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DECENTRALIZATION AND COVID-19 OUTCOMES

Investigating the relationship between levels of decentralization and COVID-19 excess mortality rates.

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Abstract

The COVID-19 pandemic created far reaching societal disruptions around the globe, forcing governments to respond to protect the wellbeing of their citizens. Because of a large variation in conditions – between geography, capacity, density etc. – countries resorted to different methods which led to differing results. Researchers began asking – which conditions or policies are best in improving COVID-19 outcomes? To contribute to this understanding, this study assessed the role of institutional design by examining the effects of levels of decentralization on COVID-19 excess mortality rate. Linear regression was utilized to study the effects of decentralization and its three different variations – fiscal, political, and administrative – to determine if decentralization played a role in lowering the mortality rate of different countries. The study further investigated if the results were different from developing and developed countries. In the end, the study did not find that decentralization had significant effect on mortality rates, except for administrative decentralization in developed states. The findings instead suggest polarization and corruption played a larger and more significant role in increasing mortality rates, while economic and state capacity led to lower mortality rates.

Keywords: *decentralization, types of decentralization, COVID-19, excess mortality rate,*

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1 Introduction

The pandemic started an unprecedented time for everybody as governments struggled to contain the virus and lessen its impact on the people and economy. As they struggled to contain the virus and fought back, different countries came up with different models to combat the pandemic. Different variables had to be considered – geography, population density, different social & economic capacities, etc. which resulted in diverse model responses. Countries also reacted differently, some bowing to public pressures whereas others preemptively set strict policies in stone to combat the virus. These conditions led to vastly different results between different countries. Countries such as Sweden had relaxed approaches to the pandemic, while others, such as China or South Korea, practiced stricter protocols.

The complexity of responses and environments prompted a slew of questions from researchers, policy makers, or journalists as to which kind conditions or policies were most effective. Does strictness improve efficiency? Does higher economic capacity account for differences? How does trust affect outcomes? Do autocracies do better than democracies in combatting the pandemic? This research study seeks to contribute to understanding which conditions affected outcomes in the pandemic by analyzing institutional design of decentralization and its effects on lowering mortality rate. Common wisdom suggests that by bringing the government closer to the people, it can respond more efficiently and effectively. However, this wisdom has been challenged by some researchers, implying that decentralization is not the only variable in improving outcomes, and roads to better policy involve a complex number of assumptions.

This research study will examine the role decentralization had on COVID-19 mortality rates. Decentralization will further be subdivided into three different indices: fiscal decentralization, political decentralization, and administrative decentralization. The study will utilize decentralization to study the effects it has on the COVID-19 excess mortality rate of countries, with data taken from countries between 1st of January 2020 to 31st December 2021. This is a quantitative study with the main method utilizing a multivariate linear regression as the main method. Countries will be studied together, then divided between developing and developed countries. This is because some research suggests that assumptions about

decentralization can be complicated in developing countries, thus requiring investigation into the differences.

The paper will begin by presenting the current state of the art and the research gap motivating this study. Afterwards, the theory will be presented. This will be followed by the presentation of the data, operationalization of the framework, followed by the results. It will conclude by discussing the limitations in the study and a discussion of the results. Overall, the study found mixed results. Decentralization does not have a significant effect on COVID-19 excess mortality rates, except for administrative decentralization leading to increased mortality rates in developed countries. Other factors examined in the study have stronger explanatory power in explaining increases or decreases in the mortality rates between countries.

2 State of the Art

In this section, the state of the art will be presented. This is a large and multifaceted topic, that requires examining different areas of previous research. This includes research on decentralization, research on disasters, and research on COVID-19 itself. Below, the paper will overview the current state of research and highlight important findings.

2.1 Decentralization

Researchers have put a lot of effort in seeking out the answers to determine if, or by how much, levels of decentralization affect many different societal outcomes such as welfare redistribution, health outcomes, governance etc. In a meta-analysis of works, it was shown how decentralization can improve a government's accountability and responsiveness by altering its structure so it can amplify citizen's voice and change local level incentives to be beholden to citizen voices more (Faguet, 2014). People will understand which politicians are responsible, have easier time understanding actions (transparency), voting out unfavorable actors more directly, increasing competition (incentives), and letting minority groups have governable power over their territory (Faguet, 2014). In a study on decentralization and corruption, it was found that decentralized fiscal structure led to decreases in corruption, when controlled for other factors such as GDP, civil liberties, etc. (Fisman & Gatti, 2002). Other researchers confirmed it, showing how fiscal decentralization contributes to mitigating adverse effects of corruption on public deficits (Oto-Peralías, Romero-Ávila, & Usabiaga, 2013). In a case study of Colombia and Bolivia, decentralization helped improved educational outcomes (Faguet & Sánchez, 2008).

The study found that calls for decentralization came from the poorest or smallest communities, and both shifted financial and responsibility of public services to local governments which improved literacy and attendance rates (Faguet & Sánchez, 2008). Decentralization has also been the goal of several international organizations, including World Health Organization and World Bank (Mills, Vaughan, Smith, & Tabibzadeh, 1990) (Rondinelli, Nellis, & Cheema, 1990).

At the same time, there is no consensus on decentralization behaving the way it is theoretically meant to behave. In one study it was shown that fiscal decentralization increased quality of government (QoG), but at the same time had an inverse relationship when accompanied by political decentralization (Kyriacou & Roca-Sagalés, 2011). Some research studied different types of decentralization (between fiscal, administrative, and political) and found variation in outcomes. In a study of examining the three subtypes of decentralization, it was found it generally led to improved QoG outcomes, but no marginal change with political decentralization (Camões, 2020). Against that, another study found political decentralization improved outcomes, but only when a state has a higher socio-economic score (O'Dwyer & Ziblatt, 2006). A continuing issue in some of these studies is the fact they mostly study developed countries, which can lead to non-generalizable results. For example, a study on fiscal decentralization found that it led to lower corruption, however the observations were OECD countries who are already developed, democratic, and wealthy – a limitation the authors themselves concur (Oto-Peralías, Romero-Ávila, & Usabiaga, 2013, p. 226).

This leads to the second challenge, in that decentralization may work in complex ways, or in fact even adversely to how theories would normally suggest. The actual state of decentralization or implementation of decentralization is a lot more heterogenous than traditional literature would make it seem. In a meta-analysis of decentralization, it was shown how in the real world, the actual levels of devolution, deconcentration, and delegation are highly complex, done over different levels of subunits, and decentralization may not even be even across the country (for example when territories can have greater autonomy) (Smoke, 2015, p. 101). These challenges may present difficulties for quantitative studies and thus impose limitations that need to be kept in mind.

Third, there is also opposition to the idea that decentralization is even the answer to many of the state's problems. First, fiscal decentralization can increase disparities because the government subunits which will compete between each other to offer the most attractive fiscal

model, which will inevitably concentrate wealth in few subunits (Prud'homme, 1995, pp. 202-204). Two, it can jeopardize stability. Central governments have more power and leeway to implement fiscal policy and have more power to respond to extranational challenges (Prud'homme, 1995, pp. 205-207). Three, it can undermine efficiency by restricting the economies of supply side efficiency such as economies of scale in producing or delivering services or goods that divided subunits could not produce as quick (Prud'homme, 1995, p. 207).

2.2 Disaster Studies

Disaster studies is a broad and multidisciplinary field that focuses on the multifaceted concept of disaster(s). The field has many scholars and researchers from diverse disciplines researching individual parts of a disaster – before, during, and after. The definition of disaster is difficult to standardize because there is a diversity of actors (from researchers to policymakers) who use their own definition. One definition describes disasters as “an event concentrated in time and space, in which a society or one of its subdivisions undergoes physical harm and social disruption, such that all or some essential functions of society or subdivision are impaired” (Lindell, 2013, p. 797). This physical harm of social disruption must also be greater than what regular societal protections can typically help against, such as car accidents, which are numerically abundant, but are typically taken care of by everyday protections from the health and policing institutions (Lindell, 2013, p. 797). What creates the difference is the immense societal disruption caused by the intensity of disasters (Guggenheim, 2014). Disasters tend to be greater and affect more of the society through its pre-impact period, trans-impact, and post-impact (Lindell, 2013, p. 798). That leads to subcategory of studies: focusing on understanding cost, risk, mitigation, responsiveness, preparedness, and vulnerability.

Disasters impacts society both physically and socially. Physical impacts are things such as deaths, illnesses, and structural or ecological damage. Social impacts are divided into an array of impacts: psychosocial, demographic, economic, political (Lindell, 2013, pp. 799-802). The multifaceted nature of disasters invites a myriad of disciplines: anthropologists, health specialists, geologists, climate specialists, economists, political scientists etc. all studying micro and macro level impacts of disasters and all focusing on different parts of disaster associated with their field (Andharia, 2020). Economic and political scientist authors research a myriad of topics, including, but not limited to: economic costs, political costs, policy & management, and

mitigation (Lindell, 2013, pp. 800-803) (Cooperman, 2022) (Sainz-Santamaria & Anderson, 2013) (Mechler, 2016)

A sect of this research, that this paper is concerned about, has also focused on decentralization and how it affects disaster response. Most of the research is focused on single or few case studies. In a study on South Korea, authors found that a centralized response system was paramount to South Korea's success in fighting the initial waves of COVID-19 (Kim & Ashihara, 2020). In a study on the MERS outbreak in South Korea and the Indian COVID-19 response, it was found that centralized structures undermined outcomes instead (Ku, Han, & Hyung-Lee, 2022) (Choutagunta, Manish, & Rajagopalan, 2021). Others emphasize that despite decentralization being helpful, the actual process to decentralize is a difficult task and does not always go as planned. Efforts to decentralize are subject to nuances that do not always conclude perfectly, may regress into centralization, or work in bizarre ways where central actors can still capture local decision making (Hermansson, 2019) (Prud'homme, 1995) (Smoke, 2015) (Ku, Han, & Hyung-Lee, 2022). Others have shown how, even if a state is de jure decentralized, due to complex realities (such as lack of fiscal decentralization) it still puts local actors at the behest of central actors, nullifying the effects (Liwanag & Wyss, 2019) (Warner, Richards, Coyle, & Smith, 2021).

