00161)
Area			0.230***	0.243***
(Gini coefficient)			(0.0616)	(0.0725)
Constant	0.387***	0.385	0.425***	0.339
	(0.130)	(0.243)	(0.0972)	(0.232)
Region FE	YES	YES	YES	YES
Observations	615	474	615	474
R-squared	0.467	0.430	0.484	0.452

The table reports cross-regional, cross-country OLS estimates associating NGQ with spatial inequalities. Dependent variable is Gini coefficient of admin 1 spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

The OLS results reported in Table 1 indicates that there is a negative and highly significant relationship between NGQ and spatial inequality for the African regions in our sample. A one unit increase in NGQ is associated with a slight (0.04%) decrease in spatial inequality across all permutations in columns (1) to (4). In short, better quality of national government is associated with reduced spatial inequality.

In columns (1) and (2) we control for log area size of each province to account for any concerns that the size of regions biases the results. In columns (3) and (4) we control for variations in the area of municipalities that are nested within each province. We do this by calculating a gini coefficient to capture variations in municipality sizes. This is done to address the idea that smaller units have higher levels of inequalities (due to the modifiable areal unit problem discussed previously), and thus provinces with significant variations in the size of nested municipalities experience higher levels of overall spatial inequality. In columns (2) and (4) we control for measures of local government corruption and trust. We see that they do not have a significant relationship with spatial inequality.

Across all permutations, we also find that spatial inequality is significantly associated with variations in terrain ruggedness municipality area size, and population distribution.

4.2.2 Government quality vs. Natural Endowments

A number of studies have argued that variations in economic development are driven by geographical endowments (e.g. Diamond, 1998; Bloom et al., 2003; Dell et al., 2012). In light of this research, we wanted to examine the degree to which variations in geography drive spatial inequality within African provinces. Given that the results we see in Table 1 are somewhat contradictory to the literature (i.e. precipitation and temperature do not appear to be significant), we need to address concerns of collinearity and over-controlling when using these geographical variables. One method of addressing these concerns is to use principal component analysis to transform the original set of variables into a new set of uncorrelated components (Chatfield and Collins, 1980). Thus, following the approach outlined in Alesina et al. (2016) who looked at the relationship between geographic variation and contemporary development, we create a composite index of geographical variation using PCA. In doing so, we capture variations in geographical factors by creating components based on seven geographical

variables – two related to topography (ruggedness and elevation), two related to climate (temperature and precipitation) and three related to natural resource endowments – gem mines, petroleum sites and gold mines, elevation.

Table 2 provides the results of the principal component analysis. The first two components explains approximately 30% of the common variance of our seven measures of geographical variation, while the second component explains approximately 25% (therefore cumulatively explaining 63% of variation). Six measures load positively onto the first component. The first component has an eigenvalue of 1.69, while the second component has an eigenvalue of 1.17. We therefore include these components in our model (the rule of thumb for including components is above 1) (Chatfield and Collins, 1980). All other components have eigenvalues of less than one.

Table 2: Principal Component Analysis

Principal Component	Eigenvalue	Cumulative	Variable	1st Component	2nd Component	3rd Component	4th Component	5th Component	6th Component	7th Component
1	1.6961	0.1429	Precipitation Gini	0.3384	0.4971	0.038	-0.4791	-0.3487	0.4237	0.326
2	1.1714	0.2857	Elevation Gini	0.5298	-0.1945	-0.123	0.133	-0.2057	0.3372	-0.7019
3	0.97974	0.4286	Ruggedness Gini	0.4446	-0.2436	-0.2953	0.4652	-0.325	-0.201	0.5416
4	0.909227	0.5714	Temperature Gini	0.4743	0.1177	0.2458	-0.335	0.058	-0.7485	-0.1578
5	0.824608	0.7143	Gem Mines	0.2312	0.4986	-0.5051	0.1909	0.6368	0.0257	-0.0132
6	0.75252	0.8571	Gold Sites	-0.0243	0.5388	0.5281	0.6213	-0.1814	-0.0278	-0.1027
7	0.666398	1	Petrol Sites	0.3579	-0.321	0.5494	0.0411	0.5373	0.3234	0.2685

Table 3: OLS Results

VARIABLES	(1) Spatial Ineq	(2) Spatial Ineq	(3) Spatial Ineq	(4) Spatial Ineq
NGQ	-0.00581***	-0.00586***	-0.00553***	-0.00556***
	(0.000841)	(0.000844)	(0.000808)	(0.000811)
Geog (PC 1)	0.0509***	0.0496***	0.0278**	0.0273**
	(0.0116)	(0.0110)	(0.0112)	(0.0109)
Geog (PC 2)		0.0110		0.00607
		(0.00891)		(0.00838)
Area			0.274***	0.270***
(Gini coefficient)			(0.0556)	(0.0552)
Population			0.241***	0.240***
(Gini coefficient)			(0.0586)	(0.0589)
Constant	0.636***	0.637***	0.457***	0.459***
	(0.0295)	(0.0296)	(0.0369)	(0.0374)
Region FE	Yes	Yes	Yes	Yes
Observations	708	708	708	708
R-squared	0.360	0.362	0.437	0.438

The table reports cross-regional, cross-country OLS estimates associating NGQ and the first two geography components with spatial inequalities. Dependent variable is Gini coefficient of admin 1 spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

In Table 3 we assess the relationship between geography (measured using the first two components), NGQ and spatial inequality. Column (1) examines the simple relationship with dummies for the six broad African regions, while column (2) also controls for variation in area of nested municipalities and variation in population within each province. We see that for both columns NGQ is highly significant and negatively associated with inequality. A one unit increase in NGQ is associated with a slight (.06%) reduction in spatial inequality across African provinces in our sample. Similarly, geography (through the first component) appears to be significantly associated with spatial inequality, while the second component does not appear to have an association. Nonetheless, we can conclude that NGQ appears to matter just as much as geographical endowments in explaining spatial inequality.

4.3 Instrumental Variable Analysis

While the OLS results indicate a significant and negative relationship between NGQ and spatial inequality, the results could be endogenous through reverse causality. In other words, spatial inequality could lower NGQ. For example, some forms of spatial inequality are driven by ethnic divisions in African regions (Alesina et al., 2016). Ethnic groups that perceive themselves as marginalised are likely to challenge the legitimacy of governments – thereby leading to a deterioration in the government's ability to exercise rule of law Kyriacou (2013). Thus, in order to establish the causal impact of NGQ on spatial inequality, we use a 2SLS instrumental variables model.

The instrument used is log European settler mortality rates, as popularised by Acemoglu et al. (2001) in their study on the role of institutions on economic performance. Historically in Africa, there were two primary forms of colonisation – colonisation through 'indirect rule' whereby so-called 'extractive states' were set up. This involved empowering local state apparatuses to govern on behalf of colonial empires to form "a dependent but autonomous system of rule, one that combined accountability to superiors with a flexible response to the subject population, a capacity to implement central directives with one to absorb local shocks" (Mamdani, 1996: 60). These systems were set up by colonial powers to 'extract' value from colonies, without many resources being allocated to developing institutions that protected property rights or preserved rule of law. The second form of colonisation, according to Acemoglu et al. (2001), involved European settlements – whereby Europeans would settle and set up European-style institutions, which placed a heavier emphasis on rule of law and private property protections. These states included South Africa, Rhodesia and British Kenya.

A number of studies argue that 'institutional culture' persists over long periods of time (e.g. North, 1990, Young, 1994; La Porta et al., 1998). We can understand 'institutional culture' as a set of beliefs and social behaviours that are bound up in institutions. This includes certain values or conceptions of morality. Thus, if an institution has normalised behaviours over time such as clientelism or bribery, these norms affect how government officials currently act.

As such, Iddawela et al. (2021), argue that the relationship between historical government institutions and present-day government institutions is based upon shared social and cultural

traits, which persist over time and still determine differences in development across regions and cities. Following this logic, an instrument that can capture historical levels of government quality should meet the exclusion restriction of being unrelated to present-day government quality.

European settler mortality rates therefore qualify as a meaningful instrument for present-day NGQ. European regimes decided where to settle based on the mortality rates of sailors, soldiers and bishops situated in colonies between the 17th and 19th centuries. Areas that had high settler mortality rates saw the creation of 'extractive states' without significant protection of property rights, while areas that had lower settler mortality rates saw the creation of settler-colonies with European-style institutions. As such, the institutional culture developed in early institutions may filter through to present-day institutions. Meanwhile, present-day institutions, in turn, affect levels of spatial inequality as countries with poor government quality may engage in regional favouritism, self-serving behaviour and clientelism (Ezcurra, & Rodríguez-Pose, 2014).

Following this logic, we arrive at the following first stage estimating equation:

$$(5) \qquad logSettlerMortality_c = \alpha + \beta Inequalities_{rc} + \mathbf{X}'_{rct}\varphi + \gamma_a + u_{rc}$$

Where $logSettlerMortality_c$ is the log settler mortality level for each country from Acemoglu et al. (2001). This data was compiled from the work of historian Philip D. Curtin (1964).[12]

[12] Acemoglu et al. (2001) use data on European settler mortality from the work of Philip Curtin. Curtin compiled this data from military records which were dated from 1815 (for British soldiers). French records began being collected during the 1830s, while by the 1870s most European countries were publishing records on soldier health. Curtin triangulated these datasets with numerous sources and found them to be reliable (Curtin, 1989).

