DOCTOR OF PHILOSOPHY

Fiscal decentralization and the poor.

Hussain, Christopher

Award date:
2017

Awarding institution:
Bangor University

FISCAL DECENTRALIZATION AND THE POOR

Thesis submitted for the degree of
Doctor of Philosophy
at Bangor University

by
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May 2017

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Abstract

In recent years, many governments in developed and developing economies have implemented reforms to decentralize tax raising powers, the supply of public services, and other functions previously delivered by central governments, with the aim of achieving greater government accountability and more efficient and effective public services. In this thesis, I examine empirically the effects of fiscal decentralization on several key areas of public policy, including: poverty and income distribution (chapter 3), public healthcare and public education (chapter 4), and citizen trust in government (chapter 5). In order to examine the effects of fiscal decentralization I produce a fiscal decentralization dataset comprising of a range of indicators for tax and spending decentralization; subnational government autonomy; local government accountability and local government size (land area and population). Using this dataset, I produce the following findings. First, in chapter 3 tax and spending decentralization can help reduce income inequality in high income countries, and increase absolute poverty in low and middle income countries. Furthermore, fiscal decentralization appears to be more beneficial for the poor when the average size of local jurisdictions is smaller. Second, in chapter 4 I find that there is no clear relationship between fiscal decentralization and the level of public healthcare and public education provided. Instead, fiscal decentralization appears to improve vaccination coverage over time, when subnational governments have autonomy over expenditure, and when there is a higher level of public spending on healthcare. Third, in chapter 5 I find that fiscal decentralization has no clear effect on citizen trust in government; however, tax and spending decentralization has contrasting effects depending on the number of tiers of government (government structure) and the average population size of local jurisdictions. The main conclusion is that fiscal decentralization can have an impact on the key areas of public policy examined in my research, however these effects are often not observed through tax and spending decentralization, but rather other aspects of fiscal decentralization, including the closeness of local government to local citizens, local government autonomy and accountability.

Acknowledgements

I would like to thank my two supervisors, Professor John Thornton and Doctor Rhys ap Gwilym. Their continued support during my course means that I am able to write these acknowledgements. In particular, I thank Professor John Thornton for the support he has given me well into my final year and I thank Rhys ap Gwilym for being available whenever I have needed support in the many different aspects of my work. I wish them all the best for the future.

I would also like to thank Margaux Llapasset for her unwavering support during the last three years. She has given me great support in every way she could. She has been there throughout the lowest moments of my studies, and without my memories of my PhD would not be so colourful. I congratulate her on the completion of her Masters in France, just months before I submitted my thesis, and I wish her well in everything she does in the future.

I would like to thank my mother and father for supporting me in any way they could during my course. I thank my father, whose pleasant company in the dining room meant I did not feel alone when writing up my thesis. I thank my mother, who has given me support whenever I have asked and needed it throughout my course.

Finally, I would also give thanks to the friends I have met during my time at Bangor University. Though they are too many to count, I thank all of them for just being great friends, and for providing even the smallest amount of support at any moment. In particular, I thank friends in Bangor University Chess Club during the first two years of my course, and the fantastic people that I met at the Salsa Club. Truly one of the best feelings after a long day in the library was dancing with friends.

Contents

List of Tables

List of Charts and Figures

Introduction

Over the course of the last 30 years there has been a gradual move towards more decentralized government, particularly in developing countries. Dillinger (1994) notes that in a sample of 75 developing and transitional economies, all but a dozen have embarked on some form of decentralization. Faguet (2004) comments that government decentralization is a part of broad reforms for development in Asia, Africa and Latin America. In practice, decentralization reforms present themselves as increases in subnational government spending and local government accountability. For example, Stein (1998) observes a small, but steady increase in subnational government share of total government spending – roughly 4% between 1985 and 1995. This increase in spending has also been accompanied by political autonomy reforms, particularly in Latin America, where local government executives (mayors) that were at one time appointed by the central government, are now elected by local citizens.

Yet, despite the apparent trend towards government decentralization in developing countries, they are still far behind their developed counterparts. Each of Oates (1972), Davoodi and Zou (1998) and Bahl (1999) all observe a stark contrast in the decentralization of spending between more and less economically developed countries. Whilst subnational governments account for roughly one third total government expenditure, subnational governments in developing countries account for roughly less than half (between 11% and 20%).

Part of the reason for this push for more government decentralization, particularly in developing countries, is the expected benefits of fiscal decentralization. The benefits of fiscal decentralization include improving government responsiveness to the diverse local demands of local citizens (Oates, 1972), which could ultimately improve public sector efficiency (Davoodi and Zou, 1998). Fiscal decentralization could also lead to competition between subnational governments and consequently, reduce excessive taxes (Brennan and Buchanan, 1980) and provide sustained

economic development at the local and national level, which many believe centralized administration has failed to deliver (Oates, 1999).

Fiscal decentralization is not without its critics however. Opponents of fiscal decentralization consider the potential dangers of subnational and local government autonomy (Prud'homme, 1995). These dangers include a race to the bottom in taxes on capital (Hoyt, 1991), lower spending on social services and redistribution (Keen and Marchand, 1997), inter-regional differences in investment, productivity and public spending (Cai and Treisman, 2005), and lower spending on goods and services that exhibit positive externalities (Besley and Coate, 2003).

Furthermore, recent studies on the effects of fiscal decentralization have examined other aspects of decentralization that are often overlooked in favour of the more conventional measures of fiscal decentralization, namely subnational government share of revenue and expenditure (Stegarescu, 2005). Treisman (2002) and Ivanyna and Shah (2014) have developed new datasets on subnational and local government autonomy and accountability, while Ebel and Yilmaz (2003); Thornton (2007a) and Altunbas and Thornton (2011) have incorporated a range of indicators of other aspects of fiscal decentralization in their empirical research. Often, the effects of fiscal decentralization on public sector size, economic growth and corruption are sensitive to the chosen indicator of fiscal decentralization.

In this thesis, I contribute to the area of fiscal decentralization by exploring empirically the effects of fiscal decentralization. In chapter 1 I explore the fiscal decentralization literature. I set out several theoretical arguments for and against further government decentralization, and I consider how various aspects of decentralization relate to those arguments. In chapter 2 I explore the fiscal decentralization data. I consider the limitations of the conventional measures of fiscal decentralization and I produce a decentralization dataset that contains a range of indicators for tax and spending decentralization, subnational government autonomy, local government accountability and other features of fiscal decentralization. I use the theoretical arguments in chapter 1 and the decentralization dataset in chapter 2 to examine the effects of fiscal decentralization on several key areas of public policy. Specifically, I investigate the effects of fiscal decentralization on poverty and income distribution (chapter 3); public healthcare and public education (chapter 4) and trust in government (chapter 5). The contributions of this research are several:

1. One of the main contributions of this research is to shed light on the effects of fiscal decentralization on a particular group, namely the poor and poorest. Most fiscal

decentralization research has examined the effects of fiscal decentralization on macroeconomic variables, such as economic growth (see Davoodi and Zou, 1998); public sector size (see Oates, 1985) and inflation (see Thornton, 2007b). However, some of the aims of fiscal decentralization include strengthening ties between decision makers and citizens (Musgrave, 1983); improving local government accountability and making government more responsive to citizen demands for public services (Faguet, 2004). As Dillinger (1994) comments, the effects of decentralization may not be positive, or negative, for everyone, and certain sections of society may lose out. In this research, I focus on the effects of fiscal decentralization on poverty; income inequality; public healthcare and public education, and trust in government.

2. The second contribution of my research is a look at how the effects of tax and spending decentralization depend on other aspects of decentralization that are often overlooked. In the introductory chapters of my thesis I develop key concepts of decentralization (chapter 1) and I represent those concepts in an extensive decentralization dataset (chapter 2). My empirical research in chapters 3, 4 and 5 often demonstrate that the effects of tax and spending decentralization are mixed and statistically insignificant. Instead, the effects of fiscal decentralization depend on many aspects of decentralization.
3. In chapter 3 I use my decentralization dataset to examine the effects of fiscal decentralization on absolute poverty and income distribution (chapter 3). To my knowledge, this is the first examination of the effects of fiscal decentralization on poverty for a wide range of countries. I produce evidence that tax and spending decentralization can reduce income inequality in high income countries and increase absolute poverty in low and middle income countries. Furthermore, the average size (area) of the local jurisdiction has a bearing on the effects of tax and spending share of subnational governments. Specifically, smaller localities help to reduce inequality and poverty when tax and spending is devolved to subnational governments, but the opposite is true when localities are larger.
4. In chapter 4, I develop previous work on fiscal decentralization and public healthcare and public education by examining the effects of various aspects of decentralization on a range of public services indicators. My findings show that fiscal decentralization has different effects between different indicators of public services, and that fiscal decentralization can improve healthcare outputs (vaccination) when subnational governments have autonomy over spending and when total public spending is higher. Spending decentralization also observes contrasting effects on public education, depending on whether the local executive

is elected locally, or appointed by the central government.

5. In chapter 5, I examine the effects of fiscal decentralization on citizen trust in government. Only one piece of work has examined the effects of decentralization on trust in government across a selection of countries (see Ligthart and Oudheusen, 2015). I build on their research by including measures for subnational government autonomy, local government accountability and local government population size to produce a greater range of results. I produce evidence that citizens are indifferent about the degree of tax and spending decision making of subnational governments. Instead, citizens trust government less when there are more tiers of government, and trust government more when local governments are responsible for fewer people.

1. An Introduction to Fiscal Decentralization

In the first chapter of this thesis I review the fiscal decentralization literature. The aim of this review is to establish some of the key arguments, for and against, fiscal decentralization. The arguments that I present in this review are particularly relevant to my own research on poverty, the provision of basic public services and citizen trust in government. In addition to reviewing the effects of fiscal decentralization, I consider alternate forms of government decentralization that do not meet all the conditions of fiscal decentralization, defined in the opening sections of this chapter. It is important to consider other forms of government decentralization, as some of the effects of fiscal decentralization may still arise without subnational government autonomy, local government accountability and so forth.

This chapter is organised as follows. In section 1.1 I define the concept of fiscal decentralization. I briefly touch upon the case for fiscal decentralization, specifically in the allocation of government resources at the local level (Oates, 1972), before defining other forms of decentralization. In sections 1.2 and 1.3 I present the case for fiscal decentralization (1.2) and highlight some of the dangers associated with subnational government autonomy (1.3). In section 1.4 I consider how each form of decentralization discussed in section 1.1. relate to the different arguments for and against fiscal decentralization. I include a discussion on an alternate form of decentralization, known as partial fiscal decentralization (see Brueckner, 2009), where subnational governments have autonomy over expenditure, but not taxation. Finally, I conclude this literature review by leading into chapter 2: "measuring fiscal decentralization"

1.1. Concepts of Decentralization

One of the main problems in the fiscal decentralization literature is how we define what fiscal decentralization means. As Treisman (2002, 2007) explains, fiscal decentralization is often used to represent different things. If it is unclear what fiscal decentralization means, then it will not be possible to understand the effects of fiscal decentralization. In this section I provide a definition for fiscal decentralization based on several key contributions from Oates, Treisman and others, that encompasses the various aspects of fiscal decentralization. I also define alternate forms of government decentralization that may be more common in practice.

1.1.1. Fiscal Decentralization

Fiscal decentralization is the distribution of tax and expenditure decision making between the different tiers of government, that together form a federal state (Oates, 1972). Within a federal state, each tier of government is responsible for some tax and expenditure functions (Gordon, 1983), but no tier is responsible for all functions. The distribution of tax and expenditure functions between tiers of governments depends on the various advantages of fiscal federalism, which I will discuss later in this chapter.

Oates' definition covers several aspects of government decentralization. These aspects are: i) the share of government activity at the subnational government level (distribution of responsibility), ii) the discretion subnational governments have over certain tax and expenditure (autonomy), iii) the direct accountability of local governments to local constituents (accountability). Each of these aspects of fiscal decentralization can be understood as alternate forms of government decentralization (see Treisman, 2007). However, fiscal decentralization is defined as all of these aspects in one. Fiscal decentralization depends on the distribution of government activity; discretion over government activity, and the extent to which local government is accountable directly to local constituents.

As Treisman (2002) explains, it is not simply a matter of fiscal decentralization or fiscal centralization, but rather the organisation of powers to tax and spend between a multi-tiered government. Therefore, fiscal decentralization concerns the degree to which subnational governments determine taxation and spending, relative to the central government.

Fiscal decentralization is about more than the share of government activity for each tier of government. A second important aspect of fiscal decentralization is that subnational

governments should have discretion over the functions that have been devolved to them. The roles and responsibilities of subnational governments should be clearly defined, and free from any influence from the central government (Oates, 1972). The autonomy of subnational government concerns certain constraints imposed by the central government. We can think of constraints as either constitutional constraints, budget constraints or the appointment of local government officials by the central administration (Prud'homme, 1995). In the absence of such constraints, we have fiscal decentralization. Where such constraints exist, subnational governments do not have the necessary degree of autonomy to constitute fiscal decentralization, though some form of government decentralization may still take place. As Tanzi (1996) explains, fiscal decentralization concerns the authority of subnational governments, determined by the constitution, to raise revenue and allocate expenditures. Autonomy of subnational government decision making is a necessary condition of fiscal decentralization.

Third, subnational governments should be held to account for the decisions that they make. Each tier of government and unit of government within that tier has a duty to a particular group of people within the entire population of that country. Fiscal decentralization requires that when a subnational tier of government provides a particular function, tax or expenditure, that affects a subset of the population, those citizens that are affected must be able to control directly the decisions made by that subnational government. If this is not the case, then subnational government will be accountable to the central government, which will maintain a degree of control over the decisions that subnational governments make.

Finally, we may understand fiscal decentralization as fiscal federalism, where a government consists of centralized and decentralized levels of decision making, where the choices that are made at each level of government are determined by the demands of the residents of their respective jurisdictions. Subnational governments operate as individual units of governments, but are part of a sphere of a coordinated effort for certain policies. Oates (1972) explains that fiscal federalism, the model of fiscal decentralization, requires the above strict conditions and that, in practice, fiscal decentralization (or fiscal federalism) is in fact rare, with only a dozen or so countries classified as federal states[1]. Often central governments exert a greater degree of control over subnational government decision making.

[1] Oates (1972) refers to the categorisation of fiscal federalism by Elazar, whose work is cited in Treisman (2008). Treisman notes that of 164 countries, only 19 countries are classified as having federal governments

1.1.2. Other Forms of Decentralization

Recently, many academics have sought to distinguish between fiscal and other forms of decentralization. There are three important reasons why we should consider other forms of decentralization, and how they differ from fiscal decentralization.

The first reason is the incorrect labelling of fiscal decentralization in practice. Oates (1972), Boadway and Shah (2009) and Brueckner (2009) explain that fiscal decentralization is quite rare. Subnational governments may account for a range of government activity, yet the degree to which subnational governments have discretion over devolved functions is often limited. For example, subnational governments tend to have less control over taxation and depend upon transfers from the central government. This enables the central government to mandate subnational government expenditure through transfers (Treisman, 2002; Boadway and Shah, 2009). When subnational governments have some autonomy over expenditure, but not over revenue, we should recognise this as a different form of decentralization.

The second reason is the link between the decentralization theory and the different forms of decentralization. Some of the key arguments in the fiscal decentralization literature do not necessarily require that subnational governments have autonomy. Therefore, fiscal decentralization may not be necessary to achieve some of the supposed aims of fiscal decentralization.

The third reason is the limitation of data and the representation of fiscal decentralization. The empirical research in this area continues to encounter problems of representation, where fiscal decentralization is difficult to measure in a single indicator. For example, the most common measure of decentralization used in empirical research captures the share of subnational government activity, but not extent of autonomy that the subnational government has.