2.3 COVID-19 Research

The COVID-19 pandemic is still ongoing as of this writing, and a lot of research is now dedicated to studying the effects, aftermath, and implications of the pandemic across numerous fields. The pandemic is an important political affair, because to fight it, governments were forced to respond to it by allocating resources and producing policies to fight it, to controversial responses in some states. Diverse realities and factors led to different models in combatting the pandemic; even in states that are similar, such as Scandinavian states, which had different strategies. Research has come out to study the effects of these policies, the implications, which factors affect the success rate, and so forth. In this section, I have outlined current COVID-19 research that has come out.

Most research has focused on singular or few more qualitative examinations of cases (Ren, 2020) (Chen, Zhu, Wu, Zhang, & Yan, 2020) (Lippi & Capano, 2021) (Hallas, et al., 2021)

(Jarvis & Hartley, 2020). This is to be expected, a lot of the research is based on on-going and recent happening, so abundant cross-country data was not as common yet. States such as Sweden, United States, Italy, and China received significant amount of attention due to particularities in their strategies and position. China for being the first to record the COVID-19 outbreak, and to draw comparisons between democracies and autocracies. Italy received much attention for being the first Western epicenter (Ren, 2020, p. 423). US got attention for the diversity and decentralization of its states (Hallas, et al., 2021). Lastly, Sweden was target of much research for its lax lockdown policies at a time when many countries were locking down societies (Chen, Zhu, Wu, Zhang, & Yan, 2020) (Petridou & Zahariadis, 2021). Other qualitative research studies used case design to study similar environments, such as Hong Kong or Taiwan to China (Li, Farrel, & Alon, 2020).

Large scale quantitative studies are not as abundant but are becoming more common now that data has become more available two years after the pandemic began. Some quantitative research study already exists to pave way for future research, for example one focused on mapping out different kinds of lockdowns and their effectiveness, but data was based on very early research (Paul, Thill, & Rahman, 2020). Another studied the role of polarization and trust in reducing mortality rates (Charron, Lapuente, & Pose-Rodriguez, 2020). Other research investigated how the pandemic policies change for electoral reasons or how to improve compliance with policy (Pulejo & Querubín, 2020) (Luszczynska, et al., 2021).

3 Motivation

3.1 Research Gap

The current state of the art suggests that in the realm of decentralization, there is no clear consensus. The COVID-19 pandemic gives researchers an opportunity to contribute to that discussion. By focusing on decentralization, this study intends to understand the role institutional design, decentralization, has on outcomes during the pandemic. This is an important question to research – this topic must deal with who makes decisions and how that affects societal outputs (efficiency, quality etc.) which can have implications for governance. This topic, of which conditions or outcomes are best, has also been asked by not just researchers, but journalists and policymakers as well.

A recurring gap is that most of the studies examining institutional design within disaster studies focused on a single or few cases (Lindell, 2013, pp. 813-815) (Sainz-Santamaria & Anderson, 2013) (Birkland & Waterman, 2008) (Hermansson, 2019) (Ku, Han, & Hyung-Lee, 2022) (Liwanag & Wyss, 2019). Most research in disaster studies tend to be observational or turns to interviews, and the field could benefit from including more quantitative studies (Lindell, 2013, pp. 813-815). There are several reasons for why most disaster research tends to be targeted. Disasters do not exist everywhere equally and are localized affairs; some areas are more prone to hurricanes, others more prone to earthquakes, and to study impacts of those disasters is only possible in those affected areas (Stallings, 2007). For decentralization studies this creates a generalizability issue since sample sizes are low and results may be unique to a single or few observations (Stallings, 2007, pp. 62-65). Due to the nature of the pandemic being a global disaster, the pandemic is equally affecting every country on our planet. This creates an opportunity to study differences in disaster outcomes globally rather than just locally. Because of the breadth of data coming out in regards to the pandemic, quantitative cross-country comparisons are now becoming more common but none, that I am aware of, have focused on the role of decentralization in the pandemic.

3.2 Research Question

The question of this research paper is: *Does decentralization lead to lower COVID-19 mortality rates?* Given the gaps in the current state of research, there is sufficient justification for this paper's study. Furthermore, such a study may have policy implications. Decentralization, of any of the aspects of government's power, is a large characteristic of a country's system that affects governance and outcomes. However, if some institutional designs are better than others (and decision on how to decentralize is such a decision) it is imperative to know the realities. This paper seeks to examine the relationship between levels of decentralization and how that affected COVID-19 mortality rates. It will examine and measure using an aggregate decentralization index (ADI) and further subdivide into three different types of decentralization – fiscal, administrative, and political. Did decentralized states do better in the pandemic? Do the different subtypes have variations in outcomes? Ideally a research paper will analyze a country's policies on a case-by-case basis and do in-depth studies and cross reference them globally, but such an undertaking will require immense amount of time and type of research that is far beyond the possible scope of this paper. Therefore, this paper turns to using theories on decentralization

to examine the COVID-19 policy outcomes quantitatively in a more pragmatic sense. As has been shown, there are numerous gaps in the research and there have been calls for more quantitative studies. COVID-19 provides this opportunity to study a disaster globally.

4 Theoretical Framework

This section will outline theoretical literature that motivates the variables and the design used. It will also introduce the hypotheses that will be tested. It will examine the theoretical role of decentralization in improving outcomes, which justifies it as the main variable. Two, it will present discussion on why developing countries and developed countries should be separated for study. Third, this section will examine the use of excess mortality as proxy for efficiency in combatting the COVID-19 pandemic. Lastly, the research paper will discuss the hypotheses emanating from the theories presented.

4.1 Decentralization

The government, in most contexts, is the ultimate source of authority in a nation. Therefore, how it is run and how the power is divided has great implications for the rest of society. How much it is decentralized by determines who and what has the decision making and fiscal making powers to raise taxes, implement and enforce policy. As has been show from the current state of the art research, how a society is divided has effects on performance, and thus it follows that same logic that levels of decentralization could potentially affect the efficiency of the COVID-19 responses. This concept is supported by various research on both decentralization as well as disaster studies (Smoke, 2015) (Kyriacou & Roca-Sagalés, 2011) (Faguet, 2014) (Hermansson, 2019) (Birkland & Waterman, 2008) (Liwanag & Wyss, 2019).

Levels of decentralization has been the aim of studies of many researchers in different fields. For this reason, it is a very multifaceted concept that can be both broad and narrow within its scope and definition, meaning it can focus on just one micro area (for example, hospital services) or a much broader sense, like local government. **Centralization**, in its simplest definition, is the *concentration of power and decision making into a single centralized government*. Decentralization is more complex, because it involves *how* things are decentralized, and this can differ radically. In its simplest definition, **decentralization** is the *division of power and decision making into many smaller governments or entities*. There are also types of decentralization, and that will be discussed below. Government and governance are also not the

only field where decentralization can help, it should theoretically be useful in improving education, social welfare, healthcare and outcomes in disasters, the topic of this research paper. Although it lacks a clear consensus, there is more research proving to the efficacy of decentralization (Faguet, 2014) (Faguet & Sánchez, 2008) (Fisman & Gatti, 2002) (Oto-Peralías, Romero-Ávila, & Usabiaga, 2013). The argument is that decentralization should bring decision making and governance closer and more directly to the local environment. This will theoretically improve accountability, improve transparency, and improve incentives for better outcomes. Local actors understand local nuances better, can assess needs more directly, minimize lag which will ultimately improve the government's responsiveness to public needs and demands (Faguet, 2014) (Fisman & Gatti, 2002) (Smoke, 2015). Therefore, decentralization is understood as degree to how close and readily available the government is to the most local level and this study uses a dataset to reflect that (Ivanyna & Shah, 2014, p. 5).

This is especially true when it comes to disasters because it is the local people that will be the first to witness or feel a disaster, and thus the local decision-making actors will always be the first to respond (Birkland & Waterman, 2008, p. 695). There is also no reason to believe COVID-19 pandemic would be different. In various research it has been shown how centralized states created difficulties, mismanagement, and lag in response time (Hermansson, 2019) (Birkland & Waterman, 2008) (Ku, Han, & Hyung-Lee, 2022). In the few articles to come out, it has been demonstrated that centralization, or central-local relations, has backlogged improving responses in different states (Liwanag & Wyss, 2019) (Warner, Richards, Coyle, & Smith, 2021) (Ren, 2020).

4.2 Types of Decentralization

When governments are decentralized, it can take different forms, such as deconcentration (creating local units of higher government), devolution (creating elected local governments with autonomy), and delegation (contracting a central function to a public or private entity) (Smoke, 2015, p. 98). These forms of decentralization have different dimensions – administrative, fiscal, or political (Smoke, 2015, p. 98). In literature these terms are not always consistent, not always properly defined, or are used interchangeably which creates a difficulty in understanding (Yuliani, 2004). When it comes to understanding types of decentralization, **decentralization** is referring to *the transfer of administrative, fiscal, and political roles to lower subunits*. To my knowledge, there is no literature on the effectiveness of the different forms, instead literature has

focused on the dimensions instead (Faguet, 2014) (Camões, 2020) (Kyriacou & Roca-Sagalés, 2011).

Several research papers have shown that different decentralization dimensions can have varying effects on outcomes. Camões' research on decentralization and quality of government has shown that fiscal decentralization had the most positive impact on QoG, with administrative having a minor impact, and political having no effect (Camões, 2020). Another study found that fiscal decentralization created largest improvements in QoG, but political decentralization nullified that improvement (Kyriacou & Roca-Sagalés, 2011). Study on English devolution found that, despite undergoing devolution (of political & administrative), the response to COVID-19 was hampered by the lack of fiscal decentralization (Warner, Richards, Coyle, & Smith, 2021). This means that the response in England was de facto centralized because disaster relief funds required approval from central authorities (Warner, Richards, Coyle, & Smith, 2021). This is a repeated issue in India, where lack of fiscal authority prevented any response without a central authority approving it, despite variations in resources, capacity, and COVID-19 cases creating an inefficient and disjointed response (Choutagunta, Manish, & Rajagopalan, 2021). Overall, the literature shows mixed results, but more so in favor of fiscal decentralization being the best dimension for improving outcomes.