Table 4: Instrumental Variables Results

VARIABLES	(1) Spatial Inequality	(2) Spatial Inequality	(3) Spatial Inequality	(4) Spatial Inequality
NGQ	-0.0165***	-0.0180***	-0.0162***	-0.0186***
	(0.00272)	(0.00535)	(0.00319)	(0.00599)
Precipitation	0.975	0.919	0.816	0.823
(Gini coefficient)	(0.619)	(0.755)	(0.615)	(0.769)
Ruggedness	0.217**	0.232*	0.164	0.165
(Gini coefficient)	(0.103)	(0.129)	(0.105)	(0.139)
Temperature	-0.224	-0.302	-0.255	-0.445
(Gini coefficient)	(0.239)	(0.327)	(0.260)	(0.440)
lnArea	0.00287	0.00123		
	(0.0128)	(0.0179)		
Population	0.101	0.145*	0.0763	0.112
(Gini coefficient)	(0.0637)	(0.0826)	(0.0625)	(0.0806)
Petrol Sites	-0.0286	-0.00544	-0.0318	-0.0211
	(0.0301)	(0.0410)	(0.0279)	(0.0412)
Gem Mines	0.0156**	0.0143**	0.0131**	0.00972
	(0.00629)	(0.00703)	(0.00599)	(0.00669)
Gold Sites	0.00963	0.00296	0.00964	0.00386
	(0.00619)	(0.00551)	(0.00658)	(0.00565)
lnCrop Calories	0.0132	0.0187	0.0152	0.0237
	(0.0185)	(0.0218)	(0.0188)	(0.0241)
Local Corruption		0.00177		0.00209
		(0.00245)		(0.00246)
Local Trust		0.00192		0.00276
		(0.00250)		(0.00251)
Area			0.188**	0.280***
(Gini coefficient)			(0.0749)	(0.0886)
First-Stage F-Test	33.84	12.89	21.78	9.52
Anderson-Rubin P-Value	0.000	0.000	0.000	0.000
Observations	403	343	403	343

The table reports cross-regional, cross-country OLS estimates associating NGQ with spatial inequalities. Dependent variable is Gini coefficient of provincial spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. First-stage results reported in Appendix Table 5.

The 2SLS IV results reported in Table 4 indicate that our OLS results hold. We can see that a one unit increase in NGQ is associated with a 1.6% - 1.8% decrease in spatial inequality across all permutations in columns (1) to (4). In other words, there appears to be a causal, negative and significant relationship between NGQ and spatial inequality for African provinces.

In columns (1) and (2) we control for log area size of each province to ensure that the size of provinces does not affect our results. In columns (3) and (4) we control for variations in the area size of municipalities that are nested within each province. In columns (2) and (4) we again control for measures of local government corruption and trust.

The first stage f-test in columns (1)-(3) are greater than 10 (the rule of thumb for a strong instrument), however it is just below 10 in column (4). Nonetheless, the Anderson-Rubin confidence interval, which is robust to weak instruments (Mikusheva, 2010), is less than 0.01. With this caveat in mind, we argue that our instrument is likely to be valid with NQG having a significant causal impact on spatial inequality

Table 5: Instrumental Variables Results: Geography vs NGQ

VARIABLES	(1) Spatial Inequality	(2) Spatial Inequality
NGQ	-0.0161***	-0.0161***
	(0.00243)	(0.00238)
Geog (PC1)	0.0263***	0.0220***
	(0.00717)	(0.00685)
Geog (PC2)	0.0291***	0.0168
	(0.0106)	(0.0110)
Area		0.135**
(Gini Coefficient)		(0.0683)
Population		0.134**
(Gini Coefficient)		(0.0571)
Observations	469	469
First Stage F-Test	35.11	36.79

The table reports cross-regional, cross-country 2SLS IV estimates examining the impact of NGQ on spatial inequalities. Dependent variable is Gini coefficient of provincial spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1. First-stage results reported in Appendix Table 6.

In Table 5 we subsequently examine the causal relationship between NGQ and spatial inequality while controlling for geography (measured using the first two components of our PCA). We see that for both permutations NGQ appears to have a causal, significant and negative relationship with spatial inequality. A one unit increase in NGQ is associated with a slight (1.6%) reduction in spatial inequality across African provinces in our sample. It appears

that both components of geography are significant in column (1), however after controlling for variations in area and population in column (2), just the first component of geography remains significant. Nonetheless, our results suggest that good quality institutions reduce spatial inequality just as much as variations in geographical endowments.

5. Robustness Tests

We conduct a number of robustness tests to ensure the validity of our results. One of the primary sources of concern in constructing spatial inequality indices relates to the measure of population used. We have chosen to calculate luminosity per capita for each municipality using the UN's Gridded Population of the World on the denominator. This is the most widely used measure in night light studies. However, to test the sensitivity of our results to population measures we re-run our analyses using an alternative measure of pixel-level population estimates by Worldpop. Using this alternate population measure, we see that a one unit increase in NGQ is associated with roughly a 0.04% - 0.05% decrease in spatial inequality. In other words – our OLS results (presented in Appendix Table 7) still hold as there is a negative and highly significant relationship between NGQ and spatial inequality.

Similarly, our 2SLS instrumental variable estimations likewise suggest that a one unit increase in NGQ leads to a 1.6% - 1.8% decrease in spatial inequality (Appendix Table 8). As before, we see that there is a causal, significant and negative relationship between NGQ and spatial inequality. The first stage f-test remains above 10 in columns (1) to (3), however it is slightly below 10 in column (4). Despite this, the Anderson-Rubin test, which is robust to weak instruments, has a p-value well below 0.05 across all columns, which indicates that our results hold.

Another potential source of bias in our results is the inclusion of large cities. It could be argued that our spatial inequality measure is driven by capital cities or commercial capitals, whereby large cities are surrounded by more rural areas. Therefore, provinces which have large cities experience higher levels of inequality as surrounding areas are significantly less developed by comparison. To address this concern, we drop all regions which have a capital city or commercial capital from our analysis. We subsequently re-run our analyses and find that, despite the exclusion of capital cities and commercial capitals, the results hold (Appendix Table

9). We see that a one unit increase in NGQ is associated with roughly a .05% decrease in spatial inequality across all permutations

The 2SLS IV results likewise hold withstanding the exclusion of capital cities and commercial capitals. We can observe a causal, negative and highly significant relationship between NGQ and spatial inequality (Appendix Table 10). A one unit increase in NGQ causes roughly a 1.7% reduction in spatial inequality in columns (1) to (4). The first stage f-test is above 10 in columns (1) – (3) and is slightly below 10 in column (4). However, as previously, the Anderson-Rubin test's p-value is well below 0.05, thereby indicating our results in column (4) holds.

Finally, given the high degree of inequality in DRC (see Figure 4), there may be a concern that our results are being biased by the inclusion of DRC. Therefore, to address this concern, we re-run the analysis excluding DRC. We see that the OLS (Appendix Table 11) and IV (Appendix Table 12) results hold and that NGQ is significant, and negatively related to within-province spatial inequality.

6. Conclusion

Despite the growing concern about the drivers and consequences of spatial inequality within the African context, the vast majority of prior studies have, due to the absence of official sub-national data, focussed on spatial inequality at the country-level (e.g. see Lessman and Seidel, 2017; Alesina et al., 2016). Such studies have measured inequality by comparing variations in provincial economic performance. The implicit assumption of this work is that city-specific favouritism displayed by governments, or favourable geographical endowments, spills over to equally benefit an entire province. This assumption, however, needs to be further scrutinised in the African context given the sheer size of provinces. As a result, we examine whether city-specific favouritism and geographical endowments leads to spatial inequality *within* provinces.

Understanding these within-province spatial dynamics are fundamental for policy makers given that most African countries have provincial-level governments that play an important role in driving development outcomes of each province (Iddawela et al., 2021). Therefore, if local policymakers are equipped with both a robust measure of within-province spatial inequality (in the absence of official data) as well as an understanding of what drives spatial

inequality; they will be able to implement redistributive policies that can address inequality derived from either national government quality or variations in geographical endowments.

This study creates a novel index of within-province spatial inequality by using high-resolution satellite imagery of night-time luminosity to calculate the economic performance of municipalities that are nested within a province. We subsequently create Gini coefficients reflecting the variation of economic activity between municipalities within provinces of 52 African countries, and then measure the extent to which both national government quality (measured through the World Governance Indicators) and geographical factors shape spatial inequality.

We subsequently find that national government quality matters just as much as geographical endowments in explaining spatial inequality within provinces. In using a 2SLS instrumental variables approach (which employs European settler mortality rates as an instrument for present-day government quality), we see that the relationship between NGQ and spatial inequality is causal. This appears to suggest that city-specific favouritism of national governments causes inequality within these provinces, rather than benefitting the provinces equally.

Thus, to summarise, there are numerous policy implications of this study. First, our insights on within-provincial spatial inequality can encourage future redistributive policies at both the national and sub-national level. Second, by showing the importance of NGQ we can encourage local policymakers, donors and citizens alike to improve national government quality given the implications for inequality. Finally, our novel measure of within-province inequality can be used to monitor and evaluate interventions that are developed to target spatial inequality in the future.

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Appendix Table 1

Variable	Definition	Source
National Government Quality	Government Effectiveness Score (0-100)	World Governance Indicators
Nighttime light emissions (GDP)	Log of night light density measured using the Visible Infrared Radiometer Suite (VIIRS)	National Oceanic and Atmospheric Administration
Number of gold mines	Number of gold mines	GOLDATA (Balestri, 2013)
Number of petroleum sites	Number of petroleum sites	PRIO
Number of gem mines	Number of gem mines	GEMDATA (Balestri, 2013)
Ruggedness	Terrain ruggedness	Nunn, N., & Puga, D. (2012).
Elevation	log average elevation (metres) from Shuttle Radar Topography Mission dataset at 500m resolution	Consortium for Spatial Information
Temperature	Monthly average of daily mean temperature (2015 and 2016)	University of Delaware's Climate Data Archive
Local Corruption	Afrobarometer Round 5	Afrobarometer Round 5
Local Trust	Afrobarometer Round 5	Afrobarometer Round 5

Appendix Table 2

Summary Statistics

	Observations	Mean	Std. Dev.	Min	Max
Area	720	36870.94	62458.48	1.558356	623514.8
Population	720	253102.5	381833.1	1048.248	5640702
VIIRS	720	623.2273	1780.953	0	22342.28
Precipitation	720	436307.4	784280.5	237.4	8299267
Temperature	720	1316153	1976889	24.3619	1.75E+07