For these reasons, it is important to distinguish between the different types of decentralization; to understand what effects each form of decentralization can have, and to examine those effects in practice through empirical research. Before addressing the problems of measuring fiscal decentralization in chapter 2, I will address the other forms of decentralization that are touched on in the literature, and distinguish between them and fiscal decentralization in this introductory chapter.

Partial Fiscal Decentralization:

Partial fiscal decentralization refers to a scenario where subnational governments depend on transfers from the central government to finance local expenditure (Brueckner, 2009). Subnational governments are provided with funds through intergovernmental transfers, from a central pot of funds controlled by the central government. The subnational government is responsible for allocating expenditure according to the demands for certain goods and services at the local level. In this scenario, the subnational government has autonomy over expenditure, but does not have the power to raise revenue and control the budget. Critically, partial fiscal decentralization cannot constitute fiscal decentralization because the central government exerts influence over subnational government decision making (through intergovernmental transfers). Therefore, we must distinguish between these two forms of government decentralization.

In practice, partial fiscal decentralization is more popular than fiscal decentralization. Compared to federal countries, most countries observe a "greater degree of central government control over the public sector" (Brueckner, 2009: 23). Oates (1972) identifies only a small number of countries meeting his criteria for fiscal federalism, and Treisman's (2008) updated decentralization dataset refers to only a small number of countries as federal states[2]. Subnational governments are often reliant upon transfers from the central government. Boadway and Shah (2009) observe this, where subnational governments in developed countries receive 1/3 of their total budgets from intergovernmental transfers, and in developing countries, the proportion is even higher, at 60%.

A widely-held view in the literature is that the case for devolving expenditure is greater than the case for devolving revenue (see Prud'homme, 1995; Boadway and Shah, 2009). The view in the literature is that fiscal decentralization may be welfare enhancing if it improves the allocation of resources according to heterogeneous demands across the population (Oates, 1972). However, the devolution of revenue could obstruct national objectives such as redistribution and stabilisation of the national economy. I will go into this in greater detail during this literature review

Electoral Decentralization:

Another related concept of decentralization is known as electoral decentralization. Even if subnational governments have autonomy over expenditures and/or taxes at the jurisdictional level, the decisions made by subnational governments will depend on who they are accountable

[2] Only 19 countries out of a total 164 are classed as federal states in Treisman's dataset.

to. If the central government appoint subnational government executives then they may simply act as representatives of the central government at the subnational government level (Boadway and Shah, 2009). In the absence of electoral decentralization, the incentives for subnational governments (to be re-appointed), will depend upon the agenda of the central government, and not the local constituencies. If subnational governments are elected at the local level by those affected by the policies of the subnational government, then subnational governments have an incentive to respond to the demands of local citizens.

Treisman (2007) explains that electoral decentralization can provide certain benefits, such as bringing governments closer to the people, and by improving the knowledge of governments of the demands (tastes and preferences of local citizens). Even in the absence of much subnational government activity or autonomy, electoral decentralization may provide a means for the central government to extract information from local citizens, for example, through local elections.

Local vs. Subnational Government:

Treisman (2002) and Ivanyna and Shah (2014) explain that decentralization is not simply a matter of central government vs. non-central government (subnational government)[3]. Also, subnational government will not have a consistent definition between countries, where some countries observe more complex government structures than others[4]. Therefore, fiscal decentralization should not simply consider the range of responsibilities and decision making carried out by any subnational government, but the distribution of powers between the subnational governments. If a given set of government functions are delivered by the regional government, this would constitute less decentralization than the exact same functions delivered by the most local government.

The reason why it is important to consider government structure and the distribution of powers between different tiers of subnational governments is because the decentralization of functions to local governments intensifies the effects of fiscal decentralization. For example, the degree of mobility of citizens will be greater between local governments than regional[5] governments. Mobility leads to competition between government units; hence decentralization

[3] In the empirical literature decentralization is often represented through the proportion of government activity delivered by all tiers of government beneath the central government, known as the subnational government.

[4] Treisman's (2008) decentralization dataset includes a measure for the number of government tiers (including central government). The number of tiers of government can vary between 2 tiers and tiers. In China, there are 5 tiers of government: provinces, prefectures, countries, towns.

[5] Subnational governments have different names for different countries, regional or state is often used to portray a decentralized tier of government that is not the smallest (local).

to local governments will intensify that competition. Similarly, if certain public goods and services exhibit economies of scale, then local governments will lose out more than regional governments. Boadway and Shah (2009) explain that regions may be sufficiently large that there is little difference between centralized provision and regional provision. Barankay and Lockwood (2007) explain that local governments would lose out the most.

In practice, different tiers of subnational government can occupy different responsibilities. Wallis and Oates (1988) shows that state governments account for more government revenue and expenditure than local governments. They also show that at the beginning of the 20th century local government dominate state government responsibility and that only over the course of 80 years toward the end of the 20th century that state governments accounted for more government activity.

1.1.3. Considering Fiscal and Other Forms of Decentralization and the Literature

As explained earlier, one of the reasons why it is important to distinguish between fiscal decentralization and other forms of decentralization is because not all of the decentralization theory relates specifically to the conditions of fiscal decentralization. As Treisman (2002, 2007) explains, fiscal decentralization is frequently used to represent alternate forms of government decentralization, and certain arguments are incorrectly associated with types of decentralization that do not fit the theory. Boadway and Shah (2009) provide an in-depth discussion of the problems associated with fiscal centralization and how a balance between subnational government discretion and central government control could produce more favourable outcomes of government decentralization. If the objective of decentralization is to induce a provision of public goods and services that is responsive to the heterogeneous needs of the population, perhaps other forms of decentralization can effectively achieve this objective, without the risks associated with subnational government autonomy (Prud'homme, 1995). Seabright (1996) also touches on this point, explaining that fiscal decentralization may not be a pre-requisite of a non-uniform set of public policies, merely that fiscal decentralization, specifically direct accountability of subnational government decision making, can induce that outcome. However, Besley and Coate (2003) argue that there is neither theoretical, nor empirical evidence that suggests a central government cannot provide a non-uniform set of public policies across the country. They also cite empirical evidence whereby infrastructure

investment from the US federal government differs (US highway). However, this does not mean that a fully centralized government is in effect here, there may be other types of decentralization at play that enable a central government with control over fiscal revenues to establish a heterogeneous provision of public goods and services.

1.2. The Case for Fiscal Decentralization

The fiscal decentralization literature begins with the view that the most efficient public sector cannot be realised through a centralized government. Therefore, the efficient allocation of public goods and services to all citizens within a country cannot be achieved when decisions are made solely by a single central administration. Musgrave (1960), Oates (1972) and Boadway and Shah (2009) explain each government has three main functions. The first is to ensure an equitable distribution of income and to redistribute income between citizens. The second is to maintain a stable economy, with high employment, low inflation and sustainable growth, through fiscal and monetary policy. The third is to allocate tax revenues to a wide range of public goods and services that are demanded by the citizens. It is a widely-held view that of these three objectives (redistribution, stabilisation and allocation), two of them are best achieved through a strong central government, coordinating policy across the country.

Redistribution:

Many argue that fiscal decentralization could harm efforts to achieve equitable distribution of income across the country. The main problem is that decentralization and redistribution will ultimately be self-defeating, as citizens are more mobile at the subnational government level than they are moving between countries. As Prud'homme (1995) explains, subnational governments may be unwilling or unable to levy higher taxes on the wealthiest citizens, who will be able to exit a jurisdiction with higher taxes. Subnational governments will either reduce taxes on the wealthiest to attract them, or they will drive them away by attempting to redistribute incomes to the poorest living in the jurisdiction. Thus, the scope for redistributive programs is limited at the local government level due to the mobility of residents, which all other things equal, will be greater the smaller the jurisdiction (Oates, 1972: 8).

Stabilisation:

Oates gives one example where decentralization could have devastating effects on the national economy. His example, where local governments are able to print money, would result in local government using monetary policy, as oppose to fiscal policy, to raise sufficient revenue. With all governments seeking to finance expenditures this way, the consequence would be high levels of inflation.

Allocation:

Whilst the case for fiscal decentralization with respect to redistribution and stabilisation is weak, the case for fiscal decentralization and allocation is strong. Oates (1972) and others argue that a fully centralized government cannot achieve an efficient allocation of goods and services. Whilst there are certain goods that should be provided by the central government, such as national defence, which have large fixed costs and benefit everyone in the country equally, other goods and services exhibit spatial characteristics (Tanzi, 1996) and are best delivered to subsets of the population according to need (Oates, 1972).

Following on from the work of Oates (1972) and Boadway and Shah (2009), I make the case for fiscal decentralization with regards to the benefits of allocation. I refer to several key pieces of work in this section. First, Oates (1972) presents the basic premise for the decentralization of public policy. Second, Tiebout (1956) explains how differentiated public policy between regions can induce a more efficient allocation of resources. Third, Brennan and Buchanan (1980) explain how mobile citizens can discipline against rent-maximising governments. Finally, Seabright (1996) and Besley and Case (1995) explain how the direct accountability of local government decision making to local citizens ensures local governments are responsive to local demands for public policy.

At the end of this section I will demonstrate that in order to achieve an efficient allocation of public goods and services, set out in Oates' decentralization theorem, subnational governments require discretion over spending, taxation, and local citizens should have direct control over the actions of subnational governments through local elections.

I begin with Oates (1972) decentralization theorem.

1.2.1. 'Decentralization Theorem' (Oates, 1972)

The reason why allocation is best devolved to local governments is outlined in Oates' decentralization theorem. The argument follows that where there are no cost-savings to be made from centralized provision, and where there are no external economies, fiscal decentralization can produce a more efficient allocation of goods and services among a population with heterogeneous preferences. The argument assumes that central governments tend toward uniformity in the provision of public goods and services. If this assumption holds, for those goods and services that have spatial characteristics (Tanzi, 1996), the case for decentralized allocation of expenditures is strengthened.

In a simple model, Oates demonstrates that collective consumption for a good that could otherwise be consumed by individuals could lead to an inefficient outcome. If individuals are able to consume a different quantity of goods, pareto efficiency may be realised. I outline Oates (1972) model below.

The Model:

There are two individuals (A, B) and there are two commodities (X, Y). Commodity X is defined as a pure private good, consumed by each individual separately. Commodity Y is defined differently between two scenarios. In scenario 1 the two individuals consume Y separately. In scenario 2 commodity Y is consumed jointly. However, when commodity Y is consumed jointly it is also consumed in equal amount by the two individuals, so that $Y_A = Y_B$. The following are the optimal solutions for each scenario:

Scenario 1: An idea of decentralization (Y consumed separately)

$$\max U_i(X_i, Y_i) \;\; subject\ to \sum X_i = X \,, \sum Y_i = Y \,, F(X, Y) \qquad 1.1$$

$$MRS_A = MRS_B = MC \qquad 1.2$$

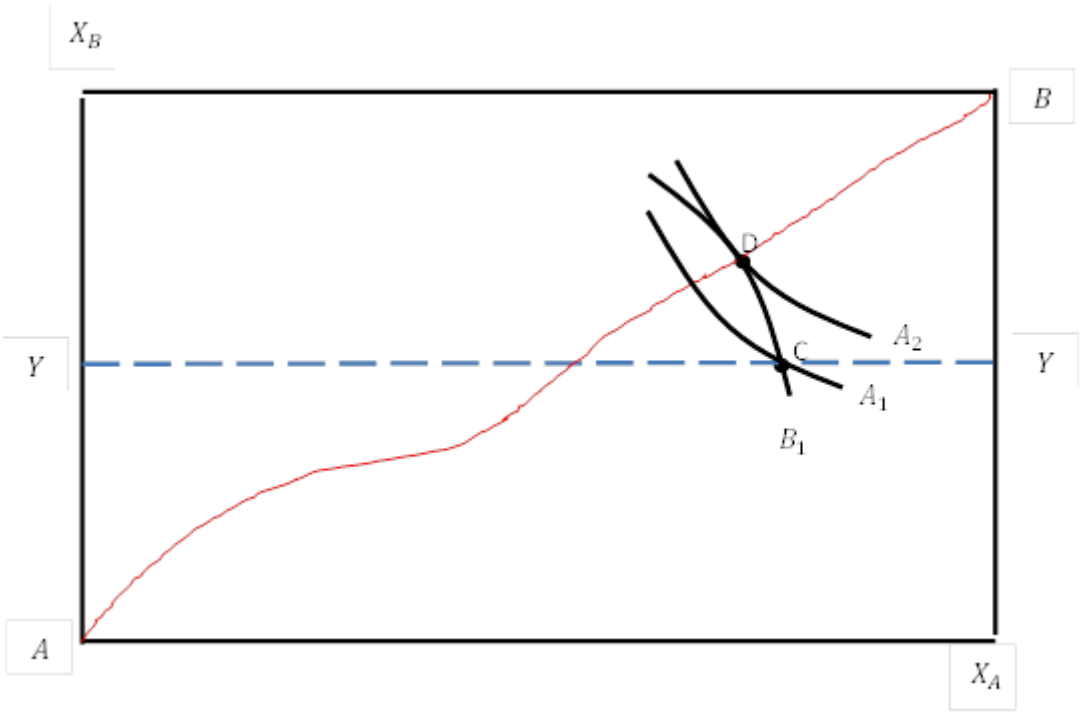
Scenario 2: An idea of centralization (Y consumed collectively)

$$\max U_i(X_i, Y_i) \ \ subject\ to \ \sum X_i = X\,, \sum Y_i = Y\,, F(X,Y), Y_A = Y_B \qquad 1.3$$

$$MRS_A + MRS_B = 2MC \qquad 1.4$$

If there are no cost-savings to be had from greater provision (consumption) of commodity Y, scenario 1 will generally produce a more efficient outcome than scenario 2. Only in a special case, where both individuals would consume the exact same quantity of commodity Y, would scenario 2 be as efficient as scenario 1. If A and B would choose to consume a different quantity of Y were they able to do so, then scenario 1 will produce Pareto-efficient welfare. This is demonstrated below:

Figure 1: Oates' Decentralization Theorem Illustrated



The horizontal line Y to Y' represents the constraint of scenario 2 (centralization), where both individuals consume Y equally. In this scenario, we are at a sub-optimal position 'C', where utility curves B_1 and A_1 intersect. However, we can see that the welfare of individual A can be improved without reducing the welfare of individual B, at point D along the contract curve. Here, the MRS along B_1 (same utility as centralization) is tangent to the MRS along A_2 (greater

utility than centralization). This is the pareto-optimal position that can only be obtained through decentralized consumption in this example.

In the general model, where there are many individuals and many public goods (Xi ... Xn), and each good is consumed by a subset of the population, the responsibility of providing that public good should be devolved to the respective government. In the case of pure public goods, they should be provided by the central government to all citizens, but for each good that benefits a subset of the population, there should be a subnational government to provide that good.

1.2.2. Mobility of Citizens and Congregation of Preferences (Tiebout, 1956)

The Oates model demonstrates the inefficiency of equal consumption between individuals with different preferences. However, Oates (1972) assumes that the central government will be unable to differentiate public policy between geographical subsets of the population, or at the very least, would be less efficient than the alternative: decentralized delivery. Tiebout (1956) presents an important argument in favour of decentralization, which explains how decentralization can ensure that governments respond to different preferences between subsets of the population. Tiebout argues that local provision can create a competitive environment between local governments, thereby improving the efficiency of government by minimising the costs of delivery public goods and services to a subset of the population.

The Problem:

In a defining piece, Tiebout addresses one of the concerns of public finance – the absence of a market based solution for the pricing and provision of public goods and services. Musgrave (1939) and Samuelson (1954) explains this problem of the public sector. Citizens voluntarily give up some of their income so that in return they receive a set of public goods and services to meet their preferences. However, there is no mechanism by which the consumer (and taxpayer) can express their preferences for a range of public goods and services. Tiebout explains that even if taxpayers could state their preferences, they would face an incentive to understate their demands so that they can avoid paying the correct price.