4.3 Developing vs. Developed

There are many erroneous assumptions about decentralization when it concerns developing states. Across the globe, it may not be the case that voters behave in a constant, and decentralization may not address these issues. For example, some societies have sectarian cleavages, or they vote based on familiarity to the local party or the local candidate (which was the case in many Latin American countries) rather than voter preference (Prud'homme, 1995, p. 208) (Smoke, 2015, p. 104) (Ku, Han, & Hyung-Lee, 2022). One paper found that different types of decentralization had different effects, with political decentralization having a positive impact in states with high GDP states, but worse scores with low GDP countries (O'Dwyer & Ziblatt, 2006). There is also no guarantee that all actors are faithful - centralized actors could decentralize while leaving themselves power, while placing corrupt decentralized actors in power (Smoke, 2015, pp. 102-105). One study speculated that in areas with low trust, states may benefit from centralization during time of crisis to make up for lack of plausible horizontal cross-

collaboration found in decentralized states (Petridou & Zahariadis, 2021, p. 300).

Decentralization is also a process, and the process could be undermined or rolled back at any time (Smoke, 2015, p. 105). This has been brought up as a potential issue with developing states and decentralization, in that developing states may have complicated assumptions due to realities of implementation or due to corruption issues which could ultimately lead to an inverse relationship (Prud'homme, 1995) (Smoke, 2015). For this reason, developing and developed countries should also be studied separately to ensure better validity and generalizability of results.

4.4 Excess Mortality

To track “outcomes” I utilized the concept of “*excess mortality*.” Outcomes is a very broad word, and as a result there is a multitude and complicated ways of determining it. Researchers have used different types of variables for their independent variables: economic outcomes, infection rates, compliance, hospitalization rates, or mobility rate (Chen, Zhu, Wu, Zhang, & Yan, 2020) (Paul, Thill, & Rahman, 2020) (Cheibub, Jean Hong, & Przeworski, 2020) (Ashraf, 2020) (Charron, Lapuente, & Pose-Rodriguez, 2020). These indicators are valid and may be preferred in certain contexts, but I argue that *mortality rate* offers a more valid indicator for comparison. Governments, whose policies are efficient at containing and fighting the virus should have lower mortality. That implies the people listened to government’s orders, stayed at home during lockdowns, or followed public health protocols. The *excess mortality* variables are estimates of what the true mortality rate is based on the previous pattern of a country’s mortality rate and the difference with the levels during the pandemic. The motivation behind using an *excess* variable is that countries do not have a standardized protocol for defining and reporting COVID-19 deaths. For example, in the beginning of the pandemic, Netherlands counted only individuals who died in hospital after testing positive for COVID-19, while Belgium included deaths in the community and everyone who died after showing symptoms, regardless of diagnosis (Adam D. , 2022). Some countries are also hiding the true statistics while others have no reliable health statistics (Chappell, 2022). Researchers studying mortality rates have already began using excess mortality measurements and contend it is more robust than using reported COVID-19 death rates (Aron & Muellbauer, 2022) (Charron, Lapuente, & Pose-Rodriguez,

2020) (Jung, Ro, Ryu, Shin, & Moon, 2021). By utilizing data on *excess mortality* this study can gauge truer mortality numbers compare to what countries have reported.

4.5 Polarization

As literature on disaster studies pointed out, there are sociological components to disasters, and that is also true for the COVID-19 pandemic. How people react, how much they will listen, extent they will go to help etc. can influence how efficient governments are when fighting the pandemic. In a meta-analysis, it was shown how characteristics such as norms, culture, values, biases, may affect the response to COVID-19 (Van Bavel, et al., 2020). Due abundance in literature proving to the importance of trust and polarization in disaster settings and improving outcomes, special consideration was put towards those factors to determine how they interact with decentralization.

Polarization has received some attention in the media and was a topic of concern for some studies. One study found that polarization had a significant correlation with COVID-19 excess mortality (Charron, Lapuente, & Pose-Rodriguez, 2020). Another study found that verbal knowledge (in contrast to quantitative reasoning), when combined with political polarization, led to differences in views regarding the COVID-19 pandemic (Shoots-Reinhard, et al., 2021). The implication being that ideological polarization would create a disagreeable environment regarding the perceptions of the virus or government measures (Shoots-Reinhard, et al., 2021). For example, it has been found that conservatives in the US refused to wear masks more often (Brenan, 2020) advocated for visiting pubs in the UK (Jones, 2020) and continue bullfighting in Spain (Minder, 2020) (Charron, Lapuente, & Pose-Rodriguez, 2020). This disagreeableness leads to worse outcomes as people make up their own rules, refuse to follow official government policies, refuse to wear masks, social distance etc. all of which could lead to worse outcomes.

4.6 Trust

Like polarization, trust has received attention in literature regarding COVID-19 pandemic effectiveness. As a concept it can be very generalized and understood in simple terms - of trustworthiness between different actors, groups, organizations to do the right thing. Researchers typically differentiate between different types of trusts or describe them in different ways based on contexts. For example, researchers would examine trust within context of business, others

would examine in context of neighborhoods. For this study, the focus will be on social trust (between individuals in a society).

Social trust represents the individual-to-individual aspect of trust. Previous research shows high trust areas are more willing to contribute for the common good (Putnam, 1993) (Putnam, 2000). High social trusts allow governments to implement policies at lower cost to the benefit of all (Harring, Jagers, & Löfgren, 2021, p. 3). It has already been shown that mistrustful and polarized societies led to higher excess mortality in European countries (Charron, Lapuente, & Pose-Rodriguez, 2020). High trust has also been cited by researchers as the reason for high trust country's lax but cooperative responses to the pandemic (Chen, Zhu, Wu, Zhang, & Yan, 2020, p. 765). In the study of Hong Kong, it was shown how a society that does not trust the central Chinese state utilized social capacity at the community level to improve outcomes (Jarvis & Hartley, 2020). In the US, it was found that social trust was important for health altruistic behavior during the pandemic (Charron, Lapuente, & Pose-Rodriguez, 2020, p. 9) (Barrios & Hochberg, 2020).

4.7 Hypothesis

Literature of decentralization points to the fact that it leads to faster and more direct responses, it improves accountability, and generally improves outcomes. As such, the first hypothesis:

H₁: - Decentralization will lead to lower mortality rates.

Overall, the literature on which type of decentralization has the most impact is slightly mixed, but there is better evidence that fiscal decentralization is more important for improved outcomes. Thus, leading to the second hypothesis:

H₂: Fiscal decentralization will be the most impactful in lowering mortality rates.

Because the literature on decentralization is mixed and several researchers pointed out how it may work differently, I hypothesize that centralization stands as the better alternative to decentralization because decentralization for developed states results in greater spread of corrupt actors. Thus:

H₃: In developing countries, decentralization will increase mortality rates.

5 Methodology

This section will outline the research methodology of the study. It will discuss and motivate the research design, discuss the data sources, the operationalization of all the variables in the study. This is a quantitative study that will utilize linear regression as the main method. The four different decentralization indices – *fiscal, administrative, political, and decentralization aggregate* – will be the main independent variables in the regression equation. The dependent variable is COVID-19 outcomes, operationalized as *excess mortality rate*. Various control variables are added at different stages to control for extraneous influence.

5.1 Data

The research is done at the country level and includes as many observations as possible, limited only by the available given the study. Statistical analysis will be aided by tables and graphs. Several datasets from different sources were used for this study. The largest bulk of variables comes from the Quality of Government Institute's dataset, which is a dataset consisting of over 2,000 variables that are compiled from other different databases (Teorell, Sundström, Holmberg, Rothstein, & Alvarado, 2022). The source of QoG's data come from: the World Bank, World Value/European Value Survey, Bertelsmann Stiftung's Transformation Index(BTI), the Varieties of Democracy(V-Dem) institute and Center for Systemic Peace. Other data was coded to be added into the study's dataset for research. Indices on decentralization were developed by Ivanyna & Shah (Ivanyna & Shah, 2014). The COVID-19 mortality rate was developed by the Institute for Health Metrics and Evaluation (IHME) (IHME, 2022)

5.2 Operationalization

5.2.1 Levels of Decentralization

To study the levels and types of decentralization, four indices were developed by Ivanyna & Shah: *fiscal decentralization index, political decentralization index, administrative decentralization index, and aggregate decentralization index*. This is the most comprehensive database on levels and types of decentralization of which I am aware. The indices were designed to examine the closeness of the government to the local citizens (Ivanyna & Shah, 2014, p. 5). The three types of decentralization indices are continuous variables operating in values between 0 (full centralization) and 1 (full decentralization), except for the ADI which ranges from 0 (full centralization) with continuously increasing decentralization score (with highest score 36.875). To get better data distribution, the ADI variable was log transformed.

The fiscal index is based on various indicators focusing on the local government's ability to autonomously raise its own funding for its own goals. Administrative index is developed from indicators focusing on local government's ability to autonomously hire, fire and ability to hold local officials accountable. The political index is formed from indicators assessing the direct electability of local governments, popular participation, and contestability of local elections. Lastly, the ADI is utilized to test the overall impact of decentralization. It is based on the three indices and few other indicators on local government to give an overall score. For further read on full development of the indices see Ivanyna & Shah's study (Ivanyna & Shah, 2014).

5.2.2 COVID-19 Excess Mortality Rate

To gauge effectiveness against COVID-19 and to measure the mortality rate, IHME's *excess mortality rate* is utilized. *Excess mortality* refers to deaths that occurred because of COVID-19, but that would otherwise not have happened had the pandemic never existed. It is calculated by the net difference between the number of deaths during the pandemic and an estimated number of deaths that would be expected based on past trends (IHME, 2022). The *excess mortality rate* is defined by excess mortality per 100,000 to make the data comparable between countries. Given that there have not been other major disasters around the world, this makes *excess mortality rate* a valid indicator to use for this study. For further read see IHME code book (IHME, 2022).