Appendix Table 3

OLS Results using alternative population measures

VARIABLES	(1) Spatial Inequality	(2) Spatial Inequality	(3) Spatial Inequality	(4) Spatial Inequality
NGQ	-0.00485***	-0.00497***	-0.00511***	-0.00517***
	(0.000781)	(0.00105)	(0.000683)	(0.000957)
Precipitation (Gini coefficient)	1.214**	1.020*	0.948*	0.881
	(0.547)	(0.564)	(0.555)	(0.593)
Ruggedness (Gini coefficient)	0.352***	0.326***	0.279***	0.264***
	(0.0851)	(0.0922)	(0.0815)	(0.0941)
Temperature (Gini coefficient)	0.0545	0.181	0.0695	0.151
	(0.158)	(0.178)	(0.146)	(0.168)
lnArea	0.00802	0.00445		
	(0.00880)	(0.0101)		
Population (Gini coefficient)	0.307***	0.339***	0.264***	0.290***
	(0.0601)	(0.0739)	(0.0561)	(0.0692)
Petrol sites	-0.0134	0.00730	-0.0145	-0.00505
	(0.0207)	(0.0250)	(0.0175)	(0.0235)
Gem Mines	0.00268	0.00293	0.00131	0.00117
	(0.00669)	(0.00683)	(0.00598)	(0.00579)
Gold Sites	-0.0133***	-0.0140***	-0.0114***	-0.0119***
	(0.00252)	(0.00291)	(0.00230)	(0.00262)
lnCrop Calories	0.00316	0.00485	0.00675	0.00938
	(0.00815)	(0.00979)	(0.00949)	(0.0116)
Local Corruption		-0.000523		-0.000452
		(0.00193)		(0.00179)
Local Trust		7.58e-05		0.000520
		(0.00152)		(0.00134)
Area (Gini coefficient)			0.242***	0.268***
			(0.0631)	(0.0742)
Constant	0.297**	0.326	0.318***	0.265
	(0.112)	(0.197)	(0.0826)	(0.187)
Observations	615	474	615	474
R-squared	0.459	0.432	0.480	0.459

The table reports cross-regional, cross-country OLS estimates associating NGQ with spatial inequalities. Dependent variable is Gini coefficient of admin 1 spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 4

IV First Stage Results

	(1)	(2)	(3)	(4)
VARIABLES	Spatial Inequality	Spatial Inequality	Spatial Inequality	Spatial Inequality
Settler Mortality	-5.524***	-4.201***	-4.612***	-3.909***
	0.949	1.17	0.988	1.267
Precipitation	51.08*	48.328*	53.572*	50.918*
(Gini coefficient)	30.56	31.763	30.12	30.143
Ruggedness	-6.537	-6.031	-7.168	-7.411
(Gini coefficient)	4.513	5.033	4.856	5.372
Temperature	-17.029	-24.405	-41.57***	-45.807***
(Gini coefficient)	13.752	15.185	13.278	15.524
lnArea	-2.751***	-1.973***		
	0.591	0.678		
Population	-4.727	-1.389	-4.057	-0.734
(Gini coefficient)	3.648	3.991	3.691	3.948
Petrol Sites	-1.533	-1.053	-0.793	-1.036
	1.518	1.72	1.469	1.654
Gem Mines	0.536*	0.271	0.152	-1.109
	0.306	0.314	0.249	0.263
Gold Sites	1.229***	0.503***	1.213***	0.479***
	0.292	0.35	0.274	0.347
lnCrop Calories	-0.309	-0.543	0.338	1.012
	-0.0185	1.142	0.998	1.092
Local Corruption	1.102	0.188*		0.194
		0.114		0.118
Local Trust		0.186**		0.177*
		0.938		0.0982
Area			-3.67	2.661
(Gini coefficient)			3.361	4.203
Observations	403	343	403	343

The table reports first stage of cross-regional, cross-country 2SLS IV estimates examining the impact of NGQ on spatial inequalities. Dependent variable is Gini coefficient of provincial spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 5

Instrumental Variables Results using alternative population measures

VARIABLES	(1) Spatial Inequality	(2) Spatial Inequality	(3) Spatial Inequality	(4) Spatial Inequality
NGQ	-0.0158***	-0.0177***	-0.0151***	-0.0181***
	(0.00266)	(0.00513)	(0.00314)	(0.00572)
Precipitation	1.349**	1.419*	1.166*	1.292
(Gini coefficient)	(0.635)	(0.775)	(0.626)	(0.786)
Ruggedness	0.230**	0.226*	0.181*	0.159
(Gini coefficient)	(0.106)	(0.136)	(0.107)	(0.144)
Temperature	-0.120	-0.207	-0.0983	-0.308
(Gini coefficient)	(0.220)	(0.309)	(0.245)	(0.424)
lnArea	0.00716	0.00467		
	(0.0131)	(0.0179)		
Population	0.103	0.162**	0.0783	0.128*
(Gini coefficient)	(0.0638)	(0.0784)	(0.0613)	(0.0760)
Petrol Sites	-0.0186	-0.00443	-0.0227	-0.0207
	(0.0282)	(0.0412)	(0.0261)	(0.0408)
Gem Mines	0.0115*	0.0103	0.00954	0.00611
	(0.00607)	(0.00681)	(0.00581)	(0.00655)
Gold Sites	0.00776	0.00307	0.00728	0.00387
	(0.00579)	(0.00524)	(0.00613)	(0.00536)
lnCrop Calories	0.0263*	0.0302*	0.0273*	0.0347*
	(0.0149)	(0.0179)	(0.0147)	(0.0199)
Local Corruption		0.000406		0.000694
		(0.00240)		(0.00240)
Local Trust		0.00133		0.00217
		(0.00241)		(0.00239)
Area			0.191**	0.289***
(Gini coefficient)			(0.0737)	(0.0865)
First-Stage F-Test	34.82	13.40	22.36	9.77
Anderson-Rubin P-Value	0.00	0.00	0.00	0.00
Observations	403	343	403	343

The table reports cross-regional, cross-country OLS estimates associating NGQ with spatial inequalities. Dependent variable is Gini coefficient of admin 1 spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 6

Instrumental Variables Results: Geography vs NGQ First Stage Results

VARIABLES	(1) Spatial Inequality	(2) Spatial Inequality
Settler Mortality	-6.074***	-5.934***
	0.815	0.826
Geography	-3.357	-2.94
(Gini coefficient)	0.624	0.643
Area		-9.343***
(Gini coefficient)		3.014
Population		1.355
(Gini coefficient)		3.403
Observations	469	469

The table reports first stage cross-regional, cross-country 2SLS IV estimates examining the impact of NGQ on spatial inequalities. Dependent variable is Gini coefficient of provincial spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 7

OLS Results using alternative population measures

VARIABLES	(1) Spatial Inequality	(2) Spatial Inequality	(3) Spatial Inequality	(4) Spatial Inequality
NGQ	-0.00485***	-0.00497***	-0.00511***	-0.00517***
	(0.000781)	(0.00105)	(0.000683)	(0.000957)
Precipitation	1.214**	1.020*	0.948*	0.881
(gini coefficient)	(0.547)	(0.564)	(0.555)	(0.593)
Ruggedness	0.352***	0.326***	0.279***	0.264***
(gini coefficient)	(0.0851)	(0.0922)	(0.0815)	(0.0941)
Temperature	0.0545	0.181	0.0695	0.151
(gini coefficient)	(0.158)	(0.178)	(0.146)	(0.168)
lnArea	0.00802	0.00445		
	(0.00880)	(0.0101)		
Population	0.307***	0.339***	0.264***	0.290***
(gini coefficient)	(0.0601)	(0.0739)	(0.0561)	(0.0692)
Petrol sites	-0.0134	0.00730	-0.0145	-0.00505
	(0.0207)	(0.0250)	(0.0175)	(0.0235)
Gem Mines	0.00268	0.00293	0.00131	0.00117
	(0.00669)	(0.00683)	(0.00598)	(0.00579)
Gold Sites	-0.0133***	-0.0140***	-0.0114***	-0.0119***
	(0.00252)	(0.00291)	(0.00230)	(0.00262)
lnCrop Calories	0.00316	0.00485	0.00675	0.00938
	(0.00815)	(0.00979)	(0.00949)	(0.0116)
Local Corruption		-0.000523		-0.000452
		(0.00193)		(0.00179)
Local Trust		7.58e-05		0.000520
		(0.00152)		(0.00134)
Area			0.242***	0.268***
(gini coefficient)			(0.0631)	(0.0742)
Constant	0.297**	0.326	0.318***	0.265
	(0.112)	(0.197)	(0.0826)	(0.187)
Observations	615	474	615	474
R-squared	0.459	0.432	0.480	0.459

The table reports cross-regional, cross-country OLS estimates associating NGQ with spatial inequalities. Dependent variable is gini coefficient of admin 1 spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 8

Instrumental Variables Results using alternative population measures

VARIABLES	(1) Spatial Inequality	(2) Spatial Inequality	(3) Spatial Inequality	(4) Spatial Inequality
NGQ	-0.0158***	-0.0177***	-0.0151***	-0.0181***
	(0.00266)	(0.00513)	(0.00314)	(0.00572)
Precipitation	1.349**	1.419*	1.166*	1.292
(Gini coefficient)	(0.635)	(0.775)	(0.626)	(0.786)
Ruggedness	0.230**	0.226*	0.181*	0.159
(Gini coefficient)	(0.106)	(0.136)	(0.107)	(0.144)
Temperature	-0.120	-0.207	-0.0983	-0.308
(Gini coefficient)	(0.220)	(0.309)	(0.245)	(0.424)
lnArea	0.00716	0.00467		
	(0.0131)	(0.0179)		
Population	0.103	0.162**	0.0783	0.128*
(Gini coefficient)	(0.0638)	(0.0784)	(0.0613)	(0.0760)
Petrol Sites	-0.0186	-0.00443	-0.0227	-0.0207
	(0.0282)	(0.0412)	(0.0261)	(0.0408)
Gem Mines	0.0115*	0.0103	0.00954	0.00611
	(0.00607)	(0.00681)	(0.00581)	(0.00655)
Gold Sites	0.00776	0.00307	0.00728	0.00387
	(0.00579)	(0.00524)	(0.00613)	(0.00536)
lnCrop Calories	0.0263*	0.0302*	0.0273*	0.0347*
	(0.0149)	(0.0179)	(0.0147)	(0.0199)
Local Corruption		0.000406		0.000694
		(0.00240)		(0.00240)
Local Trust		0.00133		0.00217
		(0.00241)		(0.00239)
Area			0.191**	0.289***
(Gini coefficient)			(0.0737)	(0.0865)
First-Stage F-Test	34.82	13.40	22.36	9.77
Anderson-Rubin P-Value	0.00	0.00	0.00	0.00
Observations	403	343	403	343

The table reports cross-regional, cross-country OLS estimates associating NGQ with spatial inequalities. Dependent variable is gini coefficient of admin 1 spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 9