The most efficient outcome would require that: i) the government is able to ascertain the preferences of each individual (information), ii) satisfies those preferences (allocation), and

charges each individual accordingly for their consumption (taxation). Tiebout explains that whilst the problems raised by Musgrave and Samuelson are relevant to the central government, local governments may be able to induce a more efficient outcome

The Model:

To demonstrate how fiscal decentralization could solve the public sector problem explained above, Tiebout outlines a model containing several key assumptions. Citizens are perfectly mobile and are knowledgeable of the range of public policies across many jurisdictions. There are no cost-savings to be had and no externalities. Local governments seek to optimise the size of the local population to whom they are accountable, so that the average cost of public goods and services in the local area is at the minimum. It is also possible for jurisdictions to be over-populated, which would reduce the utility of citizens living in that jurisdiction.

In this model, citizens can move to jurisdictions that matches their preferences closest. As citizens search for the set of public policies that matches their preferences, they register their demands for goods and services. The decision to locate to a given region is recognised as the citizen's willingness to pay. Therefore, local governments providing different public goods and services to meet to the demands of their local jurisdictions can approximate a market solution, and improve the efficiency of public expenditure.

In practice, decentralization leading to heterogeneous public policy can only help to approach the Pareto-optimal solution due to the costs of migration (costs of mobility). If citizens are not perfectly mobile, a cost (disutility) would be associated with movement. The citizen faces a simple problem: In practice, the surplus welfare from moving from one jurisdiction to another jurisdiction that better matches the citizen's preference would need to exceed the cost (disutility) migration. Although the solution would not be Pareto-optimal, citizens would still register their demands when the marginal utility obtained by moving into the next jurisdiction would exceed the cost of doing so. Though the information that local governments derive in the imperfect model would be weaker, we would still expect local governments to produce a more efficient set of public policies than a central government.

Tiebout's model is not without flaws and its critics. Seabright (1996) points out that the restrictive assumptions of the Tiebout model means that it can "provide no basis for normative analysis of the actual world" (62). Specifically, the absence of externalities and cost-savings will not hold for many public goods and services. Also, as Tiebout recognises, in order for Pareto-optimal solution to be met there must be a sufficient number of jurisdictions to ensure that citizens can maximise welfare. If the number of jurisdictions is fewer than the sufficient

number required to match every citizens' demands, then some citizens would have to settle for second best, and move to a jurisdiction whose public policy is close to their preference, but not quite what they are looking for.

However, despite these limitations, Tiebout's model still provides an understanding of how decentralized government decision making and heterogeneous public policy across a large number of smaller jurisdictions can improve public sector efficiency. Another advantage of Tiebout's model is that it provides an understanding of how a congregation of tastes and preferences for pubic goods and services may occur. Over time citizens could congregate within geographically distinct regions, and geographical based heterogeneity of taste and preferences strengthens the case for differentiated delivery of public goods and services (Oates, 1972; Wallis and Oates, 1988).

1.2.3. Constraining the Leviathan (Brennan and Buchanan, 1980)

The next pivotal piece of work comes from Brennan and Buchanan (1980). In depicting the central government as a revenue-maximising leviathan, Brennan and Buchanan suggest that competition between local governments for a mobile tax base can reduce tax rates and constrain the leviathan.

Brennan and Buchanan consider a monolithic government that seeks to exploit its citizens through higher tax rates. This view runs counter to the Pigovian public finance view that governments are benevolent, and set tax rates and expenditures in the interests of all who are governed. Instead, the central government functions in the same way a monopolist would function in the private sector. If the central government faces no constraints, i.e. competition for taxable subjects, then it could seek to maximise tax revenues, operating at the peak of the Laffer curve (Cowley and Sobel, 2011).

If the assumption of the monolithic central government holds, the question then is how the central government can be constrained when it seeks to maximise revenue. One view is that the decentralization of tax and expenditure decision making to local governments can reduce tax rates through tax competition. As Tiebout (1956) demonstrates, when local governments are responsible for setting public policy, citizens are empowered to choose to locate where their welfare is maximised. Treisman (2007) sums this point up, where subjects can be taxed anywhere by the central government, regardless of where the subjects (citizens, capital), reside. On the other hand, subnational and local governments must consider the

potential outflow of taxable subjects (citizens and capital), as a consequence of local tax policy. Subnational and local governments must consider the elasticity of the tax base when deciding the optimal level of taxation. The effect is stronger as functions are devolved to the most local government tier, as citizens can move more easily between local jurisdictions.

Essentially, the mobility of citizens acts to constrain the leviathan government, and leads to lower taxation overall. This is demonstrated in a simple model below:

The Leviathan Model:

A government seeks to maximise tax revenue, where total revenue is a function of the tax rate 'τ', and the tax base to which it is applied 'B'. A government seeks to maximise revenue, which depends on the tax rates and the tax base.

$$R = \tau B(\tau) \qquad 1.5$$

The tax base 'B' is a function of the tax rate – the Laffer curve. There exists an optimal level of taxation 'τ^*' where tax revenue is maximised, 'R^*'. When the tax rate is lower, tax revenue is also reduced. However, as the tax rate increases, the tax base shrinks. The change in tax revenue depends on two forces: the increase in the tax rate, the reduction in the tax base. The tax base as a function of the tax rate, is modelled below:

$$B = \alpha + \beta\tau \qquad 1.6$$
$$where\ \alpha > 0, \beta < 0$$

There exists a tax base that is independent of the level of taxation 'α'. However, the rest of the tax base is dependent on the tax level, to the coefficient 'β', which represents the elasticity of the tax base to the tax rate. As β declines, the elasticity of the tax base to the tax raise increases. As 'β' nears 0, the tax base is more inelastic. Below is the optimal solution to this problem:

$$R = \tau(\alpha + \beta\tau) \qquad 1.7$$
$$R = \alpha\tau + \beta\tau^2 \qquad 1.8$$
$$\frac{\partial R}{\partial \tau} = \alpha + 2\beta\tau \qquad 1.9$$
$$\frac{\partial R}{\partial \tau} = 0 \qquad 1.10$$

$$\tau^* = -\frac{\alpha}{2\beta} \qquad 1.11$$

The more responsive the tax base is to changes in the tax rate, captured in β, the lower the optimal tax rate τ^* will be. The sensitivity of the tax base to changes in the tax rate will depend on the degree of mobility of taxable subjects. Therefore, fiscal decentralization would be associated with a higher value of β, and consequently, a lower value of τ^*. Hence, fiscal decentralization is associated with lower taxes, all other things equal.

Brennan and Buchanan demonstrate that competition between subnational governments can ultimately lead to lower taxes. Should Oates (1972) and Tiebout's (1956) theories hold, then decentralized governments should produce a more efficient outcome for the public sector, which should also lead to lower taxes. Brennan and Buchanan also provide an argument for subnational governments to have autonomy over tax, specifically, the tax rates in their jurisdiction (for one or any number of taxes).

1.2.4. The Accountability of Local Governments

Some of the more recent work in the decentralization literature has focused on alternate incentives for local governments. In the absence of perfect mobility of citizens, or even if we assume that citizens are unable to move at all, other incentives may be created through fiscal decentralization that will produce a more efficient public sector. In the next two sub-sections I consider the direct accountability of local governments to local citizens.

By definition, fiscal decentralization would not only empower citizens to discipline governments through mobility, but in the absence of costless mobility, fiscal decentralization also empowers citizens to elect, or dismiss (reject), local governments. As Seabright (1996) explains, Tiebout's argument does not necessarily require fiscal decentralization. However, fiscal decentralization does require that local governments are accountable to local citizens, and consequently, local governments face incentives to respond to the preferences of local citizens. Prud'homme (1995) points out that in order for local governments to have an incentive to satisfy local preference (of local citizens), they must first be accountable to them. As Tanzi (1996) and Treisman (2007) point out, it is a condition of fiscal decentralization that local governments are directly accountable to the subset of the population for which they must govern Finally, Faguet (2014) summarises this point: that electoral accountability changes the incentives that

public officials face at the local government level. In the absence of direct accountability between local citizens (target of policy) and local government (deciders of policy), local governments would instead be accountable to central government, which would defeat the purpose of fiscal decentralization.

On the other hand, the central government is not direct accountability to any local jurisdiction, and the centralization of government decision making could lead to "policies that are regionally more uniform than decentralized ones" (Seabright, 1996: 63). Seabright provides a theoretical model to demonstrate this point, which I have outlined below:

The Model:

The economy contains 'N' jurisdictions, from $i = 1, \ldots, N$. The citizens living in each jurisdiction elect either a local government in each jurisdiction (decentralized government), or a single central government that covers all jurisdictions. Once elected, governments implement a policy set: $x = \{x_1 \ldots . x_n\}$ for their respective jurisdictions.

The welfare of the local citizen is defined below as a function of the policy set in the jurisdiction they occupy, and a shock specific to that local area, so that $U_i(x, y_i)$. Citizens cannot control the set of policies in their jurisdiction directly, but will determine the decisions that governments made through the government objective function.

The government objective function depends on the cost (disutility) of effort and the reward of being elected. Effort is a function of the policy set within the jurisdictions for which that government is responsible, local or central, and can be understood in literal terms (a harder working government means better quality public services) and could also refer to the foregoing of private interests (Seabright, 1996: 69). The marginal disutility with respect to effort is constant across central and local governments (therefore there are no economies of scale). The reward for being in (or retaining) office is denoted as W for local governments, and αW for central governments, where $\alpha > 1$. This means that the reward for occupying central office is greater than for local office. The objective functions for the governments are:

$$Local: V_i(x_i) + W \; if \; elected, V_i(x_i) \; if \; not \qquad 1.12$$

$$Central: V(x) + \alpha W \; if \; elected, V(x) \; if \; not \qquad 1.13$$

As Seabright points out, by making re-election contingent on the welfare of citizens, either at the local or national levels, politicians are motivated to serve their citizens. However, welfare also depends on the shocks, which are assumed to be additive so that citizen welfare is:

$$U_i(x, y_i) = U_i(x) + y_i \qquad 1.14$$

The range of $y = \{y_1 \ldots., y_i \ldots., y_n\}$ and the range of shocks are assumed to be distributed with a joint density of $D(y)$. Citizens do not observe the values of the policy set (x_i). Instead citizens have an expectation of welfare that must be met for them to re-elect the incumbent government (referred to 'C'). We may think of 'C' as the expected welfare from the alternative government in waiting. The value of 'C' could also be determined by the performance of local governments in neighbouring jurisdictions (yardstick competition). I go into this later in sub section 1.2.5, and for this research the determination of 'C' is unimportant. As C is increasing, the effort required from the incumbent to be re-elected will also need to increase, which means better welfare for citizens.

The election or dismissal of the incumbent depends on whether there is a local government in each jurisdiction or an all-encompassing central government. If the welfare of local citizens falls short of the deterministic reservation level of C, then the incumbent can be replaced by the rival party through the local election. However, if there is a central government, a sufficient number of the population also want to eject the central government. In the case of a local government, the local citizens must be satisfied $(U_i(x) + y_i \geq C)$. In the event that the local citizens are satisfied, this is denoted s_i.

$$\begin{gathered} s_i \; when \; U_i(x) + y_i \geq C \\ y_i \geq C - U_i(x) \end{gathered} \qquad 1.15$$

If there are no shocks, then for the local government to be re-elected, the utility of local citizens must be at least equal to the value of 'C'.

The problem faced by the central government is different however. For the central government to be re-elected, a sufficient number of the local jurisdictions must be satisfied with the central governments performance. This is denoted by S^K, the equivalent of s_i for local governments, when K of N jurisdictions are satisfied.

Therefore, the problems faced by the local government and central government in two scenarios are to choose the policy set (x) maximise the following:

$$Local: \qquad E[V_i(x_i) + W] = V_i(x_i) + W.pr[s_i] \qquad 1.16$$

$$Central: \quad E[V(x) + \alpha W] = V(x) + \alpha W . pr[S^K] \tag{1.17}$$

Therefore, the local government chooses the policy set x_i, so that:

$$-\frac{dV_i}{dx_i} = W\frac{dU_i}{dx_i} . D(y_i) \tag{1.18}$$

$D(y_i)$ is the marginal density of y_i evaluated at $C - U_i(x)$. Therefore, the local government chooses x_i so that the marginal disutility from effort exerted as a result of a change in policy is equal to the reward of retaining or winning government in the local jurisdiction, times by the marginal increase in the probability of being re-elected. The marginal increase in the probability of re-election depends on the marginal utility with respect to the local policy, and for each unit increase in the locality's welfare, the increase in probability that, when shock y_i is realised, locality i's welfare will exceed the deterministic value of 'C' – the benchmark welfare.

The solution for the central government is as follows:

$$-\frac{dV_i}{dx_i} = \alpha W\frac{dU_i}{dx_i} . D(y_i)\Pi_i + \alpha W \sum_j \frac{dU_j}{dx_i} . D(y_j)\Pi_j$$

$$where \tag{1.19}$$

$$\Pi_i = (pr[S_i^{K-1}|s_i] - pr[s_i^K|-s_i])$$

$$\Pi_j = \left(pr\left[S_j^{K-1}|s_j\right] - pr\left[s_j^K|-s_j\right]\right)$$

Π_i and Π_i denote the importance of support from that jurisdiction in order for incumbent in central government to be re-elected. The term $(pr[S_i^{K-1}|s_i] - pr[s_i^K|-s_i])$ is the probability the central government will be re-elected when it obtains the support of the local jurisdiction 'i' minus the probability it will be elected without the support of local jurisdiction 'i'. The second term represents the same calculation for all other jurisdictions 'j'.

The key difference between the two functions faced by a local government and the central government is the probability of being re-elected. In the case of the local government, this depends on density of y_i, or simply the locality specific shock that is the gap between the utility

of citizens in the local jurisdiction and the minimum they would demand from the local government. In the absence of shocks, the utility of the incumbent is directly related to the utility of citizens. Hence local government is directly accountable to local citizens and their corresponding welfare.

The problem for the central government is different. Whilst the central government (incumbent) must also attain sufficient support to be re-elected, it does not require the support of every locality to do so, or rather, any particular locality to do so. Instead the central government must weigh up the importance of a particular localities support against the remaining localities. The central government sets public policy (x_i) so that the disutility of effort is equal to the value of winning the election (αW) and the marginal increase in probability of being re-elected. As explained above, the second item in function (1.19) contains the relative importance of each jurisdiction on the central government's re-election chances.

To conclude, the central government is not directly accountable to any single jurisdiction. However, in the event that jurisdictions have different weights with respect to the central government's re-election chances, then the central government has an incentive to improve the welfare of that jurisdiction more than any other jurisdiction. If we consider an extreme example, whereby there is one jurisdiction of many who must deliver support for the incumbent to be re-elected, the central government will prioritise the welfare of that jurisdiction above all the other jurisdictions.

Seabright's model demonstrates that local governments elected by local citizens have an incentive to improve the welfare of local citizens. In order to improve the welfare of local citizens, local governments must consider the preferences of local citizens, and match those preferences with a set of local policies, x_i. Hence, fiscal decentralization provides incentives for governments to know the preferences of local citizens more than the centralized government.

This particular finding is important for understanding how fiscal decentralization may induce a more efficient set of public policies for a range of demands across many jurisdictions. One area of the decentralization literature contends that local governments have an informational advantage over central government, where local governments possess greater knowledge of local demands.