5.2.3 Polarization

Polarization is measured by V-Dem's *political polarization* variable, which comes from a researcher survey to country experts asking if society is polarized into antagonistic political camps (Pamstein, 2022) (Coppedge, et al., 2022). Researchers gave a rating reply, between 0 and 4, where 0 suggests there is friendly association between different political camps and 4 refers to divided political camps having hostile interactions. The dataset comes with different versions of the same information, and to make the study more robust I utilized the (*v2cacamps_mean*) variable where the ordinal numbers were converted into continuous based on the average of the respondent's replies. As a concept, polarization has been sometimes difficult to define. Party polarization index has been used in many studies; however, polarization can go beyond parties. Polarization can be along ethnic, religious, linguistic, urban/rural, cultural etc. cleavages, all of which may not be captured by an indicator examining party polarization (Lauka, McCoy, &

Firat, 2018). By keeping the survey question broad, the idea captures a broader subset of polarization, and not just party polarization.

5.2.4 Social Trust

Two variables are added to test social trust. First is from the World Value/European Value Survey(WVS) (*wvs_trust*) which is one of the most comprehensive worldwide surveys on social trust (Haerpfer, et al., 2021). They asked people if most people can be trusted. Score of 0 indicates one must be careful, a score of 1 indicates most people can be trusted. BTI's social capital (*bti_sc*) is also based on a survey that asked people if they trust others (Donner, Hartmann, & Schwarz, 2020). Scores of 1 indicate low trust, which is proof of poor civic organization, and 10 indicates high trust and high civic engagement. The justification behind using this variable is that data on the developing and transitional states is incomplete in World Value/European Value Surveys, and the social capital indicator helps the study examine the relationship cross country. This should not hinder the study for several reasons. First, the major component of the indicator is gauging trust. While it technically seeks to understand levels of "social capital" the exact question aims to gauge the level of trust between citizens, which they deduce is an indicator for cooperation and mutual support (Teorell, Sundström, Holmberg, Rothstein, & Alvarado, 2022, p. 158). Robert Putnam's work also equivocates social trust with social capital, realizing it as a form of currency to be used for mutual collective benefit (Putnam, 2000, pp. 12-27). Thus, the understanding of the two variables is synonymous. Two, it should not be a problem to interpret the findings of these variables. This is because both start at a low point and conclude at a high point. Both are ordinal variables with WVS acting as an ordinal dichotomous variable since the one increase represents trust in other people. Lastly, Table 2a utilizing WVS for developing countries is added in the Appendix for robustness' sake, but the findings shown were generally similar.

5.3 Other Control Variables

5.3.1 State Capacity

To control for state capacity, the indicator used is the *State Fragility Index* from the Center of Systemic Peace (Marshall & Elzinga-Marshall, 2017). It is a state capacity measure, based on several indicators measuring ability to manage conflicts, implement public policy, delivering services etc. The indicators measure effectiveness and legitimacy and the two are

combined to receive a score between 0 (low state fragility) to 25 (high). Countries with low state capacity would not be able to provide many services, leading to either worse societal outcomes, loss of budget, or even trust in the government (Ottervik, 2013, p. 3). This has great implications when it comes to disaster management and COVID-19 – the states with high state capacity should theoretically have better outcomes. A study on the Norwegian COVID-19 handling showed how trust was paired with a strong state capacity to produce an effective outcome (Christensen & Læg Reid, 2020) (Liwanag & Wyss, 2019). Others posited that the type of state capacity also matters – whereby professional more autonomous actors can assess and deliver policies better short-sighted political pressures (Charron, Lapuente, & Pose-Rodriguez, 2020, p. 14).

5.3.2 *GDP Per Capita*

Different countries have different economies and as such different wealth that can go towards combatting the virus. It should follow those wealthier states will have larger budgets to spend on combatting the virus. In essence, GDP per capita can serve as the economic capacity of a state (Charron, Lapuente, & Pose-Rodriguez, 2020, p. 19). Some research showed how improved health expenditure led to improvements in certain health outcomes (Bradley, Elkins, Herrin, & Elbel, 2011). It has been found that political decentralization was more pronounced in high GDP per capita countries, so it is important to test for this (O'Dwyer & Ziblatt, 2006). One study pointed out higher GDP per capita also led to improved outcomes in the first wave of the pandemic (Pardhan & Drydakis, 2021). To measure economic capacity a *GDP per capita* (*wdi_gdpcappppcur*) variable is used (World Bank, 2021). It is the Gross Domestic Product divided by midyear population and is set in 2020 US dollars (year the data was collected).

5.3.4 *Levels of Democracy*

Democratic states hold underperforming actors accountable for their efficiency and thus should pick leaders who will do a better job. Holding government officials accountable, through democratic means, should improve outcomes in other areas as well including institutions, healthcare, and economy. However, there has been debate regarding whether autocracies or democracies performed better. Some studies suggested democracies performed better (Frey, Chen, & Presidente, 2020) while others posited autocracies had an advantage, at least in the beginning (Cepaluni, Dorsch, & Branyiczki, 2022) (Yao, Li, Howard, Bailey, & Graffi, 2021). To control for this effect, levels of democracy is gauged by the Electoral democracy index

(*vdem_polyarchy*) and is based on Robert Dahl's indicators of gauging a democracy: freedom of association, suffrage, clean election, elected officials, and freedom of expression (Coppedge, et al., 2022).

5.3.5 Population Density

Denser areas had a greater concentration of people, which could potentially lead to more infections and thus more deaths. Equally true can be said of the opposite, areas with less density could be using the distance as a barrier from more infections. A study on Indian districts showed that density correlated with higher levels of infections, but the author also conclude that it is not conclusive and should be paired with other variables (Chundeli, Lata, Ramamurthy, & Jain, 2021). A *population density* variable added to control for this effect, and it is defined as midyear population divided by land area in square kilometers (World Bank, 2021).

5.3.6 Corruption

Misuse of office can lead to worsening outcomes as political actors do not act in good faith, misappropriate funds, or use it for counter intuitive purposes. Corruption is a deeply rooted societal affair that can cause worse outcomes in, not only the government, but different sectors of societies, such as healthcare, as well (Rothstein, 2011, pp. 58-76). Therefore, to counteract corruption's influence on the model a corruption variable is added. It is measured by the *Political corruption index* and based on a question gauging to what extent political actors use political office for private or political gain (Coppedge, et al., 2022). It ranges from 0 (low) to 1 (high).

5.3.7 Developed vs. Developing

To differentiate between developed countries and developing countries, I added a dummy variable that distinguished between developing & transitional states and developed states based on the UN's Human Development Index (HDI) and categorization (United Nations Development Program, 2020b). Countries with an HDI score greater than or equal to 0.800 are considered developed, and countries with a score lower than .800 were considered developing. There are several reasons for doing this; first, developing countries tend to be centralized more often compared to developed, two, the previous literature mentioned the irregular assumptions about decentralization in developing states motivating ta design that studies them separately.

6 Results

6.1 Scatterplots

I began by examining the basic relationship between the two main variables: excess mortality rate and different types of decentralizations. I conducted three bivariate tests, one focusing on all the possible observations, one on developing countries, and one on developed countries. The initial findings of the bivariate analysis between different types of decentralization and excess mortality rate were drawn and compiled into scatter plots shown in Figure 1. The descriptive statistics of the main variables can be seen in Table 1. The initial impression is that the relationship is weak, with lots of data scattered almost evenly at different decentralization levels, however certain findings can be extrapolated. There are more fiscally and administratively centralized states than decentralized states. Politically, the countries seem more uniformly scattered. Decentralization seems to be associated with more mortality; however, the relationship is very weak. Developing countries have a positive relationship between every decentralization type and mortality rates and had higher mortality than developed countries in every graph, except for Graph C where very fiscally centralized developing states had lower mortality compared to very fiscally centralized developed states. Graph C proves to be an exception. Developed countries had a positive relationship between decentralization and mortality rates, except for fiscal which shows a negative relationship between fiscal decentralization and mortality rates, which is also in fact the only negative relationship in Figure 1. Lastly, several studies argued there is a nonlinear U-shaped relationship between decentralization and outcomes (Camões, 2020) (Adam, Delis, & Kammas, 2013). I did not detect such a relationship, neither from various tests nor detected significance when running a polynomial regression model.

Figure 1- Graphs A, B, C, D. Scatterplots of different types of decentralization against the excess mortality rate, with lines of best fit of countries at HDI <0.8 and ≥0.8.