OLS Results excluding capital cities

VARIABLES	(1) Spatial Inequalities	(2) Spatial Inequalities	(3) Spatial Inequalities	(4) Spatial Inequalities
NGQ	-0.00485***	-0.00497***	-0.00511***	-0.00517***
	(0.000781)	(0.00105)	(0.000683)	(0.000957)
Precipitation	1.214**	1.020*	0.948*	0.881
(Gini coefficient)	(0.547)	(0.564)	(0.555)	(0.593)
Ruggedness	0.352***	0.326***	0.279***	0.264***
(Gini coefficient)	(0.0851)	(0.0922)	(0.0815)	(0.0941)
Temperature	0.0545	0.181	0.0695	0.151
(Gini coefficient)	(0.158)	(0.178)	(0.146)	(0.168)
lnArea	0.00802	0.00445		
	(0.00880)	(0.0101)		
Population	0.307***	0.339***	0.264***	0.290***
(Gini coefficient)	(0.0601)	(0.0739)	(0.0561)	(0.0692)
Petro Sites	-0.0134	0.00730	-0.0145	-0.00505
	(0.0207)	(0.0250)	(0.0175)	(0.0235)
Gem Mines	0.00268	0.00293	0.00131	0.00117
	(0.00669)	(0.00683)	(0.00598)	(0.00579)
Gold Sites	-0.0133***	-0.0140***	-0.0114***	-0.0119***
	(0.00252)	(0.00291)	(0.00230)	(0.00262)
lnCrop Calories	0.00316	0.00485	0.00675	0.00938
	(0.00815)	(0.00979)	(0.00949)	(0.0116)
Local Corruption		-0.000523		-0.000452
		(0.00193)		(0.00179)
Local Trust		7.58e-05		0.000520
		(0.00152)		(0.00134)
Area			0.242***	0.268***
(Gini coefficient)			(0.0631)	(0.0742)
Constant	0.297**	0.326	0.318***	0.265
	(0.112)	(0.197)	(0.0826)	(0.187)
Observations	615	474	615	474
R-squared	0.459	0.432	0.480	0.459

The table reports cross-regional, cross-country OLS estimates associating NGQ with spatial inequalities. Dependent variable is Gini coefficient of admin 1 spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 10

IV Results excluding capital cities

VARIABLES	(1) Spatial Inequality	(2) Spatial Inequality	(3) Spatial Inequality	(4) Spatial Inequality
NGQ	-0.0169***	-0.0172***	-0.0166***	-0.0179***
	(0.00290)	(0.00502)	(0.00351)	(0.00576)
Precipitation	0.715	0.583	0.540	0.453
(Gini coefficient)	(0.631)	(0.736)	(0.629)	(0.752)
Ruggedness	0.221*	0.238*	0.171	0.174
(Gini coefficient)	(0.114)	(0.140)	(0.115)	(0.149)
Temperature	-0.199	-0.201	-0.233	-0.338
(Gini coefficient)	(0.251)	(0.309)	(0.269)	(0.405)
lnArea	0.00171	0.000811		
	(0.0131)	(0.0178)		
Population	0.124*	0.169**	0.100	0.137*
(Gini coefficient)	(0.0665)	(0.0846)	(0.0651)	(0.0823)
Petrol Sites	-0.0235	0.00573	-0.0254	-0.00761
	(0.0316)	(0.0424)	(0.0294)	(0.0430)
Gem Mines	0.0162**	0.0153**	0.0133**	0.00995
	(0.00685)	(0.00732)	(0.00655)	(0.00727)
Gold Sites	0.0109	0.00513	0.0108	0.00579
	(0.00665)	(0.00582)	(0.00725)	(0.00620)
lnCrop Calories	0.0164	0.0226	0.0199	0.0300
	(0.0203)	(0.0228)	(0.0207)	(0.0257)
Local Corruption		0.00213		0.00250
		(0.00243)		(0.00246)
Local Trust		0.00215		0.00303
		(0.00246)		(0.00249)
Area			0.192**	0.289***
(Gini coefficient)			(0.0778)	(0.0882)
First-Stage F-Test	28.64	14.02	17.15	9.78
Anderson-Rubin P-Value	0.00	0.00	0.00	0.00
Observations	382	326	382	326

The table reports cross-regional, cross-country 2SLS IV estimates examining the impact of NGQ on spatial inequalities. Dependent variable is Gini coefficient of provincial spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 11

OLS Results excluding DRC

VARIABLES	(1) Spatial Ineq	(2) Spatial Ineq	(3) Spatial Ineq	(4) Spatial Ineq
NGQ	-0.00442***	-0.00423***	-0.00464***	-0.00443***
	(0.000782)	(0.00114)	(0.000779)	(0.00112)
Precipitation	1.023*	1.002	0.895	0.886
(Gini coefficient)	(0.588)	(0.646)	(0.604)	(0.677)
Ruggedness	0.336***	0.327***	0.278***	0.271**
(Gini coefficient)	(0.103)	(0.108)	(0.101)	(0.108)
Temperature	0.0382	0.0827	-0.00676	0.0574
(Gini coefficient)	(0.156)	(0.194)	(0.155)	(0.193)
lnArea		0.00438		
		(0.0114)		
Population	0.269***	0.313***	0.244***	0.268***
	(0.0631)	(0.0742)	(0.0588)	(0.0659)
Petrol Sites	-0.00922	0.00595	-0.0126	-0.00495
	(0.0208)	(0.0215)	(0.0175)	(0.0198)
Gem Mines	0.00485	0.00369	0.00286	0.00241
	(0.00758)	(0.00799)	(0.00723)	(0.00688)
Gold Sites	-0.0123***	-0.0138***	-0.0111***	-0.0118***
	(0.00230)	(0.00288)	(0.00232)	(0.00267)
lnCrop Suitability	-0.0108	-0.00946	-0.00645	-0.00566
	(0.00976)	(0.0121)	(0.0112)	(0.0142)
Local corruption		0.000213		0.000250
		(0.00218)		(0.00203)
Local trust		0.000278		0.000651
		(0.00175)		(0.00161)
Area			0.202***	0.243***
(Gini coefficient)			(0.0655)	(0.0725)
Constant	0.492***	0.385	0.433***	0.339
	(0.0833)	(0.243)	(0.0991)	(0.232)
Observations	591	474	591	474
Country x Year FE	Yes	Yes	Yes	Yes
R-squared	0.424	0.430	0.439	0.452

The table reports cross-regional, cross-country OLS estimates associating NGQ with spatial inequalities. Dependent variable is Gini coefficient of admin 1 spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 12

IV Results excluding DRC

VARIABLES	(1) Spatial Ineq	(2) Spatial Ineq	(3) Spatial Ineq	(4) Spatial Ineq
NGQ	-0.0163***	-0.0180***	-0.0160***	-0.0186***
	(0.00270)	(0.00535)	(0.00302)	(0.00599)
Precipitation	1.006	0.919	0.852	0.823
(Gini coefficient)	(0.638)	(0.755)	(0.621)	(0.769)
Ruggedness	0.225**	0.232*	0.168	0.165
(Gini coefficient)	(0.111)	(0.129)	(0.112)	(0.139)
Temperature	-0.210	-0.302	-0.244	-0.445
(Gini coefficient)	(0.245)	(0.327)	(0.261)	(0.440)
lnarea	0.00262	0.00123		
	(0.0128)	(0.0179)		
Population	0.122*	0.145*	0.103	0.112
	(0.0696)	(0.0826)	(0.0666)	(0.0806)
Petrol Sites	-0.0299	-0.00544	-0.0349	-0.0211
	(0.0302)	(0.0410)	(0.0280)	(0.0412)
Gem Mines	0.0155**	0.0143**	0.0121**	0.00972
	(0.00638)	(0.00703)	(0.00611)	(0.00669)
Gold Sites	0.00939	0.00296	0.00933	0.00386
	(0.00612)	(0.00551)	(0.00636)	(0.00565)
lnCrop Suitability	0.0132	0.0187	0.0163	0.0237
	(0.0187)	(0.0218)	(0.0192)	(0.0241)
Local corruption		0.00177		0.00209
		(0.00245)		(0.00246)
Local trust		0.00192		0.00276
		(0.00250)		(0.00251)
Area			0.222***	0.280***
(Gini coefficient)			(0.0826)	(0.0886)
Observations	379	343	379	343
Country x Year FE	Yes	Yes	Yes	Yes
F-test (first stage)	34.04	12.89	23.79	9.52
R-squared	-0.130	-0.334	-0.079	-0.347

The table reports cross-regional, cross-country 2SLS IV estimates examining the impact of NGQ on spatial inequalities. Dependent variable is Gini coefficient of provincial spatial inequalities using VIIRS night light luminosity per capita. Standard errors clustered at country level. *** p<0.01, ** p<0.05, * p<0.1

Paper 4 – Bureaucratic insulation vs accountability: interventions to improve service delivery in Kampala

Abstract:

Service delivery in places such as Kampala, Uganda, are marred by inefficiency, corruption, and negligence. Research suggests that a lack of resources and capacity are primary factors in driving poor service delivery. However, once resource and capacity constraints have been addressed, there is an ongoing debate on how service delivery can be further improved. One argument suggests that bureaucratic insulation – in other words, autonomy – is fundamental to improving government services. This is because government officials, once insulated from influences of corruption (either top-down from politicians, or bottom-up from citizens), are enabled to act in the most effective way. The other argument, driven by principal-agent theories, suggests that increasing accountability to political leaders and citizens ensures that government officials act in the most effective way. This paper sheds light on this debate by examining whether accountability interventions can improve service delivery in settings which do not have bureaucratic insulation. I examine this qualitatively by analysing a citizen feedback initiative conducted by an NGO, SEMA, in Kampala. The analysis shows that interventions designed to improve accountability can in fact play an important role in improving service delivery. It does so by establishing incentives for government officials to perform better, while also creating an evidence base so officials can lobby for more resources. However, such interventions on their own are ultimately unable to tackle systemic forms of corruption, which may be sewn into the fabric of government institutions and everyday life.

1. Introduction

Previous essays in this thesis have examined the impacts of government quality on economic development in African regions (paper 1), spatial inequality (paper 3), as well as some of the drivers of sub-national government quality (paper 2). This essay therefore builds on these pieces of work by qualitatively evaluating an intervention designed to improve government quality and local service delivery in one African region - Kampala.