On the other hand, a central government does not face the same incentives that local governments do to differentiate public goods and services between regions. Tabellini (2000) touches on this point as well. The central government's performance depends on public policy for the collective of localities. Tabellini explains that "this weakens the incentives to perform

well, since there is a smaller link between effort and rewards" (page 6). However, central office is more prestigious, more powerful and the incentives (rewards) for re-election are greater at the national level than the local level.

1.2.5. Yardstick Competition

The Seabright model demonstrates that when local governments must obtain the support of local citizens to be re-elected, incentives exist for local government to match local preferences. However, the effort required by the local politician to be re-elected depends not only on the effort that the local politician puts in (to provide public goods, services), but also on the expectations of local citizens. It is important to consider how local citizens arrive at their expectations of local government performance. One idea is that local citizens base their expectations on the performance of local governments of neighbouring jurisdictions.

Besley and Case (1995) present the theory of yardstick competition[6] in the context of the decentralized public sector, whereby citizens compare the performance of local governments that face identical cost curves. Consequently, citizens create expectations of what their local government should provide, and at what cost.

The basic model assumes that local governments are tasked with providing a particular public good or service to local citizens. To provide this service they must raise their own revenue from taxes on the local citizens. Besley and Case consider a problem of asymmetric information, where local governments are aware of the cost of provision, but the citizens are not. There are two types of government: i) benevolent government that charges exactly what it costs to provide the public service to local citizens, and ii) rent seeking government that seeks to exploit local citizens by charging more than the cost of providing the service. Citizens must decide whether to re-elect or not the current incumbent, and the incumbent desires to be re-elected (same as the reward from the previous model).

Yardstick competition provides a means for citizens to discipline inefficient governments, even when citizens are immobile. In previous models, local governments would compete for mobile citizens through expenditure (Tiebout, 1956) and tax (Brennan and Buchanan, 1980). However, if citizens are immobile (or not perfectly mobile) they can simply dismiss an inefficient local government. Citizens can identify inefficient government by comparing the performance of different local governments.

[6] See Shleifer (1985) for the idea of yardstick competition, specifically regarding franchise monopolies.

Yardstick competition is likely to face some complications in practice. Besley and Case (1995) present a robust model that considers different parameter values (i.e. the probability that the government is good or bad, or the probability of different cost shocks). Also, the cost of provision may not be identical between different governments. However, even if the cost of provision is not identical between local governments, either between two neighbouring jurisdictions or two neighbouring countries, the similarity in certain characteristics: size, population, location and so forth, will be much greater between local governments. Essentially, yardstick competition provides another incentive for local governments to be more efficient, even when citizens are not mobile. Local governments will be under pressure to deliver goods and services at minimum cost if citizens have higher expectations. Those expectations will depend in part on the performance of other local governments.

The accountability of local governments to local citizens may enhance welfare not simply by improving the responsiveness of government to local needs and preferences, but also by disciplining governments against corrupt behaviour. As Seabright explains, 'effort' is not defined simply as the hard work of local politicians, but is also defined as the foregoing of rents that could be extracted from the local citizens. Therefore, higher effort means less corruption. Shleifer and Vishny (1993) define corruption as the sale of government property by government officials for personal gain. Boadway and Shah (2009) explain that the propensity for corruption depends on the benefits (rents to be extracted) and the costs of corruption (risk of being caught, losing the election).

Fiscal decentralization increases the ability of citizens to monitor government activity (Boadway and Shah, 2009) and Lin and Lou (2000) cite one advantage of fiscal decentralization, where local citizens are better able to monitor the actions of local governments, as opposed to central government. Hence, fiscal decentralization increases the risk of exposure of corrupt activity (Shleifer and Vishny, 1993). If government is more efficient when decentralized, and waste and inefficiency reduce the risk of exposure (spotting corruption), then there is less of an opportunity to hide corrupt activity (Fan et al. 2009). To conclude, Besley and Case model demonstrates that bad governments will have an incentive to behave, charging citizens the cost of provision, rather than the cost plus additional rents that they would seek to extract.

1.2.6. A Summary of the Case for Fiscal Decentralization

When citizen's preferences for public goods and services are heterogeneous across the country, government should seek to allocate resources efficiently by matching provision of public goods and services to demands for them, at the local level. In section 1.2 I proposed several arguments for why fiscal decentralization may be necessary to produce a more efficient public sector. These arguments are summarised below:

i) When there are no economies of scale, and no externalities, the decentralization of provision of public goods and services to a population with heterogeneous demands will improve public sector efficiency (Oates, 1972)

ii) When local governments provide public goods and services, citizens can choose the local jurisdiction that best matches their preferences (Tiebout, 1956)

iii) When local governments are responsible for setting tax rates, citizens can move to the jurisdiction with the lowest tax rates. Consequently, fiscal decentralization reduces excessive tax rates that would otherwise be set by a revenue-maximising central government (Brennan and Buchanan, 1980)

iv) When local governments are elected by local citizens, local governments have direct incentives to provide public policy specific to local needs (Seabright, 1996)

v) When local government are elected by local citizens, citizens are empowered to compare the performance of local governments that could face similar costs for provision. Consequently, citizens can dismiss inefficient local governments (Besley and Case, 1995)

1.3. The Dangers of Fiscal Decentralization

In section 1.2 I explained the key arguments in favour of fiscal decentralization. Each of the arguments demonstrated how fiscal decentralization could be welfare enhancing, either by improving the allocation of public expenditures (Oates, 1972), enabling citizens to maximise their own welfare by moving to the region that best suits their preferences (Tiebout, 1956), by moving to an area that charges the lowest taxes (Brennan and Buchanan, 1980), and by holding local governments to account through local elections (Seabright, 1996) and yardstick competition (Besley and Case, 1995). Local governments could address the needs of local

citizens in a way that central government either could not, or would not, due to the lack of incentives to do so. The result was a more efficient provision of public expenditures.

In this section I consider the dangers associated with fiscal decentralization. Specifically, I consider the adverse consequences of a shift from centralized government and national welfare to local government and local welfare. A number of studies have developed on the basic ideas above, such as mobility and local governments addressing local welfare, and raised potential downsides of such behaviour. Basically, if the aim of fiscal decentralization is to encourage local decision making, this may not always produce desirable results. In this section I outline some of potential downsides of decentralization:

i) Fiscal decentralization leading to sub-optimal taxation of capital and sub-optimal provision of public goods (Hoyt, 1991)

ii) Fiscal decentralization leading to vertical tax externalities and overgrazing, where different tiers of government tax the same subjects (citizens, capital). The consequence of this could include higher taxes overall (Keen and Kotsogiannis, 2004; Treisman, 2007)

iii) Fiscal decentralization changing the composition of government expenditure, with higher spending on productivity enhancing goods and services, and less on non-productive public spending (Keen and Marchand, 1997)

iv) Fiscal decentralization leading to inter-regional inequality, in tax, spending and productivity (Cai and Treisman, 2005)

v) Fiscal decentralization and sub-optimal provision of public goods that exhibit positive externalities (Besley and Coate, 2003)

1.3.1. Fiscal Decentralization and Sub-Optimal Taxation

In the first paper, Hoyt 1991 considers the effects of fiscal decentralization on the taxation of capital used to finance government spending at the local level. When local governments have autonomy over tax functions, and must finance their own expenditures in the local jurisdiction, fiscal decentralization can lead to fiscal competition between local governments for mobile factors (such as capital). Local governments must maximise tax revenue (and consequently spending) according to the decisions made by other local governments. Essentially, optimisation depends on the response of other local governments to the choices one local government makes (Treisman, 2007). This is referred to as a horizontal tax externality, when

the actions of one local government have an effect on other local governments. Though similar competition occurs between countries at the international level, fiscal decentralization and the competition between local governments will be more intense as the factors of production and the subjects of taxation are increasingly mobile.

The work of Hoyt (1991) demonstrate that fiscal decentralization, leading to fiscal competition for mobile capital, results in sub-optimal taxation on capital and an under-provision of public good(s). Therefore, fiscal decentralization could have a negative effect on citizen welfare.

The Model:

An economy consists of a large number of identical jurisdictions. Each jurisdiction has a single local government and a single representative citizen. The government is assumed to be benevolent, seeking to maximise the welfare of the citizen. Production is determined by a single input, capital, with a strictly increasing and concave production function. Output in the jurisdiction depends on the capital located in that jurisdiction. Investors choose to move capital to the jurisdiction that provides the highest post-tax return to capital. As all jurisdictions are identical, the post-tax return to capital will be equal across all jurisdictions. There is a fixed stock of capital in the economy, K, and the amount of capital located in each jurisdiction, k, is equal across all jurisdictions. The share of capital located in one jurisdiction then is the total stock of capital divided by the number of jurisdictions, N.

$$\rho_i = F'(k_i) - \tau_i \qquad 1.2$$

$$t_i = t_j \therefore \rho_i = \rho_j = \boldsymbol{\rho} \therefore k_i = k_j = \frac{\overline{K}}{N} = m \qquad 1.21$$

$$\sum k_i = K \qquad 1.22$$

The citizen's utility function is assumed to be concave for two goods, a private good (x) and a public good (g).

$$U_i = f(x_i, g_i) \qquad 1.23$$

The utility function for the citizen in jurisdiction 'i' is function of the private good and public good produced in jurisdiction 'i', hence there are no externalities. Each citizen receives an

income from two sources: i) income on local rents to the fixed factor in the jurisdiction (output minus the gross return to capital), ii) return to the share of capital located in the jurisdiction. The consumption of the public good is equal to its provision, where the public good is financed through taxes set by the local jurisdiction, on the stock of capital located in the jurisdiction.

$$Private\ good: x_i = F(k_i) - (\rho_i + t_i)k_i + m * (\rho\frac{\overline{K}}{N}) \quad 1.24$$

$$Public\ good: g_i = t_i k_i \quad 1.25$$

For the local government to increase the production (and consumption) of the public good (g), it must increase tax revenue. The local government cannot attract further capital to the region as capital is distributed evenly between all the jurisdictions (function 1.21). Therefore, the government must increase the tax rate on capital. As a consequence of an increase in tax on capital, capital will flow out of the jurisdiction. Below are the effects of an increase in tax on capital on the provision of the private good and the public good:

$$\frac{dx_i}{dt_i} = -k_i \quad 1.26$$

$$\frac{dg_i}{dt_i} = k_i\left[1 + (1-m)t_i\frac{k_i'}{k_i}\right] \quad 1.27$$

$$\frac{\frac{dg_i}{dt_i}}{\frac{dx_i}{dt_i}} = -\left[1 + (1-m)t_i\frac{k_i'}{k_i}\right] < -1 \quad 1.28$$

In function 1.26 an increase in taxation leads to a fall in private consumption to the value of the capital stock in the jurisdiction. In function 1.27 an increase in taxation on capital leads to an increase in public consumption, but by a value less than 'k_i'[7]. Finally, the trade-off between private consumption and public consumption as a result of a change in tax (function 1.28) is less than unity. This is because a tax increase leads to a shrink in the capital stock located in the jurisdiction, thereby reducing the tax base. The increase in the tax rate on capital is offset by a capital outflow from the jurisdiction, which results in a rate of substitution between the

[7] This is due the elasticity of capital demand effect, denoted in $\frac{k_i'}{k_i} < 0$

public good and the private good of less than -1. Therefore, the tax rate on capital and the provision of the public good are sub-optimal:

i) Tax rate and tax revenue is inefficiently low due to the competition effect

ii) Due to lower tax revenues (than cooperative equilibrium), the provision of public good (g) is sub-optimal

To conclude, Hoyt's model, though restricted by several assumptions, demonstrates that local governments face a problem that central governments do not: the mobility problem. Local governments are constrained by the mobility of capital, and the loss of capital and production with higher tax rates. The final solution shows that the marginal utility from extra consumption of public goods would be greater than the marginal utility from extra consumption of private goods, therefore the Pareto optimal set of private and public goods cannot be obtained in a decentralised setting.

1.3.2. Fiscal Decentralization and Vertical Tax Competition

In 1.3.1 I outlined the problem of the horizontal tax externality resulting from competition for mobile capital leading to a sub-optimal provision of public goods in each jurisdiction (and relative to the centralization scenario). In 1.3.2 I outline the problem of the vertical tax externality, where local government and central government tax the same subjects, leading to a rivalry between subnational governments and the central government and the problems that arise from that. In practice, fiscal decentralization does not simply lead to interactions between subnational governments, but also interactions between subnational governments and the central government (Treisman, 2007).

The problems that arise from vertical tax externalities are two-fold. First, subnational governments and central government are now taxing the same subject (capital or citizens). This can lead to a problem known as over-grazing, whereby the combined taxes of government on a single taxable source can exceed the tax that would be levied by a single central government. Therefore, vertical tax externalities could lead to over-taxation, rather than lower taxation observed in section 1.3.1. This will be demonstrated below. Second, the central government will now receive lower tax revenues than it would in a fully centralized scenario. This effect is greater as the taxes levied by subnational governments increases (Keen and Kotsogiannis, 2004; Brulhart and Jametti, 2006). The taxes levied by the subnational government can crowd out the federal government.

The Model:

The basic model follows an economy with two identical jurisdictions: $i = 1, 2$. There is a total amount of capital in the economy: $\overline{K}$, and the amount of capital invested in a particular jurisdiction is k_i. Output (income) in each jurisdiction is a function of capital, and is strictly increasing and concave in capital, k_i.

There are two scenarios: i) a centralized government, and ii) a decentralized government featuring one central government and two jurisdictional governments. In the first scenario, the unitary government levies a common tax rate on taxable subjects of $T \in [0, \bar{\tau}]$, where $\bar{\tau}$ is the maximum tax rate. In the second scenario, jurisdictional governments levy their own tax rate, $t_i \in [0, \bar{\tau}]$. Unlike the Hoyt (1991) scenario, whereby there is no central government and jurisdictions compete horizontally, Treisman (2007)[8] introduces a central government, which levies a tax alongside the jurisdictional tax of, $T_1 \in [0, \bar{\tau}]$. In the decentralized setting, there is an aggregated tax rate in each jurisdiction: $T_i + t_i \leq \bar{\tau}$. The objective of government is to maximise tax revenue, i.e. the Laffer curve, which depends on the output in a given jurisdiction. Output, as in previous models, depends on the capital located and the aggregate tax rate in the local jurisdiction:

$$f_i(k_i, t_i, T) = (1 - t_i - T)\alpha k_i - \beta k_i^2) \; for \; i = 1, 2 \qquad 1.29$$

Output is declining with taxation, where taxation is now made up of two taxes: one levied by the jurisdictional government (t_i) and one levied by the central government (T). Tax revenue for either the local government or central government is the tax rate levied by that government, and the output function. Output for the central government is the aggregate output across the two jurisdictions, or simply $f(\overline{K}, t, T)$

$$R_c = T.f(\overline{K}, t, T) \qquad 1.30$$

$$R_i =. t_i.f(k_i, t_i, T) \qquad 1.31$$

Now let's consider the two scenarios: a fully centralized government, and a decentralized government, and the optimal tax rates:

Scenario 1: under centralization, the central government chooses T to maximise

[8] And similar work by Keen and Kotosgiannis (2004); Brulhart and Jametti, 2006

$$T(1-T)(\alpha k_1 - \beta k_1^2 + \alpha k_2 - \beta k_2^2) \qquad 1.32$$

As jurisdictions are identical, the capital located in each jurisdiction is exactly ${k_1}^* = {k_2}^* = \frac{1}{2}$, therefore the optimal tax rate, T^*, levied by the central government, must be 0.5.