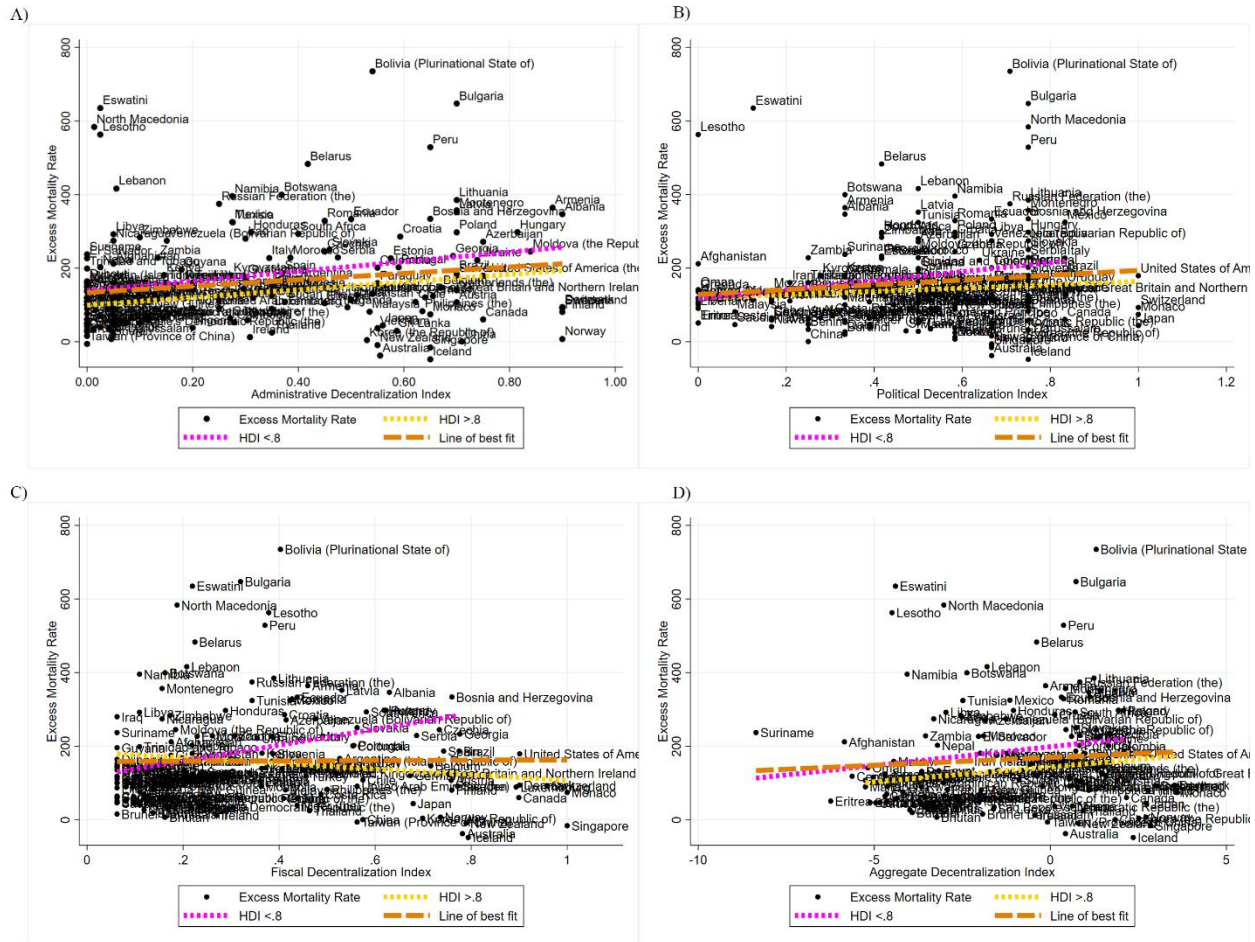


Table 1 – Descriptive statistics for the main variables.

VARIABLES	N	\bar{x}	SD	Min	Max
Political Decentralization index	168	0.483	0.236	0	1
Fiscal Decentralization Index	168	0.337	0.252	0.0625	1
Administrative Decentralization index	168	0.303	0.278	0	0.900
Aggregate Decentralization Index, log	147	-1.181	2.54	-8.359	3.608
Excess Mortality Rate	168	141.7	99.87	-47.80	416.2

6.2 Outliers

Most important thing to note from Figure 1 is the seven outlier countries. Bolivia, Bulgaria, Belarus, Eswatini, Lesotho, North Macedonia, and Peru had unusually high mortality rates. I used a boxplot to confirm they are outliers, and they were indeed deviated away from the main data points. They all varied on levels of centralization, except for fiscal decentralization which showed all seven to be fiscally centralized below .4 on FDI. Despite the scatter plots

giving credence to H_2 I decided to drop these outliers for several reasons. First, it made the excess mortality rate data better distributed for testing and two, later tests showed extreme bias in their favor, especially when countries were divided for study. Third, it is also possible the excess mortality rate estimates were far off which can be risky for the study (though it does show a limitation in using excess mortality estimates data). Some countries had a negative mortality rate: Australia, Iceland, New Zealand, Singapore, Taiwan. Different tests were done to show if they were problematic or outliers, but they were not out of the norm and fit well within the study. Despite having negative values on a “excess mortality” variable, I decided to keep them in. These countries were known for having low COVID-19 mortality and swift responses to the pandemic, so their negative values encapsulate their effectiveness against COVID-19 within the scope of this study.

Table 2 - Effects of different decentralization types on COVID-19 mortality rates, *all countries*.

VARIABLES	(1) Political	(2) Fiscal	(3) Administrative	(4) Aggregate
Political Decentralization Index	60.32* (32.44)			
Fiscal Decentralization Index		14.00 (30.71)		
Administrative Decentralization Index			80.85*** (27.17)	
Aggregate Decentralization Index, log				4.906 (3.429)
Constant	112.6*** (17.41)	137.0*** (12.91)	117.2*** (11.16)	149.6*** (9.586)
Observations	168	168	168	147
R-squared	0.020	0.001	0.051	0.014

Standard errors in parentheses
 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

6.3 Bivariate Analysis

To get a closer look at the relationships seen in Figure 1, I ran a bivariate regression to look closer at the data. The findings are listed in Table 2, and it is with outliers dropped. I left a table with outliers included in Table 1a in the appendix for comparison, but the numbers did not

Table 3 - Effects of different decentralization types on COVID-19 mortality rates, *developed countries*.

VARIABLES	(1) Political	(2) Fiscal	(3) Administrative	(4) Aggregate
Political Decentralization Index	40.15 (59.74)			
Fiscal Decentralization Index		-37.63 (49.50)		
Administrative Decentralization Index			82.57* (45.30)	
Aggregate Decentralization Index, log				8.288 (6.348)
Constant	108.1*** (38.05)	151.2*** (28.69)	95.76*** (23.92)	129.4*** (14.29)
Observations	62	62	62	59
R-squared	0.007	0.010	0.052	0.029

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ **Table 4**- Effects of different decentralization types on COVID-19 mortality rates, *developing countries*.

VARIABLES	(1) Political	(2) Fiscal	(3) Administrative	(4) Aggregate
Political Decentralization Index	111.0*** (42.21)			
Fiscal Decentralization Index		162.8*** (53.22)		
Administrative Decentralization Index			127.4*** (38.15)	
Aggregate Decentralization Index, log				9.396* (4.957)
Constant	101.2*** (19.76)	109.1*** (15.40)	118.9*** (12.31)	172.4*** (15.41)
Observations	106	106	106	88
R-squared	0.062	0.083	0.097	0.040

Standard errors in parentheses

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

significantly differ from Table 2. The rest of the analyses in this study will have the outliers excluded. All three types show an increase in mortality rates as decentralization increases; however, the variability is high and as such, the model does not explain the observations well, giving evidence against H_1 and H_2 . I further divided the analysis between developed (Table 3) and developing (Table 4) countries. The evidence seems mixed. Fiscal decentralization led to

lower mortality rate for developed countries, but the relationship remains insignificant and varied. Table 4 looks different, despite high variability the results are significant, suggesting that there is still a positive relationship but that the bivariate model does not explain it. Despite the relationship being weak, this does not immediately disprove the hypotheses, instead further investigation is warranted by adding various control variables to examine interactions with other variables or remove extraneous influence.

6.4 Multivariate Analysis

To test the effects of overall decentralization, I utilized the ADI in Models 1-3. Model 3 is the complete ADI model used to test H_1 . Model 1 tests scores without trust or polarization, Model 2 adds trust, and Model 3 adds polarization. This is to test the impact of adding trust and polarization to gauge significance of adding these indicators. To test H_2 , Models 4-6 were included for comparisons of the complete regression between different decentralization types. The indicator used “Most people can be trusted” (from the WVS) was used to gauge trust in a mix of both developing and developed countries since it contains data on both. However, most of the data available is from developed countries, which could bias the results since most centralized countries are developing. For this reason, when I divided up the developed and developing countries, I ran a second regression model using the Social Capital

Table 5- Effects of Decentralization on excess mortality rates, mix of countries, with control variables.

VARIABLES	(1) No Trust & Polarization	(2) w/ Trust	(3) w/ Trust & Polarization	(4) Political	(5) Fiscal	(6) Administrative
Aggregate Decentralization Index, Log	8.230** (4.136)	2.797 (8.748)	1.038 (8.562)			
State Fragility Index	-12.43*** (2.611)	-13.85*** (3.840)	-13.32*** (3.748)	-12.77*** (3.612)	-12.73*** (3.564)	-11.07*** (3.631)
GDP Per Capita, Log	-27.83** (11.68)	-26.25 (22.01)	-28.73 (21.47)	-27.84 (23.12)	-19.20 (21.28)	-22.31 (20.23)
Electoral democracy index	34.62 (45.51)	108.3 (80.80)	139.5* (80.11)	112.7 (79.31)	119.0 (75.62)	120.7 (74.47)
Population Density, Log	-17.89*** (6.307)	-8.778 (9.468)	-6.822 (9.268)	-8.929 (8.925)	-8.777 (8.866)	-8.805 (8.732)
Political corruption index	159.9*** (47.08)	217.0*** (78.19)	224.5*** (76.22)	192.5** (72.94)	194.1*** (70.08)	207.2*** (69.05)
Most people can be trusted		-191.9* (97.48)	-73.42 (110.9)	-92.66 (101.6)	-87.54 (100.7)	-153.6 (104.4)
Political Polarization, Mean			35.24** (17.05)	34.42** (16.98)	35.30** (16.69)	32.71* (16.50)

Political Decentralization Index				20.38		
				(64.70)		
Fiscal Decentralization Index					-56.73	
					(60.40)	
Administrative Decentralization Index						91.11*
						(54.46)
Constant	474.7***	423.1*	294.8	317.2	268.2	231.3
	(141.2)	(224.4)	(227.2)	(235.9)	(218.9)	(217.2)
Observations	137	68	68	70	70	70
R-squared	0.244	0.415	0.455	0.446	0.453	0.469

Standard errors in parentheses

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

indicator. It is based on a survey asking people to gauge levels of trust on an ordinal scale, 1-10 (low to high). Since the WVS also goes from 0-1, it acts as an ordinal dichotomous variable, which should allow for comparison. Results for mixed countries are found in Table 5, Table 6 for developed, and Table 7 for developing. Table with developing country results based on WVS data added in the Table2a in the Appendix.