According to the United States Agency for International Development (USAID), "the delivery of government services throughout Uganda has long been imperilled by a lack of accountability, cumbersome systems, and corruption. In short: governments are not providing their communities with the basic services they need" (USAID, 2016). The three most prominent causes of poor service delivery are: weak capacity of staff (Nannyonjo and Okot, 2013), under-resourcing of government offices (Muriisa, 2008), and inefficient allocation of existing resources (Mitchinson, 2003). However, once resource and capacity constraints have been addressed, an ongoing academic debate emerges on how service delivery can be further improved.

On the one hand, it is argued that bureaucratic insulation – in other words, the autonomy of government officials – is fundamental to improving government performance (Jimenez, 2020; Mueller, 2015; Hearn, 2001). This is because insulation from top-down donor pressure, political influence, and short-term, populist demands of voters, allows government officials to rely on expert knowledge and professional norms to deliver the highest quality services to citizens. On the other hand, it is argued that greater accountability is needed because, without accountability to citizens, government officials will resort to self-interest (Dewatripont et al., 1999; Kluvers and Tippett, 2010; Ananyev, 2020).

This paper aims to shed light on this debate by qualitatively addressing the research question: can accountability interventions improve service delivery in places that do not have an insulated bureaucracy? I do so by examining a citizen feedback intervention in Kampala, Uganda that is being conducted by an NGO, SEMA. SEMA promotes accountability of government offices to citizens by surveying citizens on their experiences of service delivery. This information is then anonymised, aggregated, and presented back to government offices in

the form of a monthly report. Through this, the accountability of government officials is improved, while the level of bureaucratic insulation remains constant.

The paper draws on three rounds of semi-structured interviews over five years. Using three sets of interviews in this way enables me to both triangulate across different sets of informants and investigate the impact of the programme over time. It has also allowed me to conduct research in the context of the COVID-19 pandemic. I interviewed 42 citizens in 2016 about their experiences with service delivery in Kampala, then, following the establishment of SEMA's intervention in 2018, I analyse survey responses of citizens, government officials, and SEMA volunteers (responsible for collecting feedback) in 2020[13]. Finally, I conducted virtual key informant interviews with core SEMA staff members in 2021. This paper is, to the best of the author's knowledge, the first attempt to explore the impact of accountability mechanisms in Kampala.

The case of Kampala is particularly interesting. Kampala, and Uganda more broadly, has witnessed a decline in the quality of service delivery over the past two decades (Nangoli et al., 2015). This has taken place in a context where government offices, both national and local, lack bureaucratic insulation. For example, the Kampala Capital City Authority's executive director is appointed by the Ugandan President. This lack of insulation has led to a culture of corruption being normalised in government offices (Bainomugisha, 2015). As a result, SEMA's work in Kampala is a case study on whether accountability interventions can promote service delivery in a setting that lacks bureaucratic insulation.

The results demonstrate that increasing accountability is a promising way of improving service delivery in places with limited bureaucratic insulation. This intervention works because it is a tool that motivates officials to provide better services, while also acting as a mechanism to quantify performance and track improvements to it. However, I find that citizen feedback is best suited to addressing certain barriers to service delivery that stem from the absence of an incentive structure. The most prominent of these is the lack of motivation of Kampala's government officials. It can also indirectly empower certain government offices to lobby for

[13] Given the COVID-19 pandemic during 2020, surveys of citizens and SEMA feedback collectors were conducted in Kampala by a third party, Busara. Additionally, interviews in 2021 were remotely conducted by the author.

more resources and training for staff. However, larger structural problems (e.g. a culture of corruption) must be addressed together with other means – such as bureaucratic insulation.

The paper is structured as follows. Section 2 reviews the literature debating the importance of accountability measures versus bureaucratic insulation measures in improving service delivery. Section 3 discusses the context of service delivery in Kampala and provides an overview of this paper's method, section 4 presents the results of the qualitative analysis, while section 5 concludes.

2. Improving service delivery: accountability vs bureaucratic insulation

Well-functioning government agencies are fundamental to improving service delivery, and in promoting development, economic growth and well-being (Acemoglu and Robinson, 2012; Chanda and Putterman, 2005; Evans et al., 2017). There is broad consensus that two of the most powerful ways of improving service delivery are by addressing resource constraints (Oates, 1972; Bovaird and Loffler, 2002; Khemani, 2001) and capacity constraints (Watson and Yohannes, 2005; Grindle and Hilderbrand, 1995) – particularly in the case of developing countries. These take the form of increasing funding to government offices, as well as improving education and training for government officials.

However, once resource and technical capacity constraints have been addressed, a debate opens up over the best methods of further improving service delivery. One school of thought argues that government offices need to be further insulated from sources of corruption (either top down from politicians, or bottom-up from citizens). On the other hand, a different school of thought argues that increasing accountability to political leaders and citizens is the best way of ensuring that government officials provide services in the most effective way.

Countries, such as Uganda, have entrenched elements of clientelism and patronage (Green, 2010). This culture of clientelism and patronage is driven by authoritarian rulers - Yoweri Museveni in the case of Uganda – who systematically ensure that all arms of government and power are firmly within the control of the president, the president's ethnic group, as well as the ruling party (Tripp, 2010). Clientelism and patronage has therefore permeated ethnic groups. And as a result, voting patterns in these contexts are influenced by ethnic group associations

(Kramon, 2019), while there is an expectation that jobs will be handed out to members of the same tribe or family connections rather than on merit or technical capacity (Findley et al., 2017).

One school of thought believes that the solution to protecting government offices from this type of clientelism and patronage is through increasing its insulation from top-down political pressures, and bottom-up influences from citizens. The main argument is that bureaucratic insulation allows officials to pursue preferences and formulate the most effective way of delivering services completely independently (Schneider, 1993). In other words, with insulation, government officials are free to choose the best methods of service delivery without pressure from short-term political interests, special interest groups, or citizens who may attempt to bribe officials for preferential treatment. Jimenez (2020), in analysing financial reports from local governments in the United States, finds that a lack of bureaucratic insulation incentivises governments to adopt policies solely because they are popular with voters (e.g. tax cuts and higher government spending). This subsequently leads to budgetary imbalances and long-run fiscal issues. However, when there is adequate bureaucratic insulation, experts are able to draw on their expertise to choose policies that result in the best outcomes for citizens. Similarly, Nistotskaya and Cingolani (2016), undertake a cross-country analysis of 135 countries using the University of Gothenburg's Quality of Government survey. They find that countries which have more bureaucratic insulation from day-to-day oversight of politicians, tend to implement more effective regulation, as well as experience higher levels of entrepreneurship. These studies, however, do not pay enough attention to the African context where capacity levels of government staff may be lower than those in more developed countries. In other words, if bureaucratic insulation takes place in contexts with lower technical capacity, this could negatively impact service delivery. However, to address these concerns, Rasul and Rogger (2016), analyse 4,700 engineering projects in Kenya – a country which has less technical capacity amongst government officials than in the United States. Despite having lower technical capacity, the findings appear consistent. They determine that increasing the autonomy of bureaucrats is positively associated with project completion rates. Meanwhile both monitoring practices and interventions designed to incentivise the performance of bureaucrats were both negatively associated with project completion rates. As a result, this school of thought's argument is that bureaucratic insulation leads to better quality service delivery both in developed and less-developed contexts.

Conversely, another school of thought has emerged which states that, in order to improve service delivery, accountability mechanisms[14] need to be introduced so bureaucrats act in the most effective way possible. In other words, greater access to citizens and political masters would improve service delivery. This thinking stems from the work of Tullock (1965:32), who argues that every government official "will only carry out assigned tasks if this proves the best way of attaining his [sic] own ends, and will make every effort to change the tasks so as to make them more in keeping with these objectives". Similarly, Downs (1967), builds on this by arguing that "every official is significantly motivated by his [sic] own self-interest even when acting in a purely official capacity". Finally, Niskanen (1971) came up with the concept of the 'bureaucratic utility function', whereby government officials weigh their decisions based on salary, the prerequisites of office, public reputation, power, patronage, the output of an office, ease of making changes and ease of managing an office. In other words, these theories suggest that without adequate accountability mechanisms and with too much bureaucratic insulation, officials will not act in the best interests of citizens. This is because, they argue, bureaucrats fundamentally act out of self-interest. According to Schultz (2003), these issues are compounded because government officials are far less accountable than politicians. They typically cannot be removed from office due to changes in voters' behaviour. Such theories argue that accountability interventions are the best way of improving service delivery.

Accountability mechanisms have most often been explained through principal-agent theories. For example, elected representatives or citizens act as 'principals' – they either set policies or vote for policies. These policies are then administered by 'agents' – i.e. the bureaucrats, whose role revolves around policy implementation (Olsen, 2015). Agents can be adequately supervised when there is transparency around the performance of government offices and officials (Minelli and Ruffini, 2018). The core argument is that, through accountability interventions, citizens and elected representatives are able to monitor bureaucrats – holding them to account. This prevents them from acting in self-interested ways. Moreover, when the performance of government offices is publicised, this also creates a sense of competition between offices who are interested in performing better to 'beat' other offices. In this sense, accountability measures can simultaneously facilitate a form of self-regulation through this 'competition effect' (Dijkman and Kenagh, 2021).

[14] Drawing on Boven's (2007) work, accountability is defined as the requirement for government officials to have their conduct scrutinised, and an obligation for them to justify their conduct.

Based on these theories, there have been a handful of accountability interventions in the form of citizen feedback mechanisms conducted over the past two decades. Gaventa and Barrett (2012) conducted a meta-analysis of 100 studies focused on citizen feedback initiatives and found mixed results. On the one hand, citizen feedback could lead to greater access to services and resources (Ho et al., 2015), greater protection of legal rights (Björkman & Svensson, 2009) and enhanced state responsiveness and accountability (Callen and Hasanain; 2011). However, on the other hand, citizen feedback programs could also lead to a denial of state services (Mahmud, 2010); social economic and political reprisals (Osaghae, 2010), or violence or coercive government responses (Mohanty, 2010). As a result, the literature is far from clear on whether accountability mechanisms, in the form of citizen feedback initiatives, are truly able to improve service delivery – particularly in places like Kampala which do not possess bureaucratic insulation.