Scenario 2: under a decentralized government, where taxes are set simultaneously (Cournot-Nash equilibrium), jurisdictional governments and the central government must set their own tax rates in response to the expected tax rates of the other parties. First, the jurisdictional governments must set the jurisdictional tax rate to maximise

$$t_i(1-t_i-T)(\alpha k_i - \beta k_i^2) \qquad 1.32$$

Subject to the mobility of capital:

$$(1-t_1-T)f_k(k_1^*, t_1+T) = (1-t_2-T)f_k(k_2^*, t_2+T) \qquad 1.33$$

Given that both jurisdictions are identical to one another, which means that ${t_1}^* = {t_2}^* = t^*$ and ${k_1}^* = {k_2}^* = \frac{1}{2}$, the first order condition for the local government is…

$$t^* = \frac{(1-T)(2\alpha\beta - \beta^2)}{2\alpha^2} \qquad 1.34$$

Therefore, the optimal tax rate for the local government depends negatively on the central government tax rate, T. Hence competition exists between the central and local governments. This competition, referred to as vertical tax competition, demonstrates that different tiers of government are competing to extract tax revenue from the same taxable subjects. In this example, capital is taxed, but the same rule would apply to any mobile subject.

Furthermore, vertical competition could have an effect on total taxation. Following on from function (1.34), the central government must maximise revenue according to the following function:

$$T_1 f_1(k_1^*, t_1+T_1) + T_2 f_2(k_2^*, t_2+T_2) \qquad 1.35$$

As the central government would set taxes equal in each jurisdiction, so that $T_1 = T_2$, the first order condition for the central government is…

$$T^* = \frac{(1 - t^*)}{2} \qquad 1.36$$

Therefore, when $t > 0$, the aggregate tax rate, $T_i + t_i > 1/2$. What this means is that even though horizontal competition can reduce tax rates, as observed in Hoyt (1991), following on from the Leviathan hypothesis of Brennan and Buchanan (1980), vertical tax competition can lead to greater levels of taxation than a fully centralized government setting a single (uniform) tax rate on taxable subjects. Hence, the over-grazing effect means that decentralization could in fact lead to greater taxation by an aggregate of subnational and central governments. Furthermore, function 1.36 demonstrates that the central government is responsive to taxes levied by the state, so $t > 0$, the tax levied by the central government must be $T < 1/2$, therefore less than the 0.5, the tax that would be levied by the central government in a fully centralized government.

1.3.3. Fiscal Decentralization and the Composition of Expenditure

Local governments may compete for capital through expenditure, as well as taxation. Keen and Marchand (1997) investigate the effects of competition between local governments on the composition of expenditure at the local level. In their model, Keen and Marchand distinguish between two types of public goods:

i) Consumption items that enter the citizen utility function directly (denoted g), and includes items such as recreational facilities and social services. 'G' may also refer to "redistributional payments" (34)

ii) Productivity enhancing government expenditure (infrastructure etc.) (denoted p)

Keen and Marchand consider how competition between local governments may lead to higher spending on infrastructure, and less on consumption items (e.g. parks and recreational facilities) and on redistribution.

I summarise their model below and the key finding on the composition of government spending at the local level. For this model, I ignore subscripts.

The Model:

The economy contains many identical jurisdictions, each containing a single government and single representative citizen. The government is assumed to be benevolent, seeking to maximise the utility of the local citizen (1.37) according to a budget constraint (1.38)

$$U(x - \alpha(L), G) \quad 1.37$$

$$s.t.\ x = (w - t)L + (1 - \theta)R + \rho k \quad 1.38$$

$$V(w - t, G, M) \quad 1.39$$

$$where\ M = (1 - \theta)R + \rho k)$$

Utility is increasing with the consumption of the private good (x), the public good (g), and the labour supplied (with α capturing the disutility of Labour). The budget constraint defines the consumption of the private good (x) according to 3 income sources: i) disposable income, ii) post-tax income received from local rents (R), iii) return on capital endowment for citizen. This gives the indirect utility function 'V', which depends on the disposable income, the publicly provided public good) and additional income obtained from local rents (post tax) and return on the capital endowment of the citizen, denoted M in function 1.39, which is the private income of the individual.

Output in the jurisdiction is produced through three inputs: capital, labour and productivity enhancing government spending (p). Production is strictly increasing and concave for capital and labour and all factors are complimentary. The employment of factors labour and capital are such that the marginal cost is equal to the marginal product. Finally, the employment of Labour meets the market clearing condition:

$$F(K, L, P) \quad 1.40$$

$$w = F_L(K, L, P) = MP_L \quad 1.41$$

$$\rho + t = F_k(K, L, P) = MP_K \quad 1.42$$

$$L(w - t) = D(r, w, P) \quad 1.43$$

The public sector's revenue constraint is the total spending on public good (G) and productivity enhancing expenditure (P) must be equal to the three sources of government revenue: i) tax on labour (t), ii) tax on capital (τ), and iii) tax on rents (θ):

$$P + G = tL + Tk + \tau R \qquad 1.44$$

The objective of the government is to maximise welfare according to the five controllable variables: two forms of expenditure (P, G) and three tax instruments (t, T and τ). The decisions taken by one government do not affect the decisions taken by other governments; however, capital is mobile so governments are competing for capital. The economy wide rate of return is fixed at ρ. However, governments do consider the effects of taxation on the equilibrium gross wage and the labour market. The market clearing condition for Labour must hold.

Using the indirect utility function (1.39), the revenue constraint (1.44), the market clearing condition for labour (1.43) and the taxation of rents, the Lagrangean function is below:

$$\begin{gathered} \max V(w - t, G, M) \\ s.t.\, budget\ constraint\ (t, T, \tau, P, G), \\ labour\ market\ clearing (D_L - L) \\ taxation\ of\ rents\ (\bar{\tau} - \tau) \end{gathered} \qquad 1.45$$

Solving for the F.O.Cs, Keen and Marchand make a proposition that when jurisdictions are identical, in the non-cooperative equilibrium, the public good (g) is under provided. The solution[9] is outlined below:

$$\frac{V_g}{V_M} = \left(1 + \left[\frac{tD_w + Tk_w}{(1-\tau)L' - D_w}\right]\frac{L'}{L}\right)^{-1} > 1 \qquad 1.46$$

Function (1.46) shows the MRS between the public good (g) and private income (M) is greater than 1, below sub optimal. The marginal utility with respect to government spending on non-productive good (g) and the marginal utility of income (M) is greater than 1. Income (M) depends on income from rents and return to capital, which depends on the taxation of rents and capital (T, τ). Hence, the interpretation of 1.46 is that the willingness to pay for further government spending (g) exceeds the cost. Hence government spending on non-productive goods is sub-optimal (under-provided).

[9] In appendix B, taking the FOC for (g) and for (t), we get the function: $\frac{V_g}{\alpha} = \left(1 + \left(\frac{\lambda}{\mu}\right)\frac{L'}{L}\right)^{-1}$. In appendix A, the derived function for $\frac{\lambda}{\mu} = \frac{tD_w + TK_w}{(1-\tau)L' - D_w}$. Function (6.10) is derived.

The conclusion of Keen and Marchand's model is that the competition for capital is not restricted to the revenue side, but also has an effect on expenditure decision making. The paper concludes that welfare could be improved by trading expenditure on productivity enhancing public goods for other public goods and services, but only if other subnational governments do likewise.

1.3.4. Fiscal Decentralization and Inter-Regional Inequality

In the third paper, Cai and Treisman (2005) removes one of the assumptions from the above models, that jurisdictions are identical. They investigate the effect that interjurisdictional differences in endowments (infrastructure, human capital) on local government decision making. I also consider the long-run implications of fiscal decentralization under this scenario.

The Model:

An economy contains many jurisdictions; however, the jurisdictions are not equal. Jurisdictions are differentiated with respect to their endowments. Endowments refer to the quality of infrastructure, natural resources and human capital. Jurisdictions are divided into two groups: i) those that are well endowed (N) and ii) those that are poorly endowed (M). Endowments enter the production function shown in function 1.47. Well-endowed regions observe an advantage over poorly-endowed regions, where the production of the private good is positively associated with existing infrastructure, human capital, natural resources and so forth:

$$F = A_{N,M} k^{\alpha} p^{\beta} \qquad 1.47$$

The production of the private good (x) is a function of the endowment, the capital stock in the jurisdiction, and government spending on infrastructure (productivity enhancing expenditure, like Keen and Marchand, 1997). The endowment takes one of two values, $A_N \; or \; A_M$ where $A_N > A_M$. As the ratio of $\frac{A_N}{A_M}$ increases, the productivity advantage of well-endowed units is greater. As with previous papers, there is a finite amount of capital in the economy, such that:

$$K = Nk_n + Nk_m \qquad 1.48$$

Each jurisdiction contains a government seeking to maximise the following objective function, which depends on the consumption of two goods.

$$U = (1 - t)F + \lambda g \qquad 1.49$$

Utility is a function of private consumption (post-tax) and public consumption, with a preference for public consumption denoted by 'λ'[10]. As λ increases, the preference for consumption of the public good is greater. Governments face a simple budget constraint, where total spending on investment 'I_i' and non-productive spending 'c_i' must equal initial fiscal revenues 'S' and tax on production:

$$I + c = S + tF \qquad 1.50$$

Governments seek to maximise the objective function 1.49 according to the budget constraint 1.50. Governments recognise that capital is a finite resource and must compete with other local governments through taxation and infrastructure investment (which increases the return to capital). Jurisdictions that are well-endowed understand that further spending on infrastructure and further increases in capital increase production by more than poorly endowed units. Cai and Treisman (2005) consider two scenarios in their analysis of the endowment effect:

Scenario 1: Capital is immobile

Previous papers have assumed capital is perfectly mobile; however, Cai and Treisman (2005) examine the effects of endowment when capital (k) is fixed in the jurisdiction. If capital is immobile then governments face a simple problem of maximising utility to a fixed level of capital. Therefore, governments must determine the level of spending in both productive (p) and non-productive goods (x). To derive the solution to this problem, the budget constraint (function 1.50) is entered into the utility function (function 1.49). The solution is:

[10] This model is slightly different to previous papers in that Cai and Treisman (2005) define 'g' as either a public good provided to increase the welfare of citizens, or as consumption of public funds by public officials seeking to improve their own welfare. This does not change the results of this research however and I interpret g as the consumption of the public good (hence government is benevolent).

$$\frac{\partial F}{\partial I} = \theta \; where \; \theta = \frac{\lambda}{[1 + (\lambda - 1)t]} \qquad 1.51$$

Therefore, the optimal spending on investment depends on the preference factor 'λ'. As the preference for government spending on non-productive items increases, the marginal production from an increase in investment must also increase. Hence function 1.51 demonstrates the opportunity cost of infrastructure investment with respect to public spending. By substituting function 1.51 into the production function 1.47 we can see that the optimal level of investment depends on capital stock and the endowment factor of the jurisdiction:

$$I(\bar{k}, A) = \left(\frac{1}{\theta}\beta A \bar{k}^{\alpha}\right)^{\frac{1}{(1-\beta)}} \qquad 1.52$$

So, the higher the preference (λ, captured in θ), the lower the level of investment in the optimal solution. Higher capital stock also increases the incentive to invest in infrastructure and boost production (due to the greater marginal productivity from an increase in investment). This is a general finding for all jurisdictions. However, the key finding is that the effect of the endowment. A higher value of 'A' (endowment) increases the value of infrastructure investments, and consequently increases total output in the jurisdiction. The long-term effects of this finding will be discussed after scenario 2, when capital is perfectly mobile.

Scenario 2: Capital is mobile

If capital is mobile, then competition takes place between jurisdictions for the finite stock of capital in the economy. An additional assumption is made in line with Hoyt (1991) that the actions of any single jurisdiction have no effect on the economy rate of return to capital. The rate of return to capital is identical between jurisdictions:

$$\rho = (1 - t)F'(k) \qquad 1.53$$

By substituting the economy-wide return to capital (1.53) into the production function (1.47), the allocation of capital in the jurisdiction is determined by the level of infrastructure investment, the economy wide rate of return and the endowment:

$$k(I,\rho,A) = \left(\frac{1}{\rho}(1-t)\alpha A I^{\beta}\right)^{\frac{1}{(1-\alpha)}} \qquad 1.54$$

Function (1.54) demonstrates that the capital in the jurisdiction is greater when the level of investment is higher; when taxation is lower and when the endowment is higher. Given the rate of the economy wide return to capital, the government must choose the level of infrastructure investment that maximises the objective function. The first order condition is shown below

$$\frac{\partial F}{\partial I} + \frac{\partial F}{\partial k}\frac{\partial k}{\partial I} = \theta \; where \; \theta = \frac{\lambda}{[1+(\lambda-1)t]} \qquad 1.55$$

As with the previous condition when capital is immobile, the optimal investment in infrastructure depends on the preference factor in 'θ'. However, an additional term is included in the first order condition when capital is mobile: the positive effect of increasing investment on capital allocation in the jurisdiction. Hence investment in infrastructure not only boosts productivity directly ($\frac{\partial F_i}{\partial I_i}$), but also indirectly ($\frac{\partial F_i}{\partial k_i}\frac{\partial k_i}{\partial I_i}$). The optimal level of infrastructure investment under the condition of mobile capital is highlighted below:

$$I(k,A) = (1-\alpha)^{-\left[\frac{1}{(1-\beta)}\right]}\left(\frac{1}{\theta}\beta A k^{\alpha}\right)^{\frac{1}{(1-\beta)}} \qquad 1.56$$

As with the previous finding when capital is immobile (1.52), the investment in infrastructure is increasing with the level of capital in the jurisdiction and the endowment factor. However, as a consequence of capital mobility, poorly endowed units will observe lower levels of investment than when capital is immobile, as the competitive advantage of the well-endowed units leads to unequal distribution of capital between the two groups of jurisdictions. The allocation of capital between well-endowed and poorly endowed units is defined below:

$$\frac{I_N}{I_M} = \frac{k_N}{k_M} = \left(\frac{A_N}{A_M}\right)^{\frac{1}{(1-\alpha-\beta)}} \qquad 1.57$$

The difference in the level of investment between well-endowed jurisdictions and poorly endowed jurisdictions depends on the allocation of capital, which depends on the difference in

endowment. The greater the ratio of A_N to A_M, the greater the inequality in capital and in investment levels between the different jurisdictions. Cai and Treisman (2005) refer to this as the polarization effect. The competition effect, observed in Hoyt (1991) and Keen and Marchand (1997) would result in higher levels of investment (or lower taxes in previous papers) across all jurisdictions. However, when jurisdictions are not identical, the inequality in endowments has a different effect, leading to higher levels of investment in some jurisdictions (those that are well endowed), and lower levels of investment in the remaining jurisdictions (those that are poorly endowed).

Cai and Treisman (2005) also allude to another consequence of inter-regional inequalities in investment and capital stock. In the long term, infrastructure investment will become future endowments. Therefore, endowments are not fixed through time, but are built up over time through further increases in investment. This means that even a small difference in endowments can ultimately lead to much greater differences in investment, productivity and production between governments over time (see Boadway and Shah, 2009).

1.3.5. Fiscal Decentralization and Externalities

The existence of externalities may also result in sub-optimal provision of essential public goods and services. Besley and Coate (2003) explain that the problem with devolving the responsibility to provide particular goods and services that exhibit externalities is that local governments care only for the welfare of local citizens. Indeed, this is one of the main arguments in favour of fiscal decentralization, addressed in sub-section 1.2. Local governments are motivated to address the welfare of local citizens, and do not consider the effects of provision on citizens living outside the jurisdiction. Consequently, a decentralized government will provide less than the optimal quantity of the good or service (Gordon, 1983).

Besley and Coate (2003) demonstrate this problem below.