To start with H_1 , in Table 5 one can see the waning influence of the ADI as trust and polarization are added to the model. Political, fiscal, and administrative indices showed no significance in the model. These results are repeated in Table 6. In Table 7, ADI is insignificant, but the administrative index showed a significant positive correlation with excess mortality rates when controlled for other variables. The question then remains if this is the direct result of decentralization, or other, confounding factors? Significance of two factors came up – polarization and democracy. It is possible that significance of administrative decentralization is proof of a sectarian democracy having poor local subdivisions, or it could refer to administrative decentralization increases are proof of nepotistic corruption which would ultimately lead to worse outcomes in disasters. Overall, the evidence for H_1 is very weak, and I conclude that decentralization does not have significant influence on excess mortality rates, except for administrative decentralization in developing states. For H_2 , in developed countries one unit increases in fiscal decentralization led to -47.64 decreases in mortality rates, however the result is not significant and thus does not explain lower excess mortality rates well. In developing countries, a one-unit increase in fiscal decentralization led to 18.73 increases in mortality rates ,

however the result is also insignificant. Ultimately, the relationship was very weak and other variables explain mortality rates better.

Table 6 -Effects of decentralization on excess mortality rate, with control variables, developed countries.

VARIABLES	(1) No Trust & Polarization	(2) w/ Trust	(3) w/ Trust & Polarization	(4) Political	(5) Fiscal	(6) Administrative
Aggregate Decentralization Index, Log	20.62*** (6.150)	27.20** (13.27)	26.65* (13.37)			
State Fragility Index	-12.03* (6.909)	-16.28* (9.019)	-15.31 (9.150)	-16.06 (9.620)	-16.46* (9.692)	-10.47 (10.13)
GDP Per Capita, Log	-80.39*** (21.28)	-81.39** (39.20)	-79.95* (39.47)	-107.0** (46.94)	-83.72* (41.98)	-70.13 (41.43)
Electoral democracy index	-32.24 (69.54)	140.9 (132.5)	155.0 (134.4)	116.3 (145.8)	132.0 (145.8)	210.3 (142.2)
Population Density, Log	-5.665 (8.467)	-1.926 (12.25)	-1.285 (12.34)	4.477 (12.54)	5.203 (12.63)	5.707 (12.18)
Political corruption index	132.7 (85.67)	283.7** (114.5)	284.3** (115.2)	228.6* (133.6)	255.1* (130.1)	334.9** (122.4)
Most people can be trusted		-103.8 (149.4)	-54.00 (162.5)	126.6 (154.4)	110.1 (154.0)	-56.74 (175.0)
Political Polarization, Mean			15.55 (19.32)	15.35 (20.40)	17.36 (20.43)	9.597 (20.29)
Political Decentralization Index				88.52 (97.57)		
Fiscal Decentralization Index					-47.64 (85.96)	
Administrative Decentralization Index						165.3 (102.3)
Constant	999.7*** (245.3)	863.1** (352.2)	781.0** (368.6)	985.8** (434.1)	818.2** (390.5)	539.9 (410.8)
Observations	54	39	39	39	39	39
R-squared	0.496	0.572	0.581	0.538	0.530	0.563

Standard errors in parentheses

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

Table 7 - Effects of decentralization on excess mortality rate, with control variables, developing countries.

VARIABLES	(1) No Trust & Polarization n	(2) w/ Trust	(3) w/ Trust & Polarization n	(4) Political	(5) Fiscal	(6) Administrative
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Aggregate Decentralization Index, Log	2.217 (5.495)	2.306 (5.993)	2.310 (5.602)			
State Fragility Index	-6.168* (3.164)	-7.572** (3.210)	-9.028*** (3.031)	-8.440*** (2.772)	-8.370*** (2.794)	-8.217*** (2.700)
GDP Per Capita, Log	24.39 (18.28)	20.23 (18.54)	11.91 (17.51)	11.84 (13.97)	11.88 (13.92)	6.792 (13.68)
Electoral democracy index	89.42 (61.87)	154.0** (69.27)	138.1** (64.92)	124.9** (61.77)	125.5** (61.62)	133.7** (60.13)
Population Density, Log	-13.29 (8.858)	-11.76 (8.878)	-15.81* (8.385)	-12.86* (7.395)	-12.83* (7.373)	-15.25** (7.268)
Political corruption index	95.41* (56.99)	77.39 (57.24)	35.87 (54.90)	16.70 (48.54)	15.16 (48.73)	17.85 (47.34)
Social Capital		-17.62* (9.700)	-16.10* (9.079)	-13.28 (8.121)	-13.64 (8.204)	-15.38* (7.984)
Political Polarization, Mean			50.74*** (14.95)	46.06*** (13.50)	45.59*** (13.72)	44.73*** (13.11)
Political Decentralization Index				13.06 (44.39)		
Fiscal Decentralization Index					18.73 (58.89)	
Administrative Decentralization Index						80.77** (38.84)
Constant	-8.441 (195.3)	103.9 (205.9)	101.0 (192.5)	87.69 (153.8)	90.95 (154.6)	128.6 (151.2)
Observations	83	81	81	91	91	91
R-squared	0.284	0.317	0.411	0.373	0.373	0.403

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

When it comes to developing countries, centralization did lead to worse outcomes on every level, however the results are only significant for administrative decentralization, giving credence to H_3 . However, other variables were also significant. Increased scores in polarization and democracy are associated with higher mortality rates, while higher state fragility and population density led to negative relationship with mortality rates. Given the theoretical importance of these factors, the lack of evidence elsewhere, I conclude that there are mixed results for decentralization leading to higher mortality rates in developing countries.

6.5 Robustness

Before fully running my models, I first tested different control variables to ensure they are distributed well and did not have bizarre interactions with the model. I initially had an accountability indicator (*wbgi_vae* from QoG dataset), but it was highly multicollinear with the

polyarchy index. The state capacity index (*lld_capacity* from QoG dataset) was also changed due to multicollinearity with GDP Per capita, which prompted me to substitute in a State Fragility Index that lessened the focus on economic side. All regressions were followed by examining heteroskedasticity and examining residual and found no abnormalities. Lastly, concerning the possibility of bias of variables. There is no reason to believe COVID-19 influenced institutional design of countries, especially given the fact that the data on decentralization was taken before COVID-19 so there should be no issue with reverse causality. It is possible the damages from COVID-19 could influence institutional design in future as countries seek to make changes to fiscal or administrative improvements, but that is not captured in this study regardless. Usage of different dataset for social trust slightly lowers the validity of the results. However, given the similarity of the indicator used to gauge trust, it should not be an overt problem. A regression using WVS data was added in the appendix under Table 2a to examine similarities, however the results are largely the same.

7 Limitations

There were several issues within this study that need to be discussed. First, the study ran into difficulties with outliers and data sets. The mortality rates for these outliers were so high that they would greatly bias the models in the targeted sections of the study. Outliers proved to be an issue and I tried to assess the validity of the outliers by examining other data sets and comparing the values. There are two other excess mortality data sets that I am aware of, from the World Health Organization (WHO) (World Health Organization, 2022) and The Economist (The Economist, 2021). The results are posted in Table 8. Five of the outliers were towards the top for excess mortality rate, except for Lesotho and Eswatini which differed greatly. Out of the seven outliers, three countries appeared as maximums, each in the different sets. All three datasets estimate the same annual rate between 2020-2021. For Belarus, Peru, Bulgaria, Bolivia, and North Macedonia there is a general agreement that their upper bound values are correctly identified, but the actual rates are different. This is not the case for Lesotho and Eswatini, which brings question to the validity of the datasets and usage of excess mortality rates in conducting these sorts of studies. While I still contend to the robustness of using excess mortality over reported COVID-19 deaths, careful consideration must be paid to outliers and how to deal with them.

Table 8 – Comparison of outliers from different datasets.

Country	WHO Data	The Economist	IHME
Belarus	259	352	483.1
Peru	(Max)437	584	528.6
Lesotho	93	N/A	562.9
North Macedonia	369	821	583.6
Eswatini	164	N/A	634.9
Bulgaria	415	(Max)1038	647.3
Bolivia	375	469	(Max)734.9
Range	-194 to 437	-18 to 1038	-47.8 to 743.9
Mean	82.6	262.2	159.9
SD	101.3	227.2	133.4

Second issue this study had concerned with availability of data. Adding more control variables was difficult due to large differences in availability of data. The issue is that the largest concentration of centralized countries is found in the Middle East and Africa (Ivanyna & Shah, 21), for which precisely data was most lacking. Taking out the largest portion of centralized observations threatened the overall validity of the results since most of the study would involve average decentralized states and mostly decentralized states. Datasets for control variables, such as trust, were difficult to find and incorporate into the study that would have added more validity. I resorted to using a different trust dataset for comparative study given the similarity of the indicator used, however it does lessen the validity of the study to not use a uniform dataset. Alternatively, future studies could also use different operationalization to gauge the effects of decentralization on mortality rates. They should include more expansive data to use in their studies to improve the methodological scope of their studies since capture of centralized observations was difficult given the data available.

8 Discussion

Ultimately, decentralization did not have a relationship with COVID-19 excess mortality rates except for one case - administrative decentralization in developing countries. Other variables had stronger explanatory power in explaining differences in mortality rates. In developed countries, political corruption led to significant increases in mortality rates, and one percent increases in GDP per capita led to -79.95 decrease in mortality rates. This represents the economic capacity of nations to fight COVID-19, possibly suggesting wealthier countries had

spent more money to fight COVID-19 when accounting for other variables. In developing countries, the most significant variables were state fragility, democracy, and polarization. One unit increases on the state fragility index led to -9.03 decreases in mortality rate, with the scale increasing up to 25 times. It is possible that in developed countries the capacity to respond to disasters is more constant since they would have developed institutions prepared for disasters, and this fact is more significant for developing countries since their ability to utilize state resources to respond would differ wildly. Political polarization was also highly significant where for 1 unit increases in polarization led to 50.74 excess mortality rates. As previous research showed, trust and polarization are important for improving outcomes (Charron, Lapuente, & Pose-Rodriguez, 2020).

Against the backdrop of previous research into decentralization subtypes, this study found that administrative decentralization in developing countries led to higher COVID-19 mortality rates. It is possible that in developing states increases in administrative decentralization is associated with issues such as nepotism, rather than accountability from the people. However, the corruption index was not significant for developing countries in explaining mortality rates. It is still possible there are confounding effects that were not captured in this study that will require closer examination. Future studies should take note of this finding and expand research with more expansive datasets on developing countries to determine the association between administrative decentralization and outcomes in disasters in developing countries.