To summarise, once controlling for factors such as resource constraints and technical capacity constraints, the academic literature is divided on how best to improve service delivery. Moreover, the empirical evidence for accountability interventions (in the form of citizen feedback mechanisms) similarly appears to be divided. As a result, this paper aims to bring greater clarity to whether accountability interventions can be a useful method of improving service delivery in a context characterised by limited bureaucratic insulation.

3. Context and Method

3.1 Overview of SEMA's citizen feedback intervention

For the purpose of this paper, 'service delivery' captures services that are administered by both the national government, as well as local governments in Greater Kampala, such as the Kampala Capital City Authority (KCCA), Mukono District local government, Wakiso District local government and Jinja District local government. The main services assessed in this paper are local police stations (administered by the national government), and local health centres (administered by local government).

The intervention analysed is a form of citizen feedback that has been facilitated by an NGO, SEMA, in Greater Kampala. SEMA records citizens' feedback on their experiences with local

government officials. They do this by mobilising volunteers to conduct on-site interviews with citizens. Their volunteer data collectors are located at the exits of local government offices. Upon leaving the office, citizens are asked about their experiences, wait time, and overall satisfaction. Volunteers are trained in survey collection methods – for example ensuring leading questions are avoided and to read body language of respondents.

Information gathered through the surveys and devices is aggregated into a monthly one-page report, which is delivered to the head of each local government office. The report provides a grade, shows performance compared to the previous month, compares the office to other offices, and explains where an office performed well and where it needs to improve. The report is deliberately written in an easy-to-understand manner so that officials who did not finish a secondary school degree are able to interpret it (SEMA, 2020). In order to build trust with government officials, SEMA does not publish these reports. Additionally, at the end of the year, a local government office of the year is announced to further incentivise better performance.

The program's hypothesis is that if citizen feedback is presented to government offices regularly and in an easy-to-understand format, this will increase accountability, and incentivise service delivery improvements while simultaneously providing a mechanism to monitor and evaluate the quality of services over time. Since launching in March 2018, SEMA has obtained over 50,000 survey responses (SEMA, 2019). SEMA's citizen feedback was conducted at 18 government offices in Kampala.

3.2 Methodology

The paper draws on three rounds of semi-structured interviews over five years. As such, this enables me to both triangulate across different sets of informants and to investigate the impact of the intervention over time. In doing so, the paper draws on the hermeneutic tools of 'thematic analysis' to identify the impact of SEMA's accountability interventions on service delivery in Greater Kampala. Three rounds of interviews were conducted. The first in June-July 2016 to understand the level of service delivery and the impacts it was having on citizens and businesses; the second set of interviews were, given the COVID-19 pandemic, conducted by a third-party, Busara, in-person between August-September 2020; while the third set of

interviews involved virtually interviewing key informants who worked for SEMA in January 2021. No respondent was interviewed more than once. I provide further details below.

3.2.1 Interviews in 2016

In 2016, I conducted 42 semi-structured interviews with citizens on their interactions with government officials. In addition, I conducted a number of elite key informant interviews: two with Kampala local government (KCCA) officials, one from the Ugandan central government (Uganda Investment Authority), and one from the Buganda Kingdom (Buganda Land Board). The interviews were conducted in English by the author, along with two Ugandan research assistants from Makerere University.[15] The author's status as an outsider may have potentially limited the desire of individuals to share their experiences openly, however this may have been mitigated by the presence of Ugandan counterparts. There was an initial concern that three interviewers could intimidate respondents, however it appeared not to be an issue with over 90% of respondents eager to continue discussing issues after our allotted time and questionnaire had been exhausted.

To gain trust and build rapport, interviewees were called prior to the interviews, whereby the purpose of the questionnaire was explained. Upon the interviewers' arrival, respondents were presented with a letter that reiterated the purpose of the study. Recordings were not taken given the sensitivity of the questions asked. Respondents were contacted given their frequent interaction with government offices. They were then asked to provide further contacts. A snowball selection of interviewees was therefore used in the sampling strategy.

3.2.2 Interviews from 2020

The second source is a set of interviews conducted in 2020 by the Busara Centre for Behavioural Economics, who performed an evaluation of SEMA's program in Kampala. Given the ongoing COVID-19 pandemic and the associated travel restrictions, I was unable to conduct in-person interviews. As a result, I undertook secondary analysis of Busara's survey responses.

[15] Funding for these interviews was from the World Bank's *Enhancing the Economic Performance of African Cities Activity*.

Busara's objective was to explore perceptions of the citizen feedback intervention, and its effectiveness in helping improve public service delivery.

40 in-depth interviews and one focus group discussion were conducted in total. This involved 20 interviews with citizens, 10 interviews with government officials, 10 interviews with SEMA volunteers and one focus group discussion with nine volunteers, and 12 public officers. All citizens interviewed had been those who had visited government offices where SEMA operates. Likewise, government officials comprised of municipal council workers, police station staff and health centre staff to capture variations across different types of local government offices that work with SEMA.

In-depth interview questions were open ended and exploratory. This ensured respondents were not asked any leading questions that would bias results. Interviews were conducted by Ugandan interviewers in English and audio was recorded with the consent of respondents. Interviewers captured information on responses, but also observational information such as body language and tone of voice. This information was included in transcriptions.

3.2.3 Interviews from 2021

Finally, to triangulate the results from 2020, I conducted five in-depth interviews with key-informants from SEMA. Given the COVID-19 pandemic, interviews were conducted remotely through videoconferencing. Moreover, due to issues with internet connectivity in Uganda following the 2021 presidential elections, two interviews were conducted without video. Interviews were semi-structured and conducted in English with a range of staff including senior managers and training staff.

Given the sample sizes used in this study, the analysis does not claim to conclusively measure the full impact of citizen feedback on all citizens of Kampala. This would require significantly more resources, coupled with quantitative data that can be disaggregated to control for various factors such as distance of respondents' homes to government offices and their socio-economic status (which cannot be addressed with a small sample). Instead, this paper's more modest aim is to provide new empirical analysis on whether accountability interventions can improve service delivery in context characterised by limited bureaucratic insulation.

4. Empirical Analysis

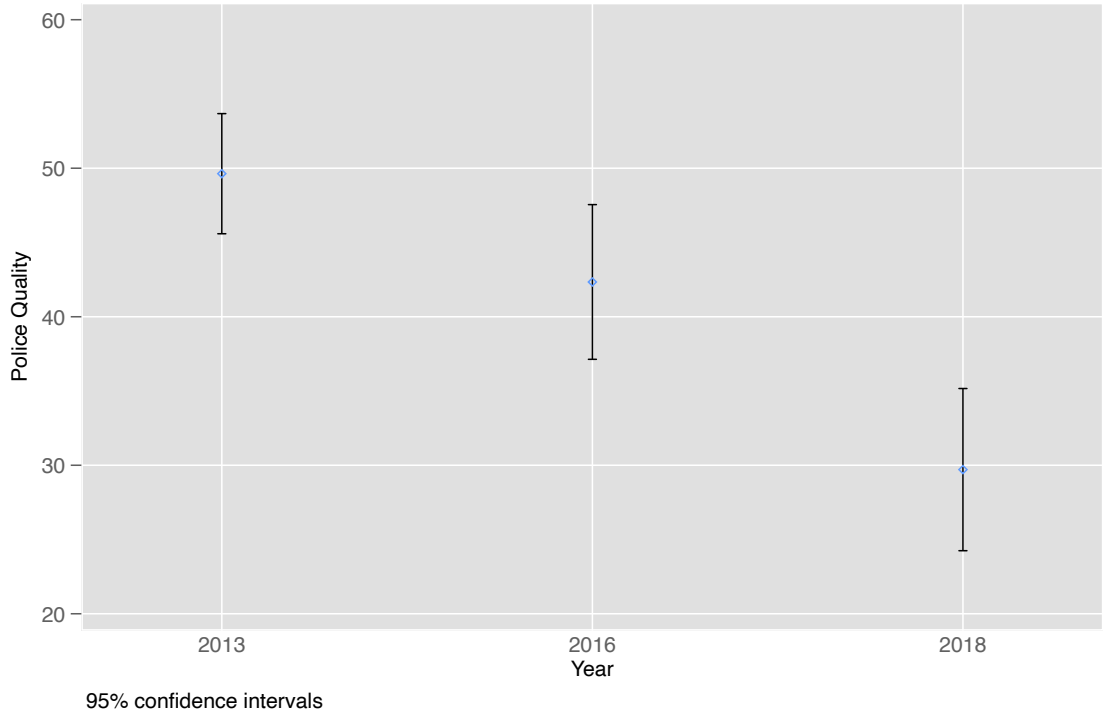
4.1 The state of service delivery in Kampala

Service delivery in Kampala, prior to 2018 (the first year of SEMA's intervention) was widely reported by respondents to be poor, while bureaucratic insulation was virtually non-existent. Uganda is characterised by a dominant, authoritarian political party, the National Resistance Movement (NRM), which controls the government apparatus. NRM and its leader, President Yoweri Museveni, have been in power since 1986. The President not only possesses the authority to nominate heads of national government agencies, but also the leaders of local government institutions, such as the Kampala Capital City Authority (KCCA). As such, government offices are seen to respond to the political wills of the autocracy. In other words, in settings such as Uganda, which are characterised by lower levels of electoral accountability, the lack of bureaucratic insulation heightens concerns about politicians interfering in the running of the bureaucracy (Martin and Raffler, 2021). This in turn disseminates a culture of political interference throughout the government apparatus. With this context in mind, respondents in 2016 identified three main issues related to service delivery: corruption, unmotivated staff, and resource constraints.

Respondents viewed corruption as something of a cultural norm within Ugandan governments. As one respondent stated, "there is systemic corruption from top to bottom which is making service provision hard" (Key Informant Interview #8, 2016). In this context of poor bureaucratic insulation, one government official admitted that they experience "political interference in the way we perform our tasks" (Key Informant Interview #3, 2016). These findings are widespread. For instance, Nangoli et al. (2015), conducted a survey with 250 respondents in Kampala during 2014. They found that corruption and nepotism within governments was ubiquitous. Another respondent, who works for KCCA, stated that 70% of all court cases are related to land disputes, most of which involve corruption among government officials (Key Informant Interview #5, 2016). These findings are further triangulated in analysing survey responses from Afrobarometer – a large sample survey of the perceptions of African citizens – on citizens' perceptions of corruption. Citizens' mean perception of the quality of the police (administered by the national government), deteriorated

over the same period (see Figure 1 - 100 is highest level of police quality, 1 is poor level of police quality).