The Model:

An economy contains two geographically distinct regions, containing a representative citizen. There are three goods: a private good (x), a public good provided by the domestic government (g_i) and a public good provided by the foreign government (g_{-i}). Citizen utility is defined below

$$U_i = x_i + \lambda[(1-\delta)lng_i + \delta lng_{-i}] \quad 1.58$$

$$No\ spill\ overs:\ \delta = 0$$

$$Spill\ overs:\ \delta = 0.5$$

The utility of the representative citizen is a function of the private good and public goods provided by the domestic and foreign governments. The degree of externalities are reflected in 'δ', which can take a value of either 0, when there are no externalities, or 0.5. Therefore, where externalities exist, the citizen's utility depends equally on the public goods provided by either the domestic government or the foreign government

$$If\ \delta = 0,\ \ U_i = x_i + \lambda lng_i \quad 1.59$$

$$If\ \delta = 0.5,\ \ U_i = x_i + \lambda\left[\frac{lng_i + lng_{-i}}{2}\right] \quad 1.60$$

In a decentralized setting, the amount of public goods provided in each jurisdiction depends on the preference for public good consumption 'λ'. For this example, I denote the preference for public good consumption in each jurisdiction as (m_1, m_2). In order to finance this consumption of public goods the government applies a head tax on the representative citizen 't'. The optimal solution for a two government (decentralization) scenario is as follows:

$$g_i^d = argmax_{g_i}\{m_i[(1-\delta)lng_i + \delta lng_{-i}] - tg_i\} \quad 1.61$$

$$FOC: (g_1^d, g_2^d) = \left(\frac{m_1(1-\delta)}{t}, \frac{m_2(1-\delta)}{t}\right) \quad 1.62$$

The optimal solution for a single government (centralization) scenario is as follows:

$$g^c = argmax_g\{[m_1 + m_2]lng - 2tg\} \quad 1.63$$

$$FOC: g^c = \frac{m_1 + m_2}{2t} \quad 1.64$$

The first order conditions show that if there are no spillovers, if $(m_1 = m_2)$, both scenarios (decentralization and centralization) will produce the same quantity of goods. However, if $\delta = 0.5$, then it is clear that the provision of public goods in each local jurisdiction will be suboptimal. However, if there are no externalities, and preference for public goods between

the two regions is not equal ($m_1 \neq m_2$), then decentralization may be more efficient – as demonstrated in Oates (1972) model.

1.3.6. A Summary of the Dangers of Fiscal Decentralization

In section 1.3 I have outlined some of the dangers of fiscal decentralization. Specifically, I have considered how fiscal decentralization can lead to harmful competition between local governments, which could ultimately reduce citizen welfare. Some of the negative consequences of fiscal decentralization revolve around the mobility of capital and citizens, and how in the non-cooperative equilibrium local governments compete for capital through lower taxes and higher investment. This competition is detrimental to non-productive spending on redistribution, social services, and recreational facilities.

When capital is mobile, local governments recognise that increasing tax on capital in order to increase provision of public goods, would lead to an outflow of capital from the region (Hoyt, 1991). Hence local governments face a problem that central governments do not (or to a lesser extent), which leads to a sub-optimal provision of public services. Furthermore, local governments may also compete through expenditure on productivity enhancing goods and services. In order to attract more capital to the jurisdiction, local governments could spend more on productivity enhancing goods (airports, infrastructure), than on parks and recreational facilities, and on redistribution (Keen and Marchand, 1997; Treisman, 2007). Finally, inter-regional inequalities in capital, investment and productivity may also arise when some jurisdictions possess certain advantages, namely better quality infrastructure, more natural resources, current human capital or simply as a result of location (i.e. landlocked). Cai and Treisman (2005) showed that poorly endowed jurisdictions would not be able to attract the same level of capital, even with lower taxes and higher infrastructure investment. Inter-regional inequalities will also grow over time, regardless of whether capital is mobile or not.

Other problems may arise even if capital is immobile. One such problem is vertical tax competition. Subnational and central government may also compete with one another to optimise tax revenue when they both levy taxes on the same subject. Consequently, when two tiers of government tax the same subject, total taxation may be higher than the leviathan tax rate (Treisman, 2007). Also, when the tax levied by the subnational government increase, the tax levied by the federal government falls. Therefore, the federal government is weakened through vertical tax externalities (Keen and Kotsogiannis, 2004). Finally, subnational

governments may under-provide public goods and services that exhibit positive externalities (Besley and Coate, 2003).

1.4. Comparing the Different Types of Decentralization

In this final section of my introduction to fiscal decentralization I compare the different types of decentralization outlined in section 1.1, according to the arguments for and against fiscal decentralization addressed in sections 1.2 and 1.3.

Fiscal Decentralization:

Fiscal decentralization is a necessary condition for all of the effects, desirable or otherwise, outlined in sections 1.2 and 1.3. When subnational governments have autonomy over taxation and expenditure responsibilities they can better address the needs of local citizens (Oates, 1972), compete on expenditure and taxation and provide choice to citizens with different preferences (Tiebout, 1956) and ensure that the central government cannot set inefficiently high taxes (Brennan and Buchanan, 1980). Furthermore, autonomous subnational governments can also be held to account by local citizens when subnational government executives are directly elected. This results in electoral incentives for local governments to address local needs (Seabright, 1996), and also leads to yardstick competition (Besley and Case, 1995).

On the other hand, fiscal decentralization produces all of the negative effects outlined in section 1.3 Taxation autonomy leads to a race to the bottom in taxation (Hoyt, 1991), and expenditure autonomy leads to an under-provision of public goods and services that do not enhance productivity (Keen and Marchand, 1997). Taxation autonomy also leads to over-grazing, reducing the tax power of the federal government (Treisman, 2007) and potentially increasing taxes overall. Fiscal decentralization also leads to and exacerbates inter-regional inequalities in investment, capital and productivity (Cai and Treisman, 2005). Finally, expenditure autonomy leads to an under-provision of public goods and services that exhibit externalities (Besley and Coate, 2003).

Though it is clear how fiscal decentralization can produce all of these effects, what is unclear is the effect of other forms of decentralization that are often observed in practice. The aim is to consider alternate forms of decentralization that may induce some of the beneficial effects of fiscal decentralization, but without the dangers associated with fiscal autonomy of

local governments. The first alternate form of decentralization I consider is partial fiscal decentralization (Brueckner, 2009).

Partial Fiscal Decentralization:

In the absence of taxation autonomy, partial fiscal decentralization could produce a healthier trade-off between the benefits of decentralized delivery of public goods and services, and limitations on taxation.

Brueckner (2009) explains that partial decentralization may still produce efficiency benefits underlined by the Oates' decentralization theorem. Subnational governments will still be more responsive to heterogeneous needs than central governments due to the information advantage they possess (Tanzi, 1996). However, as Brueckner explains, partial fiscal decentralization involves a constraint that fiscal decentralization does not, namely that subnational governments do not control their budgets, and may lack sufficient resources to address local needs.

Perhaps the strongest change is the degree of subnational government accountability. A consequence of partial fiscal decentralization is a loss of accountability of subnational government decision making. Even if subnational governments are directly elected, they are not entirely accountable for the decisions they make with respect to local expenditures. Local government executives can simply blame central government for inadequate resources to fulfil necessary expenditure at the subnational government level. The central government can also shift blame onto the subnational governments for not allocating resources efficiently. On the other hand, central government control can protect against inequalities arising from competition and from unequal endowments (Boadway and Shah, 2009). Under partial fiscal decentralization, central governments can harmonise the delivery of public goods and services across regions, and reduce inter-regional inequality.

The attraction of partial fiscal decentralization is that central government control over subnational government may prevent some of the ill effects of local government autonomy. Of the dangers of decentralization outlined in section 1.3, only two apply to partial fiscal decentralization: competition through expenditure and the effect of externalities. In the case of the latter, subnational governments with restricted budgets will face an incentive to spend more on goods that do not exhibit positive externalities, and will have an incentive to free-ride on the provision of such goods by neighbouring jurisdictions (Besley and Coate, 2003). The strength of partial fiscal decentralization is that central government control over taxes can prevent inter-regional inequalities from growing, as central governments can harmonize tax and spending

between regions (Boadway and Shah, 2009). Central governments can also provide incentives for subnational governments to provide certain goods and services through conditional transfers, which would reduce the cost of externalities. However, further central control over subnational government expenditure decision making would have a negative effect on the benefits of decentralization (Boadway and Shah, 2009).

Electoral decentralization:

Whether the local government is elected by local citizens, or appointed by central government will have a bearing on the decisions made at the local level. If the local government is appointed, then it will seek to appease central government. On the other hand, if the local government is elected, then it will have to satisfy the demands of local citizens to be re-elected, as Seabright's model demonstrated.

Electoral decentralization can have different effects depending on the degree of subnational government activity and autonomy. If subnational governments are autonomous and are responsible for a wide range of government activities, then electoral decentralization ensures that subnational governments will use its tax and spending powers to improve the welfare of local citizens. Electoral decentralization may also negate some of the dangers of fiscal decentralization. For example, citizens may mandate local government to spend less on infrastructure and set higher taxes on capital. Local government elections also provide a means for local citizens to communicate their demands for public goods and services. Though subnational governments will still be wary of the consequences of higher taxes on capital, electoral decentralization can ensure that citizens control the trade-off between private and public good consumption.

Electoral decentralization can also serve a purpose even if subnational governments do not have discretion over revenue or spending. If subnational governments act as agents of the central government, referred to as deconcentration (see Treisman, 2002; Meloche et al, 2004), then local government elections mean that local citizens must still be satisfied with the policies in the local area. Therefore, local governments will need to communicate the demands of local citizens to the central government. This may enable a centralized government to provide a non-uniform set of public goods and services. This is one way that a centralized government may be able to ascertain the different needs of citizens. Besley and Coate (2003) explain that there is no theoretical argument for why central government cannot deliver different public goods and services, and electoral decentralization may provide the central government will the information it needs to achieve this.

Local vs. Subnational Governments:

Finally, the devolution of tax and spending powers to local governments would produce stronger effects than were those powers devolved to regional governments. This is because there are more local governments than regional governments. As a result, each local government is responsible for a smaller number of people, and the size (area) of local governments will also be smaller than regional governments, therefore increasing the mobility of citizens. This means that local governments will provide greater choice to citizens in the Tiebout model, stronger preference matching in Oates' model, greater mobility and lower taxes in the Brennan and Buchanan model, and more responsive governments in the Seabright model. Yardstick competition will also be stronger as the similarities between governments will become greater the smaller the government unit is.

The downside is that competition will be more intense between local governments than regional governments due to the increased mobility of capital and citizens. In Hoyt's model, we see that as the market share of capital in each jurisdiction falls, the value of capital to each jurisdiction increases and competition intensifies. A higher number of jurisdictions at the local government level will enhance the effects observed in Hoyt's model, and the provision of public goods will be further below the optimal level (see 1.28, and the value of 'm'). Devolution of tax and spending decision making to local governments may also increase administrative costs and, for goods and services that exhibit economies of scale with greater provision, the costs of decentralized delivery will be even greater (Barankay and Lockwood, 2007; Boadway and Shah, 2009). Boadway and Shah suggest that decentralization to regional governments may provide a balance between too much centralized decision making and too much local government autonomy. This forms part of Alesina and Spolaore's (2003) discussion on the optimal size of the jurisdiction – one that can take advantage of economies of scale, whilst addressing local needs that are heterogeneous between states.

1.5. Conclusion

In this chapter I have summarised the fiscal decentralization literature. I began with a discussion on fiscal decentralization, what fiscal decentralization actually means, and what the alternate forms of government decentralization there are. I then explained several key arguments in favour of fiscal decentralization, and counter arguments that caution against local

government tax and spending autonomy. In the final section of this chapter I considered how different types of decentralization relate to those key arguments. Together, this chapter forms the basis of my empirical research into the effects of fiscal decentralization, as an important part of studying fiscal decentralization, is understanding what fiscal decentralization entails, and what the effects of greater subnational government autonomy are. The last section of this introduction is particularly relevant to the more recent contributions to the area of fiscal decentralization. For example, contributions from Treisman (2002, 2007) and Brueckner (2009) challenge the view that fiscal decentralization is a pre-requisite for some of the benefits of government decentralization to be realised.

Throughout this research, I consider how various aspects of decentralization relate to the studies I undertake in this research. Consequently, by examining how the different aspects of decentralization affect poverty and income distribution (chapter 3), public healthcare and public education (chapter 4) and trust in government (chapter 5), I am able to produce more insightful conclusions on the effects of government decentralization. However, in order to test the relevance of the different types of decentralization, I must construct a dataset fit for that purpose. In chapter 2 I provide brief overview of cross-country data that is available, and I construct a dataset for use in the rest of my thesis.

2. Measuring Fiscal Decentralization

One of the main problems in the fiscal decentralization literature is how to measure the role of subnational government. Accurately capturing fiscal decentralization and the different aspects of decentralization is essential for studying the effects of decentralization, which in turn has implications for decentralization policy. Following on from the work of Oates (1972), Brennan and Buchanan (1980), Seabright (1996), Keen and Marchand (1997) and others in chapter 1, scholars have investigated the practical implications of fiscal decentralization on economic development (Davoodi and Zou, 1998), on public sector size (Oates, 1985) and on the quality of government (Treisman, 2000). However, the effects of fiscal and other forms of decentralization will likely differ, as each type of decentralization produces only some of the effects described in the literature.

Until fairly recently, basic measures of subnational government activity (tax and expenditure) from the Government Finance Statistics were used to investigate relationships between fiscal decentralization and various macroeconomic variables and government quality. However, as Stegarescu (2005) explains, these measures misrepresent the degree of subnational government autonomy over tax and expenditure activity. Recent literature has criticised the use of these indicators to measure subnational government autonomy (Ebel and Yilmaz, 2002; Meloche et al., 2004; Stegarescu, 2005). It is also important to capture other aspects of decentralization. Treisman (2008) and Ivanyna and Shah (2014) have sought to measure different concepts of decentralization, and have produced extensive datasets to measure political and electoral decentralization, government structure and local government characteristics.

In this chapter I consider the different measures of decentralization that are available for use in my empirical research, and I consider the strengths and weaknesses of those indicators. My approach here is not to scrutinise the measures of decentralization. Rather, I accept that there is no indicator that captures every single aspect of decentralization (Treisman, 2002, 2007). Instead I produce an extensive dataset that contains information on various types of decentralization, and put this dataset to use in my own research on fiscal decentralization and poverty, public healthcare and public education, and citizen trust in government.

The organisation of this chapter is as follows. I begin by outlining the conventional measures of subnational government share of revenue and expenditure, in section 2.1. In section 2.2 I consider the importance of subnational government autonomy over expenditure functions (2.2.1), and I also look at data on taxation autonomy (2.2.2). In section 2.3 I consider measures of other aspects of decentralization that are related to the arguments I addressed in chapter 1, and will prove useful for examining the effects of fiscal decentralization in my own

empirical research. In section 2.4 I outline the complete dataset for all countries covered in this research, and provide descriptive statistics for the dataset.