Counterintuitively, democracy led to higher mortality in developing states and is also significant, which contradicts theories on accountability. However, some research was already written proving that higher democratic scores led to more COVID-19 mortality rates, particularly in the beginning, though they did not find that effect in developing countries while this study did (Yao, Li, Howard, Bailey, & Graffi, 2021). Previous research suggests that democratic countries have a lag in implementing public health policy, due to public outcry and discontent with restrictions (Yao, Li, Howard, Bailey, & Graffi, 2021) (Cepaluni, Dorsch, & Branyiczki, 2022). This harkens back to the research discussion - whether autocracies or democracies performed better, but it has seen mixed results. Answering that is beyond the scope of this paper, but the study shows that decentralization is independent of that question.

Polarization and trust were important factors in the study, where addition of trust lowered significance of decentralization in developed countries, and polarization largely explained excess mortality rates in developed countries. This study adds evidence to the importance of social indicators in combatting COVID-19 pandemic. Most of the impactful policies combatting COVID-19 involved simple instructions: washing hands, keeping distance, wearing a mask, staying at home etc. Successful lowering of mortality rates would come down to factors involving degrees to which people agree to cooperate to overcome collective action problems; that being the COVID-19 disaster in this case. Overall, these factors provide greater explanatory powers than levels of decentralization in lowering COVID-19 mortality rates.

References

- Adam, A., Delis, M., & Kammas, P. (2013). Fiscal decentralization and public sector efficiency: Evidence from OECD countries. *Economics of Governance*, 15(1), 17-49.
- Adam, D. (2022, January 18). *The pandemic's true death toll: millions more than official counts*. Retrieved from nature: <https://www.nature.com/articles/d41586-022-00104-8>
- Andharia, J. (2020). *Disaster Studies: Exploring Intersectionalities in Disaster Discourse*. Springer. Retrieved from <https://www.springer.com/series/13839>
- Aron, J., & Muellbauer, J. (2022). Excess Mortality Versus COVID-19 Death Rates: A Spatial Analysis of Socioeconomic Disparities and Political Allegiance Across U.S. States. *The Review of Income and Wealth*, 68(2), 348-392.
- Ashraf, N. B. (2020). Stock markets' reaction to COVID-19: cases or fatalities? *Research in International*, 54(101249), 1-7.
- Barrios, J. M., & Hochberg, Y. (2020). Risk Perception Through the Lens of Politics in the Time of the COVID-19 Pandemic. WorkingPaper 27008. *National Bureau of Economic Research*.
- Birkland, T., & Waterman, S. (2008). Is Federalism the Reason for Policy Failure in Hurricane Katrina? *Publius*, 38(4), 692-714.
- Bradley, E., Elkins, B., Herrin, J., & Elbel, B. (2011). Health and social services expenditures: Associations with health outcomes. *BMJ Quality & Safety*, 20(10), 826-831.
- Brenan, M. (2020, July 13). *Americans' Face Mask Usage Varies Greatly by Demographics*. Retrieved from Gallup: <https://news.gallup.com/poll/315590/americans-face-mask-usage-varies-greatly-demographics.aspx>
- Camões, P. J. (2020). Types of Decentralisation and Governance: Evidence from across the World. *Journal of Public Affairs*, 1-12.
- Cepaluni, G., Dorsch, M. T., & Branyiczki, R. (2022). Political regimes and deaths in the early stages of the COVID-19 pandemic. *Bristol University Press*, 37(1), 27-53.
- Chappell, B. (2022, May 5). *Governments have undercounted the COVID-19 death toll by millions, the WHO says*. Retrieved from NPR: <https://www.npr.org/sections/goatsandsoda/2022/05/05/1096842429/governments-have-undercounted-the-covid-19-death-toll-by-millions-the-who-says>
- Charron, N., Lapuente, V., & Pose-Rodriguez, A. (2020). Uncooperative society, uncooperative politics or both? Polarization and Populism Explain Excess Mortality for COVID-19. *QOQ THE QUALITY OF GOVERNMENT INSTITUTE*, 1-34.

- Cheibub, J. A., Jean Hong, J. Y., & Przeworski, A. (2020, July 7). Rights and Deaths: Government Reactions to the Pandemic. 1-35. Retrieved from Available at SSRN: 3645410.
- Chen, B., Zhu, H., Wu, L., Zhang, X., & Yan, B. (2020). Why Do Countries Respond Differently to COVID-19? A Comparative Study of Sweden, China, France, and Japan. *American Review of Public Administration*, 50(6-7), 762–769. doi:10.1177/0275074020942445
- Choutagunta, A., Manish, G. P., & Rajagopalan, S. (2021). Battling COVID-19 with Dysfunctional Federalism: Lessons from India. *Southern Economic Journal*, 87(4), 1267-299.
- Christensen, T., & Læg Reid, P. (2020). Balancing Governance Capacity and Legitimacy: How the Norwegian Government Handled the COVID-19 Crisis as a High Performer. *Public Administration Review*, 80(5), 774-779.
- Chundeli, F., Lata, K., Ramamurthy, A., & Jain, M. (2021). Population Density and Covid Spatial Dynamics: A Critical Assessment of Indian Districts. *Indian Journal of Public Administration*, 67(3), 425-439.
- Cooperman, A. (2022). (Un)Natural Disasters: Electoral Cycles in Disaster Relief. *Comparative Political Studies*, 55.7, 1158-1197.
- Coppedge, M., Gerring, J., Knutsen, C. H., Lindberg, S. I., Teorrell, J., Altman, D., . . . Skaaning, S.-E. (2022). V-Dem Codebook v12. *Varieties of Democracy (V-Dem) Project*, 1-432.
- Donner, S., Hartmann, H., & Schwarz, R. (2020). Transformation index of the bertelsmannstiftung 2020. *Bertelsmann Stiftung*. Retrieved from <http://www.bti-project.org>
- Dorsch, M. T., & Cepaluni, G. (2020). Political Regimes and Deaths in the Early Stages of the COVID-19 Pandemic. 1-49.
- Faguet, J.-P. (2014). Decentralization and Governance – A Special Issue of World Development. *World Development*, 53, 2-13.
- Faguet, J.-P., & Sánchez, F. (2008). Decentralization's Effects on Educational Outcomes in Bolivia and Colombia. *World Development*, 36(7), 1294-316.
- Fisman, R., & Gatti, R. (2002). Decentralization and Corruption: Evidence across Countries. *Journal of Public Economics*, 325-45. Retrieved 83.3
- Frey, C. B., Chen, C., & Presidente, G. (2020). Democracy, Culture, and Contagion: Political Regimes and Countries Responsiveness to Covid-19. *Covid Economics*, 18.
- Guggenheim, M. (2014). Introduction: Disasters as Politics - Politics as Disasters. *The Sociological Review (Keele)*, 62(S1), 1-16.

- Haerpfer, C., Inglehart, R., Moreno, A. W., C., K. K., Diez-Medrano, J., & Lagos, e. a. (2021). World Values Survey Time-Series (1981-2020) Cross-National Data-Set: Data File Version 2.0.0. *World Value Survey*. Retrieved from <https://doi.org/10.14281/18241.15>
- Hallas, L., Hatibie, A., Koch, R., Majumdar, S., Pyarali, M., Wood, A., & Hale, T. (2021). Variation in US states' COVID-19 policy responses. *BSG Working Paper Series*, 1-52.
- Harring, N., Jagers, S. C., & Löfgren, Å. (2021). COVID-19: Large-scale collective action, government intervention, and. *World Development* 138, 1-4.
- Hermansson, H. (2019). Challenges to Decentralization of Disaster Management in Turkey: The Role of Political-Administrative Context. *International Journal of Public Administration*, 42(5) , 417-31.
- IHME, I. f. (2022). COVID-19 Excess Mortality Estimates 2020-2021.
- Ivanyna, M., & Shah, A. (2014). How Close Is Your Government to Its People? Worldwide Indicators on Localization and Decentralization. *Economics: The Open-Access, Open-Assessment E-Journal*, 8, 1-63. doi:<http://dx.doi.org/10.5018/economics-ejournal.ja.2014-3>
- Jarvis, D. S., & Hartley, K. (2020). Policymaking in a low-trust state: legitimacy, state capacity, and responses to COVID-19 in Hong Kong. *Policy and Society*, 39(3), 403-423. doi:10.1080/14494035.2020.1783791
- Jones, O. (2020, June 25). *Boris Johnson wants Britain to go to the pub – and forget about the 65,700 dead*. Retrieved from The Guardian: <https://www.theguardian.com/commentisfree/2020/jun/25/boris-johnson-britain-pub-dead-government-coronavirus>
- Jung, E., Ro, Y., Ryu, H., Shin, S., & Moon, S. (2021). Interaction Effects between COVID-19 Outbreak and Community Income Levels on Excess Mortality among Patients Visiting Emergency Departments. *Journal of Korean Medical Science*, 36(13).
- Kim, J., & Ashihara, K. (2020). National Disaster Management System: COVID-19 Case in Korea. *International Journal of Environmental Research and Public Health*, 17(18), 1-18.
- Ku, M., Han, A., & Hyung-Lee, K. (2022). The Dynamics of Cross-Sector Collaboration in Centralized Disaster Governance: A Network Study of Interorganizational Collaborations during the MERS Epidemic in South Korea. *International Journal of Environmental Research and Public Health*, 1-15.
- Kyriacou, A. P., & Roca-Sagalés, O. (2011). Fiscal and Political Decentralization and Government Quality. *Environment and Planning. C, Government & Policy*, 29(2), 204-23.
- Lauka, A., McCoy, J., & Firat, R. (2018). Mass Partisan Polarization: Measuring a Relational Concept. *The American Behavioral Scientist (Beverly Hills)*, 62(1), 107-126.