Figure 1: Perceptions of Police Quality in Kampala



One of the most widely reported issues with service delivery, however, related to unmotivated staff. Almost all citizens discussed experiences at government offices where they were either ignored by staff, or where staff had come into work late, taken long lunch breaks, or left work early. One respondent stated "time management is a big issue. You come to an office and its 9am and staff are having breakfast. But there is a very long line waiting" (Interview #12, 2016). Another citizen stated that "some [officials] are rude before they even know what you want. They treat you like you're not important." (Interview #7, 2016). Part of the reason for this behaviour is that officials are not incentivised to provide better services – particularly in terms of financial compensation. They do the bare minimum required to keep their job.[16] One key

[16] A key informant (Informant #2, 2021) described how it is difficult for government officials to lose their job due to bad performance: "Government employees do not easily lose their jobs. It takes like a big corruption scandal or a big case like murder for someone to be sacked. Even then the person temporarily resigns until they are proved guilty…Basically these guys are never really under pressure to lose their jobs. All their contracts are permanent until they either die or commit a grave offence against the law."

informant – a local government official – stated that if officials were better compensated, their attitude to work would change:

> "if you looked at the benefits to the staff like recruitment benefits like if you give a person medical insurance, promotional opportunities, holiday packages the person will really be happy and will definitely change attitude towards service delivery" (Key Informant Interview #5, 2016).

While it may seem obvious that officials would argue for better pay for themselves, numerous reports demonstrate the stark inequities of compensation for Ugandan government officials. For instance, the Ugandan Equal Opportunities Commission found in 2015 that in some agencies the highest paid employee received 50 times more than the lowest paid employee (EOC, 2016). By 2017, this figure had grown to the highest paid government employees receiving 277 times the lowest employees (East African, 2017). This growing civil servant wage inequality, and the broader issues of inadequate incentives for officials, therefore culminates in a lack of motivation to improve their performance (Key Informant Interview #7, 2016).

Third is the ongoing issue of inadequate resourcing for government offices. For instance, local governments in Uganda receive the majority of their funds through direct transfers from the central government. The Ugandan Auditor-General (Office of the Auditor General, 2016), found that the allocation of conditional grants to local governments is not in line with the formula agreed upon by the central government's Local Government Finance Commission, or that which is enshrined in Article 193 of the Constitution. As a result, local governments have not received the expected increases in transfers to match the rising cost of delivering services. This was an issue raised by a number of informants. One stated:

> "Funds are not enough. Sometimes we want to do something but we are limited with budget. If development partners don't come in its [services are] stopped. …Look at the hospitals. If we had enough funds, the hospitals here would be having an ambulance." (Key Informant Interview #1, 2016).

There is a relationship between corruption and inadequate funding. There have been reports that, while funding is allocated to government offices and local governments, this funding ends up becoming lost. For example, in 2018, despite the central government increasing funding for road infrastructure development, the quality of

roads deteriorated. This was reportedly due to widespread corruption in local governments (Bainomugisha et al., 2020).

Inadequate resourcing also plays a significant role in entrenching human capital constraints. Most of the respondents I spoke with who worked for government described their desire to have opportunities to receive training and to develop their skills. However, resources have not been adequately freed up to promote capacity building programs. One key informant stated:

> "Maybe I could be performing badly because of lack of capacity but if I can be given an opportunity to train to perform better; that would help us on various issues." (Key Informant Interview 3).

These findings are not new. The lack of technical capacity in service delivery has been widely studied in the realm of Uganda's health system (Nannyonjo and Okot, 2013; and Akin et al., 2005), rural development projects (Nsingo and Kakmba, 2008); environmental policy (Turyahabwe et al., 2006); and procurement planning (Basheka, 2008).

In summary, prior to 2018, there appeared to be three primary reasons why service delivery was deteriorating in Kampala: corruption, disenfranchisement of government officials, and inadequate resources. These issues take place within a government architecture that has a clear lack of bureaucratic insulation. The next sub-section examines how accountability mechanisms can impact service delivery in the context of Kampala's environment of limited bureaucratic insulation.

4.2 SEMA's Citizen Feedback Accountability Intervention

Contrary to the belief that bureaucratic insulation is the key to improving service delivery (once controlling for funding and capacity), SEMA conducted an in-depth accountability intervention by collecting feedback on citizens' experiences with government offices. This feedback was given back to government officials in the form of monthly progress reports. A key informant from SEMA stated that, prior to 2018, "the incentive structure didn't exist in the [Ugandan] public sector system" (Interview #4, 2021). Hence, accountability, through the form of citizen feedback, can establish incentives for government officials to improve the quality of the service they provide. This section examines whether, in the context of limited bureaucratic insulation,

accountability interventions were able to address the aforementioned factors that impede service delivery in Kampala.

Corruption, as discussed previously, is sewn within the fabric of Uganda's governmental architecture. As one police officer stated: "there is systematic corruption from top to bottom, which is making service provision hard" (Interview #7, 2020). Corruption in Kampala comes from three places: (1) a normalised expectation of clientelism and nepotism – as a key informant from SEMA explained, "it starts early on in the smallest places…you're expected to give a job to someone because you're related" (Interview #1, 2021), (2) top-down political interventions – a police officer described how "there is political interference in the way we perform our tasks" (Interview #1, 2020), or (3) bottom-up – e.g. citizens who want to cut a queue at an office, or want a favourable outcome may offer bribes to officials. From this, there appear to be two root causes of corruption – culture, and low compensation of government officials.

These issues related to corruption are structural. As such, the results of SEMA's accountability intervention have been mixed with regards to addressing corruption. Given the pervasive nature of corruption, the full extent of corruption cannot be adequately measured solely through citizen feedback. This is because corruption can take place behind the scenes and at higher levels, without citizens directly experiencing it (e.g. from top-down political pressures) (Interview #2, 2021). A key informant from SEMA therefore thought that bureaucratic insulation would be helpful in shielding government officials from being influenced by the culture of corruption. This is because, "if people say it's alright to take a bribe because everyone's doing it and nobody's saying anything about it, then you start doing the same" (Interview #4, 2021). Nevertheless, accountability interventions have had some impact. In one example, a local police chief had utilised citizen feedback from SEMA's intervention to fire police officers who were accused of corruption. However, the problem is that:

> "those corrupt officers [who were fired from an office, still] remain in the system. Then one way or another, during rotations, they come back to other departments where they can access citizens and ask for money again." (Interview #1, 2021).

In other words, while this intervention may address corruption in one office, when a corrupt official is re-assigned to a different office, this ends up re-distributing corruption rather than eradicating it.

With regards to the second root cause of corruption, key informants described how government officials would accept bribes and participate in corruption because their salaries are so low (Interviews #1, 3, 5, 7 & 8; 2020). As one police officer stated, "money is a factor" that leads to corrupt behaviour within police stations (Interview #5, 2020). In these instances, while accountability interventions can provide certain incentives to promote less-corrupt behaviour and slowly change culture over time, it does not directly address the other root cause of the problem – the need for better pay and conditions for staff. As a result, accountability mechanisms on their own are unlikely to make long-term improvements in corruption within service delivery in Kampala.

The second service delivery issue raised by respondents in 2016 was related to government officials being unmotivated to help citizens. In 2020, numerous citizens similarly discussed experiences where government officials would ignore whoever came into their office or would take long breaks throughout the day while people were lining up to be served (Interviews #9, 10, 13, 14, 16, 19, 22, 24, 25 and 26; 2020). This points to a broader underlying problem within the Ugandan civil service: the lack of an incentive structure. Officials do not get compensated adequately, and similarly complain about the lack of a defined career trajectory with ongoing promotion opportunities (Interview #7, 2020). However, aside from inadequate wages, there is a significant lack of non-financial incentives to drive performance.

Bureaucratic insulation interventions – i.e. simply shielding officials from perverse incentives that come either top-down (from higher ranking officials), or bottom-up (from citizens) – are not able to manufacture incentives where incentives are largely absent (Mueller, 2015). However, in bureaucratic systems where there are adequate incentives (e.g. financial compensation or promotion opportunities) which incentivise and reward technical performance, bureaucratic insulation can be an effective tool to mitigate perverse incentives and improve service delivery (Jiminez, 2020). Given Uganda lacks such an incentive structure, bureaucratic insulation is unlikely to address the motivation of officials.

Creating incentives has been the primary achievement of SEMA's citizen feedback intervention. SEMA has managed to create incentives in two ways: first, by facilitating feedback of citizens on the performance of officials, and second by creating a sense of competition to drive performance improvements.

In terms of facilitating feedback, SEMA's monthly report provides information on the performance of individual government officials (based on the assessments gathered from citizens). This feedback quantifies performance, while also providing a useful benchmark. As a result, officials (and their managers) can track whether the service they provide to citizens is improving or deteriorating each month. Government respondents described how they are incentivised to act because they do not want their managers to see that their performance is declining (Interviews #1, 2, 3 & 5; 2020). Moreover, government officials stated that they also looked forward to seeing the positive pieces of feedback they receive from citizens. As one official described:

> "Both sides encourage us. When there is a declined performance, we have to work hard to see that that image is improved. When there is a good performance, it also motivates us to continue performing. So either way pushes us" (Interview #3, 2020).

This feeling was echoed by another key informant who was enthusiastic that "these reports give credit where it is due" (Interview #1, 2020).

In relation to creating a sense of competition, SEMA's monthly reports rank the performance of various areas within a government office (e.g. finance or HR), while also ranking the performance of a government office in relation to other government offices in the neighbourhood. One key informant called this ranking feature a "motivating structure" for them (Interview #5, 2020), and this was further heightened by 'winners' being recognised for good performance through awards. This aligns with some of the literature in behavioural psychology which emphasises the need for a rewards framework in order to incentivise performance improvements in organisations (see Cappa et al., 2020; and Vandevijvere et al., 2019).