2.1. Subnational Government Share of Revenue and Expenditure

The first aspect of fiscal decentralization concerns the degree of tax and expenditure activity carried out by subnational government. These are considered to be the conventional measures of decentralization (Stegarescu, 2005) and have been used in many of the earlier pieces of empirical work in the decentralization literature. The share of activity located at the subnational government level is not broken down according to types of expenditure or the degree of tax autonomy. Instead these measures simply give an idea of the role of subnational government relative to all government activity (the general government). The general government consists of central government (one) and subnational government, which consists of all state and local[11] government. The original data from the Government Finance Statistics (IMF) provides data for government activity. The World Bank Fiscal Decentralization Indicators[12] uses the Government Finance Statistics dataset to produce the following measures of subnational government share of revenue (function 2.1) and expenditure (function 2.2).

$$\frac{Subnational\ Government\ Expenditure}{General\ Government\ Expenditure}\ x100 \qquad 2.1$$

$$\frac{Subnational\ Government\ Revenue}{General\ Government\ Revenue}\ x100 \qquad 2.2$$

These two measures of subnational government share of tax and spending activity have been used to represent fiscal decentralization in various empirical research, including Oates (1985); Davoodi and Zou (1998); Zhang and Zou, (1998); Akai and Sakata (2002). For the rest of this thesis I refer to these indicators as '**SCG Revenue**' (short for sub-central government share of revenue) and '**SCG Expenditure'** (short for sub-central government share of expenditure). In addition to SCG Expenditure, which breaks down all public expenditure between subnational

[11] Subnational government is defined as state and local. Subnational government is essentially any government that is not central. Government Finance Statistics Manual (2001: 13), based on SNA (1993) Framework

[12] The data is available here: http://www1.worldbank.org/publicsector/decentralization/fiscalindicators.htm and the publication file for descriptions of the dataset is available here: http://siteresources.worldbank.org/PUBLICSECTORANDGOVERNANCE/Resources/285741-1326399585993/8366509-1332861347588/DatabaseofFiscalandPoliticaDecentralizationVariablesDefinition_040712.pdf

government and central government, other indicators may be created to examine the distribution of certain types of expenditure between subnational and central government. For example, we could examine the distribution of public healthcare and public education expenditure between subnational and central governments, which may be useful for contrasting the degree of decentralization of certain types of expenditure. Such measures can be used to compare the degree of subnational government share of activity for certain expenditures, and may also provide different results in empirical research. In chapter 4 I included measures for **'SCG Healthcare Expenditure'** and **'SCG Education Expenditure'** to complement my research on "Public Healthcare, Public Education and Fiscal Decentralization" (covered in Chapter 4).

All of the above indicators are available in the World Bank Fiscal Decentralization Indicators dataset. The data covers a maximum of 93 countries, between 1990 and 2009. The panel dataset is unbalanced, and few countries have complete data for SCG Revenue (from 1990 to 2009).

Unfortunately, whilst there is a fairly large amount of data available for a wide range of countries, these indicators provide only an idea of the role of subnational government. Nevertheless, these indicators have proven useful for measuring certain effects in the literature. For example, Davoodi and Zou (1998) examine the effect of subnational government share on economic growth. They focus specifically on the optimal distribution of government activity between central, state and local government. Their research provides some evidence of a link between subnational government share and economic growth[13]. However, for studying the effects of fiscal autonomy it is important to distinguish between SCG Revenue and SCG Expenditure, and measures that include information on subnational government autonomy.

2.2. Subnational Government Autonomy

The limitation of the conventional measures of tax and expenditure decentralization has led to new indicators of fiscal autonomy and fiscal decentralization. As Stegarescu (2005) explains, the above indicators misrepresent the degree of fiscal decentralization as they contain no information on subnational government autonomy. The subnational government may be reliant upon the central government in one of two ways: i) either subnational governments depend upon transfers from the central government, which could limit expenditure autonomy, and ii)

[13] They observe a negative relationship between subnational government share of expenditure for a selection of countries.

subnational governments do not control the taxes in their local jurisdiction, either in terms of tax rate, tax base or both, which would limit tax autonomy. In this section I review a range of new indicators of subnational government spending and taxation autonomy.

2.2.1. Subnational Government Expenditure Autonomy

Central governments may influence subnational government expenditure decision making. Treisman (2002) explains that expenditure decentralization could be controlled through conditional transfers from the central government. As Boadway and Shah (2009) explain, conditional transfers can be used to control subnational government's allocation of resources, as subnational governments are mandated to spend on particular goods and services. Brueckner (2009) comments that even unconditional transfers (block grants) restrict subnational government decision making, as they are still reliant upon grants to finance their expenditures. Therefore, in order to measure subnational government autonomy over expenditure, we must deduct all transfers received from the central government. This measure can be constructed using the Government Finance Statistics, or the World Bank Fiscal Decentralization Indicators. Transfers are deducted from subnational government revenue to create the indicator 'own-source revenue'[14]

$$SCG\ Own\ Source\ Revenues: SCG\ Revenue\ - SCG\ Transfers(recipient) \qquad 2.3$$

Second, the degree of subnational government autonomy over expenditures is calculated as the share of subnational government expenditure financed by own-source revenues:

$$\frac{Subnational\ Government\ Own\ Source\ Revenue}{Subnational\ Government\ Expenditure} \qquad 2.4$$

The above indicator represents subnational government autonomy over their expenditures. By combining SCG Expenditure (2.1) and SCG Autonomy (2.4) I construct a new measure of subnational government autonomous expenditure share of total government spending.

[14] Stegarescu (2005) and others define own-source revenue more strictly, according to subnational government autonomy over the base and rate of taxes in the local area. Essentially own-source revenue here represents all revenue the subnational government collect from the local jurisdiction, regardless of whether they can change the tax rate or targets of tax.

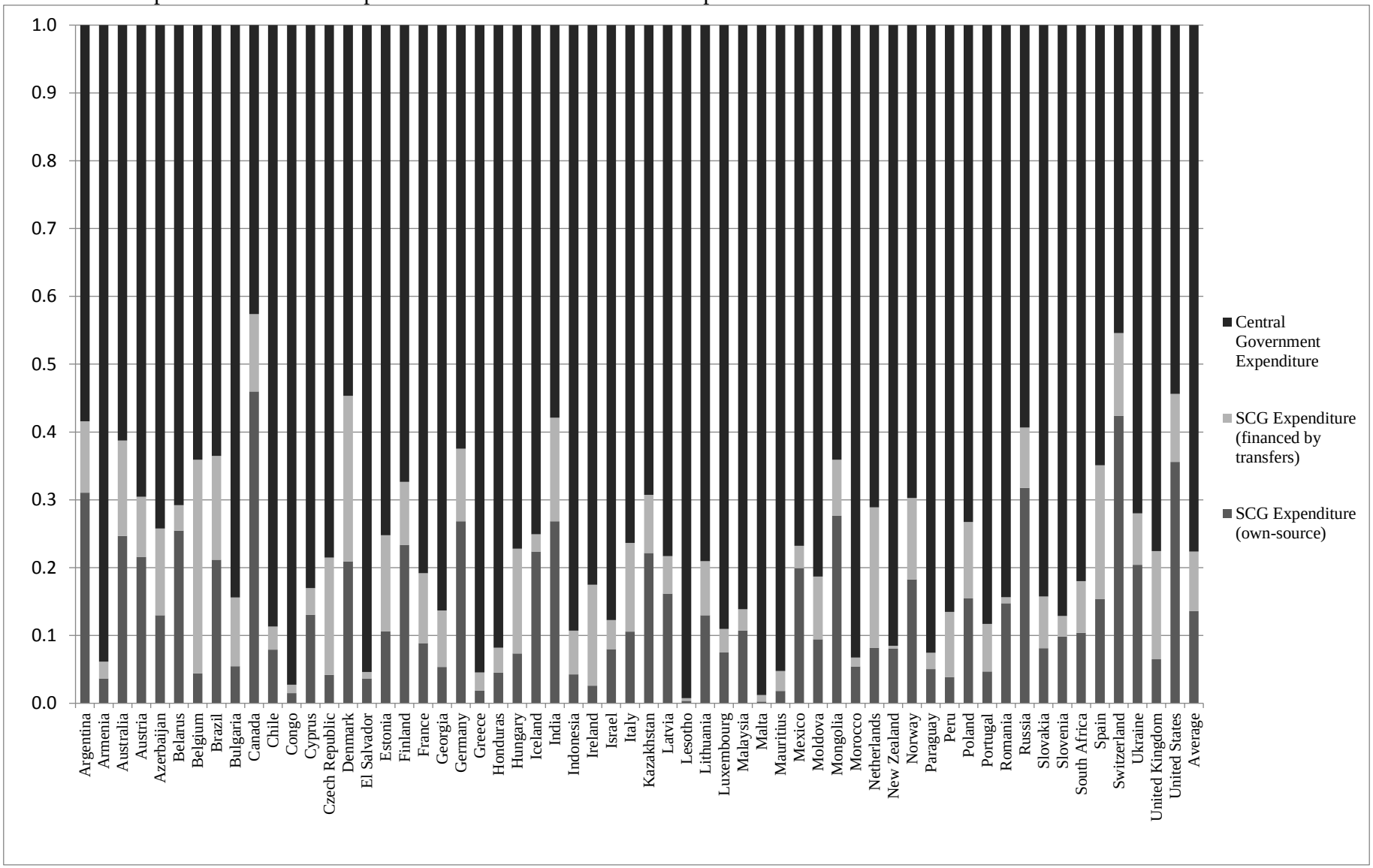
$$\left[\frac{SCG\ Own\ Source\ Revenue}{SCG\ Expenditure} x\ SCG\ Expenditure\ Share\right] x\ 100 \qquad 2.5$$

The indicator, which I refer to as **'SCG Autonomous Expenditure'** (short for sub-central government share of autonomous expenditure), represents the proportion of total government spending carried out by subnational governments, on the condition that the subnational government has discretion over how they allocate that expenditure. This measure constitutes the opposite of partial fiscal decentralization, which Brueckner (2009) defines as SCG expenditures financed by transfers. The data for this indicator is fairly large, covering most of the countries for which SCG Revenue and SCG Expenditure are available. A breakdown of total government expenditure for 59 countries[15] is available in chart 1. The bar furthest to the right is the average of the entire sample of countries, and shows that just over 20% of government expenditure is delivered by subnational government. Roughly two thirds of SCG Expenditure is financed by own-source revenues, whilst one third is financed through intergovernmental transfers from the centre.

Only two countries observe greater than 50% subnational government expenditure share, Canada and Switzerland, with United States observing just under 50%. Of these three countries, there is limited central government influence through transfers. Some countries observe heavy central government influence, such as Belgium, Denmark, Netherlands and Spain. Denmark would appear considerably more decentralized under SCG Expenditure, but once transfers are deducted, SCG Autonomous Expenditure is less than a half of SCG Expenditure.

[15] For this breakdown I could only use those countries that have data for each of SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure. For the entire list of countries that have data for at least the SCG Revenue indicator, see table 5 of this chapter

Chart 1: CG Expenditure vs. SCG Expenditure vs. SCG Autonomous Expenditure



2.2.2. Subnational Government Taxation Autonomy

The exclusion of transfers allows us to examine the degree of subnational government autonomy over expenditures. However, capturing taxation autonomy presents another problem. As Treisman (2002) explains, measuring revenue decentralization is subject to a myriad of nuances (page 12), such as the degree of autonomy over tax rates, tax base and tax sharing. The weakness of the above indicators is that they do not give an idea of the degree of control subnational governments have over their budgets. Ideally we should distinguish between own-source revenues (controlled by the subnational government) and those that are not own source (Rodden, 2002).

Unfortunately, the only data available to provide some idea of the degree of taxation autonomy is limited in both scope and scale. The OECD Fiscal Decentralization Indicators[16] break down subnational government tax share, excluding transfers, according to the degree of autonomy over the setting of tax rates and tax base. There are five categories of tax autonomy, ranging from total autonomy (SCG sets tax rate and base), to no autonomy (centralized decision making).

Table 1: SCG Revenue (excluding transfers) Tax Autonomy Categories

Category a)	SCG determines tax rate and tax base
Category b)	SCG determines tax rate
Category c)	SCG determines tax base
Category d)	Tax sharing arrangements with the centre
Category e)	Central government sets tax rate and tax base

Data is available for 4 years between 1990 and 2009: 1995, 2002, 2005 and 2008 and covers up to 34 mostly high income European countries (in year 2008 dataset). These indicators have often been used to demonstrate the difference between SCG Revenue and tax autonomy of subnational governments (see Ebel and Yilmaz, 2002; Meloche et al., 2004 and Stegarescu, 2005).

In this research I use this data merely to demonstrate the degree of autonomy for some of the countries used in my dataset. Most of my research is focused on low and

[16] For the dataset, see here: http://stats.oecd.org/viewhtml.aspx?datasetcode=TAXAUTO&lang=en, and for further information on the dataset, see here: http://www.oecd-ilibrary.org/governance/measuring-fiscal-decentralisation/measuring-decentralisation_9789264174849-3-en

middle income countries which are not covered by the OECD dataset. Depending on the research that I conducted, data would be available for only a dozen or so countries in the complete dataset; hence this data has no use within my own empirical research. Instead I want to have an idea of how much of own-source revenue (function 2.3) is actually controlled by subnational governments. Specifically, I wanted to identify the proportion of own-source revenue for which subnational governments control tax rate and base (a), tax rates only (b) and tax base only (c). The arguments presented in chapter 1 on tax competition require that subnational governments have control over taxes. Therefore, it is important to have an idea of how much tax autonomy subnational governments actually have, and how relevant the arguments on tax competition in chapter 1 are in my indicators.

In table 2 we see the degree of taxation autonomy of subnational governments I in the OECD dataset. Across the entire sample, subnational government has control over 70% of their budgets. Almost half of tax revenue accruing to subnational governments falls into category b: control over tax rates. It is less common that subnational governments have the power to change the tax base. If we include taxes that are shared between subnational government and central government (category d), almost 90% of tax revenues exhibit some form of subnational government control. Interestingly, category d, for shared taxes, accounts for almost 20% of SCG Revenue (excluding transfers). This is important when considering vertical tax externalities, where central and subnational tiers of government tax the same subject (see Treisman, 2007 and Keen and Kotsogiannis, 2004).

If we apply this information to the SCG Autonomous Expenditure indicator, it is clear to see that most revenues accruing to the subnational government are controlled by the subnational government (for high income countries at least). It is not possible to know what the degree of tax autonomy is for low and middle income countries, due to the absence of similar data for those countries.