- Li, S., Farrel, M., & Alon, I. (2020). Regime Type and COVID-19 Response. *FIIB Business Review*, 9(3), 152-160.
- Lindell, M. K. (2013). Disaster studies. *Current Sociology*, 61(5-6), 797-825.
- Lippi, A., & Capano, G. (2021, June 19). Decentralization, policy capacities, and varieties of first health response to the COVID-19 outbreak:evidence from three regions in Italy. *Journal of European Public Policy*, 28(8), 1197-1218,. doi:10.1080/13501763.2021.1942156
- Liwanag, H. J., & Wyss, K. (2019). Optimising Decentralisation for the Health Sector by Exploring the Synergy of Decision Space, Capacity and Accountability: Insights from the Philippines. *Health Research Policy and Systems*, 17(1), 1-16.
- Luszczynska, A., Szczuka, Z., Abraham, C., Baban, A., Brooks, S., & al., e. (2021). The Interplay Between Strictness of Policies and Individuals' Self-Regulatory Efforts: Associations with Handwashing During the COVID-19 Pandemic. *Annals of Behavioral Medicine*, 1-13. Retrieved from <https://doi.org/10.1093/abm/kaab102>
- Marshall, M. G., & Elzinga-Marshall, G. (2017). Global report 2017: Conflict, governance,.
- Mechler, R. (2016). Reviewing Estimates of the Economic Efficiency of Disaster Risk Management: Opportunities and Limitations of Using Risk-based Cost–benefit Analysis. *Natural Hazards (Dordrecht)*, 81(3), 2121-147.
- Mills, A., Vaughan, J. P., Smith, D. L., & Tabibzadeh, I. (1990). Health system decentralization : concepts, issues and country experience. (A. Mills, Ed.) 1-146. Retrieved from <https://apps.who.int/iris/handle/10665/39053>
- Minder, R. (2020, June 21). *Bullfighting, Already Ailing in Spain, Is Battered by Lockdown*. Retrieved from The New York Times: <https://www.nytimes.com/2020/06/21/world/europe/bullfighting-spain-coronavirus.html>
- O'Dwyer, C., & Ziblatt, D. (2006). Does Decentralisation Make Government More Efficient and Effective? *Commonwealth & Comparative Politics*, 44(3), 326-43.
- Oto-Peralías, D., Romero-Ávila, D., & Usabiaga, C. (2013). Does Fiscal Decentralization Mitigate the Adverse Effects of Corruption on Public Deficits? *European Journal of Political Economy*, 32, 205-31.
- Ottervik, M. (2013). Conceptualizing and Measuring State Capacity. Retrieved from http://qog.pol.gu.se/digitalAssets/1468/1468814_2013_20_ottervik.pdf
- Pamstein. (2022). *V-Dem Working Paper Series, 2022:21*.
- Pardhan, S., & Drydakis, N. (2021). Associating the Change in New COVID-19 Cases to GDP per Capita in 38 European Countries in the First Wave of the Pandemic. *Frontiers in Public Health*, 8.

- Paul, K. C., Thill, J.-C., & Rahman, M. (2020). COVID-19 Pandemic Severity, Lockdown Regimes, and People's Mobility: Early Evidence from 88 Countries. *Sustainability*, 1-17.
- Petridou, E., & Zahariadis, N. (2021). Staying at Home or going out? Leadership response to the COVID 19 crisis in Greece and Sweden. *Journal of Contingencies and Crisis Management*, 29(3), 293-302.
- Prud'homme, R. (1995, August). THE DANGERS OF DECENTRALIZATION. *The World Bank Research Observer*, 10(2), 201-220.
- Pulejo, M., & Querubín, P. (2020). ELECTORAL CONCERNS REDUCE RESTRICTIVE MEASURES DURING THE COVID-19 PANDEMIC. *Working Paper 27498*, 1-18.
- Putnam, R. D. (1993). *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press.
- Putnam, R. D. (2000). *Bowling Alone: The Collapse and Revival of American Community*. New York, NY: Simon & Schuster.
- Ren, X. (2020). Pandemic and lockdown: a territorial approach to COVID-19 in China, Italy and the United States. *Eurasian Geography and Economics*, 61(4-5), 423-434. doi:10.1080/15387216.2020.1762103
- Rondinelli, D. A., Nellis, J. R., & Cheema, G. S. (1990). Decentralization in Developing Countries: A Review of Recent Experience. *Staff working paper ; no. SWP 581*. Retrieved from <http://documents.worldbank.org/curated/en/868391468740679709/Decentralization-in-developing-countries-a-review-of-recent-experience>
- Rothstein, B. (2011). *The Quality of Government : Corruption, Social Trust, and Inequality in International Perspective*. University of Chicago Press. Retrieved from <https://ebookcentral.proquest.com/lib/gu/detail.action?docID=719232>
- Sainz-Santamaria, J., & Anderson, S. E. (2013). The Electoral Politics of Disaster Preparedness. *Risk, Hazards & Crisis in Public Policy*, 4(4), 234-49.
- Shoots-Reinhard, B., Goodwin, R., Bjälkebring, P., Markowitz, D., Silverstein, M., & Peters, E. (2021). Ability-related political polarization in the COVID-19 pandemic. *Intelligence*, 88.
- Smoke, P. (2015). Rethinking Decentralization: Assessing Challenges to a Popular Public Sector Reform. *Public Administration and Development*, 35(2), 97-112.
- Stallings, R. A. (2007). Handbook of Disaster Research Handbooks of Sociology and Social Research. In H. Rodríguez, E. L. Quarantelli, & R. R. Dynes, *Handbook of* (pp. 55-82). New York : Springer.
- Teorell, J., Sundström, A., Holmberg, S., Rothstein, B., & Alvarado, N. (2022). The Quality of Government Standard Dataset. *version jan22*, 1-794. Retrieved from <https://www.gu.se/en/quality-government> doi:10.18157/qogstdjan22

- The Economist. (2021, October 20). Tracking covid-19 excess deaths across countries. The Economist. Retrieved from <https://www.economist.com/graphic-detail/coronavirus-excess-deaths-tracker>
- United Nations Development Program. (2020b). *Human development report 2020*. Retrieved from <http://hdr.undp.org/en/2020-report>
- Van Bavel, J. J. (2020). Using Social and Behavioural Science to Support COVID-19 Pandemic Response. *Nature Human Behaviour*, 4(5), 460–471.
- Warner, S., Richards, D., Coyle, D., & Smith, M. J. (2021). English Devolution and the Covid-19 Pandemic: Governing Dilemmas in the Shadow of the Treasury. *The Political Quarterly (London. 1930)*, 92(2), 321-30.
- World Bank. (2021). World development indicators. Retrieved from <https://databank.worldbank.org/source/>
- World Health Organization. (2022, March 25). Estimates of Excess Mortality Associated With COVID-19 Pandemic. Geneva: World Health Organization. Retrieved from <https://www.who.int/data/sets/global-excess-deaths-associated-with-covid-19-modelled-estimates>
- Yao, L., Li, M. W., Howard, S. C., Bailey, J. E., & Graffi, J. C. (2021, September 7). Democracy and case fatality rate of COVID-19 at early stage of pandemic: a multicountry study. *Environmental Science and Pollution Research*, 29(6), 1-11. doi:<https://doi.org/10.1007/s11356-021-16250-x>
- Yuliani, E. L. (2004). Decentralization, deconcentration and devolution: what do they mean? 1-5. Retrieved from <https://www.semanticscholar.org/paper/Decentralization%2C-deconcentration-and-devolution%3A-Yuliani/2ad613073fe8ecfb610c686ee5f4e394bed1a585>

Appendix

Table 1a - Effects of different decentralization types on COVID-19 mortality rates, all countries and outliers included.

VARIABLES	(1) Political	(2) Fiscal	(3) Administrative	(4) Aggregate
Political Decentralization Index	65.31 (42.08)			
Fiscal Decentralization Index		4.867 (40.93)		
Administrative Decentralization Index			86.86** (35.83)	
Aggregate Decentralization Index, log				4.261 (4.503)
Constant	128.4*** (22.67)	158.3*** (17.05)	133.5*** (14.76)	169.5*** (12.57)
Observations	175	175	175	154
R-squared	0.014	0.000	0.033	0.006

Standard errors in parentheses

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

Table 2a - Effects of Decentralization on excess mortality rates, developing countries, with control variables, using WVS trust indicator.

VARIABLES	(1) No Trust & Polarization	(2) w/ Trust	(3) w/ Trust & Polarization	(4) Political	(5) Fiscal	(6) Administrati ve
Aggregate Decentralization Index, Log	2.217 (5.495)	-23.75* (12.07)	-24.51** (11.37)			
State Fragility Index	-6.168* (3.164)	-7.551 (4.759)	-8.588* (4.513)	-9.469* (4.621)	-10.56** (4.561)	-9.579* (4.634)
GDP Per Capita, Log	24.39 (18.28)	11.91 (33.87)	-2.659 (32.78)	8.444 (35.02)	9.406 (33.04)	-1.705 (33.65)
Electoral democracy index	89.42 (61.87)	228.7 (138.6)	245.5* (130.8)	123.0 (124.2)	128.4 (120.9)	104.8 (121.9)
Population Density, Log	-13.29 (8.858)	-13.38 (20.83)	-7.337 (19.86)	-15.53 (20.56)	-16.95 (20.27)	-13.68 (20.58)
Political corruption index	95.41* (56.99)	82.40 (121.8)	97.32 (114.9)	116.6 (110.0)	110.7 (106.4)	111.8 (109.8)
Most people can be trusted		-116.7 (206.1)	-3.016 (202.9)	-203.2 (193.4)	-169.7 (191.0)	-205.9 (195.5)
Political Polarization, Mean			58.79* (30.61)	56.90* (32.39)	56.59* (31.46)	55.57* (32.35)
Political Decentralization Index				-51.34 (91.07)		
Fiscal Decentralization Index					-100.6 (96.66)	

Administrative Decentralization Index						30.67
						(76.75)
Constant	-8.441	91.44	-4.821	59.37	78.70	112.8
	(195.3)	(324.2)	(309.3)	(329.1)	(311.6)	(316.3)
Observations	83	29	29	31	31	31
R-squared	0.284	0.504	0.581	0.504	0.520	0.500

Standard errors in parentheses

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