Taken together, the facilitation of feedback and the competition framework, has been responsible for motivating staff – filling the vacuum of inadequate incentives for performance. A key informant from SEMA stated that:

> "We've been most successful at changing the culture at the local office…staff are laughing more often when they see you as a client, they're showing basic friendliness, because they feel like someone is actually watching them and they're going to be rated at the end of the month…as a result we've been able to influence civil services at a very local level to service their clients in a better way." (Interview #4, 2021).

These findings were confirmed by another SEMA staff member who said:

> "we've been very successful at changing the mentality of public officers. It gets to the point where public officers get a sense of ownership over their work…Now they understand that their job directly impacts citizens."

The final service delivery issue which respondents raised in 2016 related to inadequate resourcing of government offices. Inadequate resourcing has had three main effects: low pay for government officials, a lack of training to improve technical capacity, and under-funded services. These have respectively led to unmotivated staff, staff lacking key competencies, and citizens who are denied access to basic services.

The literature on bureaucratic insulation is not clear on whether further insulation can allow officials to obtain further resources when required. On the one hand, bureaucratic insulation could lead to more efficiency gains as bureaucrats are free to provide services in the most efficient way possible (Schneider, 1993; Jimenez, 2019). As a result, this may mitigate the need to ask for further resources. However, on the other hand, in many developing countries, efficiency gains are unlikely to alleviate the need for further resources (Robinson, 2007). In other words, potential efficiency gains are not likely to offset the degree of under-funding. Accountability mechanisms on the other hand, appear to have more promising results with addressing resource constraints – particularly in the long term.

Under-resourcing is a structural issue with service delivery, which makes it difficult to be addressed by accountability mechanisms in the short-term. One key informant from SEMA described an incident where:

> "One of the complaints [at a small police station] was that the suspects who were arrested were not getting food. So that meant the police force were not providing the suspects with lunch, some tea, or some water or anything… So when we raised that complaint we told them [the manager of the local police station that] suspects are hungry all the time. They told us that they're not in position to offer them food. So they asked us to raise it to headquarters… We raised the issue to police headquarters. The police headquarters said they don't have a budget to provide food for small police offices located in the communities…because the money they get from the Ministry of Finance isn't enough to provide food…So most of the managers really do what can be done within their office…but sometimes they're not able to do some of these things, especially if something needs money. These are things they're not addressing." (Interview #2, 2021).

As such, it is evident these types of citizen-feedback accountability mechanisms are more impactful in situations where the manager of an office can address resource-constraints directly. When resources are constrained by factors outside of the manager's immediate control, it becomes more challenging to enact change.

However, there have been some cases where citizen feedback reports were used by government officials as evidence to lobby headquarters for further resources. For example, there have been instances where offices have obtained SEMA reports describing how citizens would get lost in their building, or that citizens were having issues accessing official forms and documents. Using these reports, officials were able to lobby headquarters for funding to procure navigation signs for buildings, and purchase printers to print the respective documents (Interview #3, 2021).

Similarly, officials have been able to use SEMA reports to address technical capacity constraints. Through reading SEMA reports, government headquarters have begun to understand the extent to which citizen-facing staff lack adequate training in customer service and client care. As a result, they are now considering providing more tailored training programs to address these issues (Interview #4, 2021). So while SEMA is unable to directly influence the level of resourcing provided to government offices, their reports help offices build their case and lobby for improvements. This process takes time, but the results are beginning to unfold after three years of their intervention. As a key informant from SEMA said, "we've now had a few cases where we've had an effect [in helping offices lobby for more resources]" (Interview #4, 2021).

Finally, while accountability mechanisms in the form of SEMA's citizen feedback intervention has contributed to improving service delivery, there is a degree of endogeneity. This is because SEMA requires managers of government offices to consent to SEMA volunteers collecting feedback from citizens. As a result, the offices that consent to SEMA's presence, are typically run by those who are most dedicated to improving service delivery. In other words, the efficacy of SEMA's intervention is influenced by the desire of managers to enact change.

As a result, citizen feedback initiatives like SEMA, need to cultivate 'champions' within government offices. Champions – in other words, reformers – play a role in lobbying managers and other staff members to try out their accountability intervention (Busara, 2020). However,

one of the biggest challenges these champions face is that some officials and many citizens are sceptical that service delivery can actually be improved. One key informant from SEMA mentioned that "many citizens say, 'dream on, things are never going to change'… [as] most citizens are rather negative about the government ever changing" (Interview #4, 2021). Hence the onus lies on these government 'champions' and organisations like SEMA to shift the attitude of people into believing that service delivery can in fact improve.

Table 1: Citizen Feedback Scores

Office Number	First Satisfaction Score	Date of First Survey	Last Satisfaction Score	Date of Last Survey	Difference
1	3.25926	Apr-18	3.83333	Feb-20	0.57407
2	3.89431	Sep-19	3.58333	Feb-20	-0.31098
3	2.93182	Aug-18	3.39815	Jan-20	0.46633
4	2.90909	May-18	3.36723	May-19	0.45814
5	3.1	Aug-18	3.28704	May-19	0.18704
6	3.0625	Mar-18	3.43165	May-19	0.36915
7	3.09032	May-18	3.86957	Jan-20	0.77925
8	3.94211	Sep-19	3.03066	Jan-20	-0.91145
9	3.81065	Sep-19	3.54745	Jan-20	-0.2632
10	3.98148	Sep-19	3.81818	Feb-20	-0.1633
11	3.74694	Sep-19	3.9	Feb-20	0.15306
12	3.91667	Nov-19	3.91753	Jan-20	0.00086
13	3.87879	Sep-19	3.97222	Jan-20	0.09343
14	4.01571	Oct-19	3.97802	Jan-20	-0.03769
15	2.94904	Mar-18	3.68421	Feb-20	0.73517
16	3.15584	Mar-18	3.40336	Jan-20	0.24752

The raw citizen feedback data for all offices (Table 1) indicates that 69% of offices experienced an improvement in citizen feedback between the first and last month of the intervention (author's aggregation of data from SEMA's citizen feedback surveys, 2021)[17]. Moreover, 75% of offices saw an improvement in service delivery within the first 12 months of the intervention

[17] This is the raw data collected by SEMA volunteers who asked citizens to quantify how satisfied they were upon being served at a government office. See section 3.1 for more information.

(ibid.). While these findings suggest that most offices improved their delivery of services through the intervention, this data is purely descriptive and causality cannot be directly assigned from these numbers. However, when triangulating these figures with the aforementioned responses from government officials during the 2020 interviews, the evidence suggests that cultural change has been possible through accountability mechanisms – though this was not an overnight process. This cultural change means that citizens and government officials alike are beginning to realise that local service delivery can indeed be improved. This, in turn, may lead to further improvements in service delivery in the future.

In summary, while further research is required in this area, accountability interventions in contexts characterised by both poor bureaucratic insulation and inadequate incentive structures for government officials, appear to be a promising way of driving improvements in service delivery. Much of this is spurred by the creation of new, non-financial incentives that were previously missing in Kampala's governmental architecture. However, some of the problems in service delivery are systemic – such as inadequate government funding of local offices, and a pervasive culture of corruption, clientelism and patronage. Accountability mechanisms on their own are unlikely to be able to address some of the root causes of corruption – at least in the short-term, however in the medium to long term they can play an important role in driving cultural change, and may equip local officials with the necessary information to lobby for additional resources.

5. Conclusion

This paper aimed to qualitatively study the impact of accountability interventions on service delivery in a context characterised by poor service delivery: Kampala. In doing so, I sought to shed light on the academic debate that exists on what the best methods of promoting service delivery are (once controlling for resource and capacity constraints): either increasing bureaucratic insulation or improving accountability measures. The research used SEMA's citizen feedback intervention in Kampala as a case study. Confirming some of the key insights from the accountability literature (Ho et al., 2015; Björkman & Svensson, 2009 and Callen and Hasanain; 2011), results demonstrate that accountability interventions are most effective in creating non-financial incentives to motivate staff to improve the quality of services they deliver. This is particularly important in a context like Kampala that has an evident lack of incentives to encourage the performance of government officials. The analysis found that

SEMA's incentives appear to drive cultural change in the attitude of government officials, while also playing a role in addressing some of the structural problems of poor service delivery such as inadequate funding and technical capacity. This works by providing an evidence base that government officials can draw on to lobby for more resources. The analysis finds that while bureaucratic insulation would help shield officials from top-down and bottom-up influences of corruption, without establishing incentives for service delivery, bureaucratic insulation on its own would not be effective in a context like Kampala.

While the analysis highlights the importance of citizen feedback mechanisms in improving service delivery, it cannot be solely relied upon to effectively address all structural problems. This is because citizen feedback only gathers feedback on citizens' direct experiences with government officials. However not all factors that deteriorate service delivery may take place in front of citizens. For instance, corruption can occur in the higher levels of government where citizens cannot not directly witness it. Thus citizen feedback is unable to capture the full range of issues that impact service delivery. The analysis also finds that many citizens are sceptical that services can be improved after having witnessed decades of poor service delivery. If individuals cannot be convinced that change is possible, citizens will be reluctant to provide their feedback, while government officials may be unwilling to experiment with the intervention. This is a core barrier that needs to be overcome. However, with the steady cultural change SEMA's intervention appears to have on service delivery, these impacts may culminate in a broader understanding that positive change in service delivery is not only possible, but that it is currently taking place.

The policy takeaway from this analysis is that, in contexts that lack adequate incentive structures for government officials, accountability interventions may be the first step that is required to improve service delivery. However, in order to adequately address some of the root causes of corruption, bureaucratic insulation could be a promising next step. This is because once bureaucrats are incentivised to perform better (through accountability measures), they then need to be shielded from perverse incentives – for example top-down pressures to cave into political interference, clientelism, or corruption.

Nevertheless, given the sample sizes of respondents in this study, this analysis cannot conclusively measure the full impact of citizen feedback on all citizens in Kampala. Thus, further research could be conducted to understand whether citizen feedback measures can

improve service delivery in more remote areas, or to better understand whether service delivery is being improved for citizens who cannot physically visit government offices (e.g. due to disabilities). Moreover, the external validity of citizen feedback could not be measured as this analysis was focussed solely on Kampala. Therefore, further studies could be conducted to examine the impact of such interventions in other regions and countries both in East Africa, and the African context more broadly. It is only then that we will be able to develop a much more holistic understanding of whether accountability mechanisms or bureaucratic insulation is better suited to improving service delivery.

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