Table 2: Cross-Sectional Data (OECD Fiscal Decentralization: Tax Autonomy)

Country	Continent	Income	Span	TA Years#	Autonomous Taxation (a, b and c[17])	SCG Tax Breakdown					
						a	b	c	d	e	f
Australia	OC	High	1999-2009	02, 05, 08	100.00	100.00	0.00	0.00	0.00	0.00	0.00
Austria	EU	High	1995-2009	95, 02, 05, 08	31.78	20.51	11.27	0.00	8.85	44.61	14.75
Canada	N.A.	High	1990-2007	05, 08	92.35	74.93	17.42	0.00	0.86	0.31	6.49
Chile	S.A.	Middle	2000-2009	08	24.97	0.00	24.97	0.00	75.03	0.00	0.00
Denmark	EU	High	1995-2009	95, 02, 05, 08	93.46	0.00	93.46	0.00	2.92	3.61	0.01
Estonia	EU	Middle	1995-2009	02, 05, 08	8.32	0.96	7.36	0.00	91.68	0.00	0.00
Finland	EU	High	1995-2008	95, 02, 05, 08	90.76	0.00	90.76	0.00	9.09	0.11	0.04
France	EU	High	1995-2009	02, 05, 08	80.93	67.78	6.58	6.57	6.45	9.34	3.29
Germany	EU	High	1995-2009	95, 02, 05, 08	14.94	0.05	14.89	0.00	79.04	3.87	2.15
Greece	EU	High	1995-2009	02, 05, 08	45.88	0.00	45.88	0.00	18.07	35.41	0.63
Hungary	EU	Middle	1995-2009	95, 02, 05, 08	80.36	0.00	80.36	0.00	19.29	0.00	0.35
Iceland	EU	High	1998-2009	02, 05, 08	94.06	0.00	94.06	0.00	0.00	0.00	5.94
Ireland	EU	High	1995-2009	95, 02, 05, 08	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Israel	AS	High	2000-2009	02, 05, 08	100.00	5.14	94.86	0.00	0.00	0.00	0.00
Italy	EU	High	1995-2009	02, 05, 08	62.11	7.89	54.22	0.00	31.93	5.96	0.00
Luxembourg	EU	High	1999-2009	02, 05, 08	97.09	5.02	92.07	0.00	0.00	1.06	1.85
Mexico	N.A.	Middle	1990-2000	95	65.35	65.35	0.00	0.00	0.00	34.65	0.00
Netherlands	EU	High	1995-2009	95, 02, 05, 08	99.41	0.00	99.41	0.00	0.00	0.00	0.59
New Zealand	OC	High	2001-2007	02, 05	98.99	98.99	0.00	0.00	0.00	1.01	0.00
Norway	EU	High	2000-2009	02, 05, 08	97.91	1.12	67.43	29.36	0.00	2.10	0.00
Poland	EU	Middle	2001-2009	02, 05, 08	42.60	0.00	42.60	0.00	52.80	0.25	4.35
Portugal	EU	High	1995-2009	95, 02, 05, 08	64.42	7.65	56.77	0.00	18.09	17.26	0.23
Slovakia	EU	Middle	2003-2009	05, 08	100.00	5.69	94.02	0.30	0.00	0.00	0.00
Slovenia	EU	Middle	1992-2009	02, 05, 08	14.80	14.80	0.00	0.00	71.27	10.32	3.61
Spain	EU	High	1995-2009	95, 02, 05, 08	64.54	43.37	21.17	0.00	34.16	1.21	0.09
Sweden	EU	High	1995-2009	95, 02, 05, 08	99.41	0.07	99.34	0.00	0.00	0.58	0.00
Switzerland	EU	High	1990-2008	95, 02, 05, 08	98.14	59.58	38.56	0.00	1.75	0.00	0.10
United Kingdom	EU	High	1995-2009	95, 02, 05, 08	100.00	0.00	100.00	0.00	0.00	0.00	0.00
AVERAGE					70.09	20.68	48.12	1.29	18.62	6.13	5.16

[17] It's very rare that subnational governments determine the targets of a particular tax instrument, but do not control the rate of tax. Nevertheless, category c is deemed to be part of the tax autonomy indicator and accounts for under 2% of subnational government taxes across the sample

2.3. Capturing Other Aspects of Decentralization

Altunbas and Thornton (2011) explain that other forms of decentralization may be used to address the shortcomings of indicators for tax and expenditure decentralization. In their empirical research they combine the various tax and spending decentralization indicators with institutional variables for election decentralization, federal constitution and political decentralization (i.e. legislative powers of subnational governments). Treisman (2008)[18] and Ivanyna and Shah (2014)[19] provide datasets for measuring the different aspects of decentralization. Ivanyna and Shah (2014) provide data for local government specifically, whilst Treisman (2008) covers different types of decentralization for subnational governments. In this section I consider some of their indicators and how they may be relevant to my research and the arguments addressed in chapter 1

2.3.1. Local Government Elections

The first aspect of decentralization concerns the direct accountability of local government decision making. Direct accountability requires that subnational governments (representatives) are elected, which is a necessary condition of certain arguments in the literature. For example, Seabright (1996) considers the responsiveness of local governments to local demands when local governments are elected by the local constituent. Elections provide a useful disciplining tool against wasteful or corrupt governments through yardstick competition (Besley and Case, 1995). On the other hand, if central governments appoint the executive of the local government then there is an incentive for the local government to do what the central government wants, and not to deliver for local demands. Therefore, we might expect further decentralization to have a different effect depending on whether the local government is elected or appointed.

Treisman (2008) presents two indicators of electoral decentralization, one for the bottom (local) tier of government and one for the second tier. In the original Treisman (2008) dataset, the variables take 3 discrete values: 0 (when SCG official is appointed), 1

[18] Treisman (2008), Decentralization Dataset, available for download here: http://www.sscnet.ucla.edu/polisci/faculty/treisman/

[19] Ivanyna and Shah (2014), Worldwide Indicators on Localization and Decentralization, available here: http://dx.doi.org/10.5018/economics-ejournal.ja.2014-3

(when SCG official is elected), and 0.5 for any system in between (i.e. where a local council is elected, who then appoint the town Mayor, see Bolivia). I modify this data so as to define this indicator as either strictly direct elections (1) or not (0), so in the case of Bolivia, this would be 0, rather than 0.5.

To measure electoral decentralization, I select the indicator for the bottom tier of government (local government elections or appointment). The reason I have chosen this indicator is because, as Seabright (1996) explains, when a government is accountable to more than one locality, as a central and regional[20] government would be, they are not accountable to one particular local region. Hence the direct accountability effect is strongest at the local government level. This is also true for Besley and Case (1995) yardstick competition argument. Local governments are more likely to face a similar cost curve than say regional governments. Also there is a moderate positive correlation (0.43) between the two indicators, which means that in countries where the local government is elected, often the next tier up is also elected by the constituents. For the remainder of this research I refer to this indicator as "Electoral Decentralization" (see table 3)

2.3.2. Political Decentralization

The second aspect of decentralization concerns other decisions made by government that are not tax or spending related. Treisman (2002) refers to decision making decentralization, whereby subnational governments have the power to legislate. As Treisman puts it, in a country where all decisions are made by the central government, this would represent full political centralization. Though measuring decision making decentralization presents a wide range of problems, Treisman provides three indicators outlined below:

i) Residual authority, where the subnational legislature has the right to legislate (according to constitution) over issues that may be assigned to other levels of government ("aut")

ii) Autonomy, where the subnational legislature has the right to legislate on a particular issue, but the constitution reserves power to decide on ("res")

iii) Weak autonomy is either residual authority (i) or autonomy (ii) ("autres")

[20] Or state, provincial etc.

To measure political decentralization, I use option iii) above. I refer to this indicator for the remainder of the research as "Legislative Decentralization" (see table 3)

2.3.3. Federal Constitution

I also include a measure for federal constitution. This indicator is fairly straightforward. In Treisman's (2008) dataset countries are described as having either a federal government or unitary government. Oates (1972) explains that the definition of fiscal federalism has few practical observations. Treisman's dataset supports this view, with only 19 of 164 countries described as having a federal government. The remainder are classified as unitary, with substantial central government control. Altunbas and Thornton (2011) explain that countries which have a federal constitution are assumed to observe more subnational government responsibilities. In the final dataset in section 1.4 of this chapter those countries in the federal government group appear to be more decentralized according to other indicators than most other countries. For example, federal governments in Canada and in the USA are some of the most decentralized countries, according to all indicators. Both countries observe some of the highest levels of subnational government share of activity, and autonomous expenditure and autonomous taxation (OECD dataset). For the remainder of this research I refer to this indicator as "Federal Constitution"

2.3.4. Vertical Decentralization (Tiers of Government)

Another aspect of decentralization is vertical decentralization, or the number of tiers of government. I use this indicator exclusively for my work on fiscal decentralization and trust (chapter 5). Vertical decentralization refers to the number of tiers of government. In a dataset containing over 150 countries, Treisman (2008) observes a range of government structures. Some governments contain only a central and a local government. In Slovenia there is a central government and local (municipal) governments. In contrast, the governments of China and India feature as many as five tiers of government in certain parts of the country. For the remainder of this research I refer to this indicator as "Tiers"

2.3.5. Local Government Size and Population

The final aspects of decentralization refer to two local government features: i) the average size (area) of local jurisdictions, ii) the average population count in local jurisdictions. These two indicators provide extra information on important theories in the decentralization literature. First, area size may determine the degree of mobility of citizens (and capital), and by proxy, the degree of subnational government competition. Let's imagine a country with a fixed land area, if we increase the number of local governments (jurisdictions), then the average size of the local government will fall. All other things equal, citizens will be more mobile the smaller the size of the local jurisdiction. If the number of local jurisdictions increases, the size of each jurisdiction falls, and this represents a greater degree of fiscal decentralization, all other things equal. Hoyt (1991) and Keen and Kotsogiannis (2004) demonstrate that when refer to the number of jurisdictions in their models on tax competition. For example, in Hoyt (1991) 'm', the share of capital in the local jurisdiction is decreasing with a larger number of local government units. As 'm' falls, the value of capital rises, and the competition for mobile capital increases. The effects are intensified when the size of local government is smaller. For the remainder of this research I refer to this indicator as "LG area size".

Second, population size may determine the degree of local government responsiveness and accountability to a subset of the population. I use this indicator exclusively in the trust chapter to see whether citizens are more trusting of decentralized governments if their local government is responsible for fewer citizens. Seabright's model (1996) compares central government responsible for lots of localities and local governments responsible for a single locality each. The idea is that local governments are more responsive to local citizens than central government would be. The same argument should also apply to the number of people the local government is accountable to. As the population size of the local jurisdiction falls, local governments are expected to be more responsive, which could have an effect on trust in government (see chapter 5). For the remainder of this research I refer to this indicator as "LG population size".

The full list of the alternate measures of decentralization is in table 3.

Table 3: Treisman (2008) and Ivanyna and Shah (2014) Decentralization Indicators

Aspect of Decentralization (title)	Short Description	Sources
Electoral Decentralization	Dummy variable: if executive at bottom tier directly elected (1); appointed by directly elected assembly (0)	Treisman (2008)
Legislative Decentralization	Dummy variable: if constitution allows for limited autonomy for subnational government (1); otherwise (0)	Treisman (2008)
Federal Constitution	Dummy variable: if country has federal government (1); if country has unitary government (0)	Treisman (2008)
Tiers	Dummy variable: if country has 4 or more tiers of government (1); if countries has fewer than 4 tiers of government (0)	Treisman (2008)
LG Area Size	The logarithm of the average number of citizens living in the smallest jurisdiction (local government), in 1,000s	Ivanyna and Shah (2014)
LG Population Size	The logarithm of the average number of citizens living in the smallest jurisdiction (local government), in 1,000s	Ivanyna and Shah (2014)

2.4. A Comprehensive Fiscal Decentralization Dataset

The final dataset that I use in this research contains each of the indicators of aspects of decentralization outlined above. In all, there are 12 indicators of decentralization. Some indicators measure subnational government share of fiscal activity; other measures capture other forms of decentralization, such as political decentralization and local government legislative autonomy. I also include measures for government structure and local government size, area and population.

The final dataset covers 69 low, middle and high income countries, over a period of 20 years, between 1990 and 2009. The summary statistics in table 4 indicate that governments are still fairly centralized, with subnational government accounting for just under a quarter of total government revenue and expenditure. When taking into account intergovernmental transfers, subnational government has autonomy over just 14% of all government expenditure. However, subnational governments account for a larger proportion of public healthcare and public education spending. In public education spending, subnational governments account for the majority of total government spending on public education.

Local jurisdiction population and area size is quite varied across the entire dataset. On average, local governments are responsible for 47.5 thousand people, and the average size of the local jurisdiction across the entire sample is 79.7 square kilometres.

Finally, the breakdown of the sample according to electoral and legislative decentralization, federal constitution and tiers presents an interesting overview of the degree of other aspects of decentralization. First, electoral decentralization is fairly

common, despite how limited the share of subnational government activity is. For more than 80% of the sample the local government executive is elected. Second, subnational governments often don't have legislative powers. In only 18 countries (of 65) subnational governments have some legislative autonomy. Third, as expected, there are many more unitary governments than federal governments. Fourth, there is a more even split in the sample regarding government tiers. In 28 countries governments contain 3 or 4 or more tiers of government, while 35 governments contain no more than 3 tiers.

I provide a complete list of the countries covered in this research in tables 5 and 6. In table 5 I provide cross-sectional averages for the primary tax and spending indicators used in the empirical research: SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure. Data is not available for all 20 years for each country, so I have provided details on the 'span' of data available in table 5. In table 6 I provide data for the remaining decentralization indicators from Treisman (2008) and Ivanyna and Shah (2014).

Table 4: Descriptive Statistics

Panel A: Quantitative Indicators of Decentralization

	Observations	**Mean**	**Std. Dev.**	**Min**	**Max**
SCG Revenue	69	24.67	14.26	1.66	66.05
SCG Expenditure	67	21.71	13.09	1.23	57.38
SCG Healthcare Expenditure	46	41.36	31.10	0.49	96.44
SCG Education Expenditure	48	55.10	26.24	2.55	96.54
SCG Autonomous Expenditure	61	13.99	10.46	0.26	45.98
Tax Autonomy	28	70.09	33.62	0.00	100.00
LG Population Size	67	47.51	80.77	1.60	427.40
LG Area Size	67	79.655	71.982	7.917	394.158

Panel B: Qualitative Indicators of Decentralization

	Obs.	**Yes**	**No**
Electoral Decentralization	58	47	11
Legislative Decentralization	65	18	47
Federal Constitution	68	14	54
Tiers	63	28	35

Table 5: Cross-Sectional Data (World Bank Fiscal Decentralization Indicators)

Country	Continent	Income	Span	SCG Revenue	SCG Expenditure	SCG Autonomous Expenditure
Albania	EU	Low	1995-1998	23.576	18.668	0.883
Argentina	S.A.	Middle	1990-2001	42.355	41.585	31.047
Armenia	EU	Middle	2003-2009	6.547	6.151	3.646
Australia	OC	High	1999-2009	40.142	38.762	24.680
Austria	EU	High	1995-2009	32.401	30.465	21.609
Azerbaijan	EU	Low	1994-2008	32.699	25.791	12.963
Belarus	EU	Middle	1992-2009	32.243	29.196	25.450
Belgium	EU	High	1995-2009	14.44	35.87	
Bolivia	S.A.	Low	1990-2007	29.526	21.348	
Brazil	SA	Middle	1990-1998	42.260	36.467	21.156
Bulgaria	EU	Middle	1990-2009	18.904	15.599	5.457
Canada	N.A.	High	1990-2007	59.751	57.379	45.980
Chile	S.A.	Middle	2000-2009	12.371	11.325	7.907
China	AS	Middle	1995-2008	66.054		
Colombia	S.A.	Middle	2001-2009	31.019	25.602	16.354
Costa Rica	N.A.	Middle	1990-2009	3.486	2.925	
Croatia	EU	Middle	1994-2009	10.634	9.715	
Cyprus	EU	High	1993-2009	21.537	16.996	13.055
Czech Republic	EU	High	2000-2009	16.49	21.48	
Denmark	EU	High	1995-2009	47.161	45.332	20.907
El Salvador	N.A.	Middle	2002-2009	7.771	4.621	3.668
Estonia	EU	Middle	1995-2009	22.713	24.770	10.609
Finland	EU	High	1995-2008	33.762	32.634	23.354
France	EU	High	1995-2009	22.397	19.195	8.886
Georgia	EU	Low	1995-2009	19.617	13.684	5.376
Germany	EU	High	1995-2009	40.018	37.542	26.851
Greece	EU	High	1995-2009	6.530	4.547	1.879
Honduras	N.A.	Middle	2003-2009	11.405	8.191	4.498
Hungary	EU	Middle	1995-2009	22.908	22.793	7.339
Iceland	EU	High	1998-2009	27.868	24.915	22.373
India	AS	Low	1990-2007	46.604	42.120	26.831
Indonesia	AS	Low	1990-1998	11.059	10.726	4.263
Iran	AS	Middle	1999-2009	6.390	3.333	
Ireland	EU	High	1995-2009	23.223	17.471	2.611
Israel	AS	High	2000-2009	13.459	12.270	7.970
Italy	EU	High	1995-2009	26.840	23.657	10.576
Jordan	AS	Middle	2008-2009	7.730	5.029	
Kazakhstan	AS	Middle	1997-2009	39.832	30.733	22.145
Latvia	EU	Middle	1994-2009	25.667	21.715	16.188
Lithuania	EU	Middle	2001-2009	22.777	20.969	12.972
Luxembourg	EU	High	1999-2009	12.334	10.955	7.486
Macedonia	EU	Middle	2006-2008	9.383	7.564	4.644
Malaysia	AS	Middle	1990-2001	11.417	13.864	10.710
Malta	EU	High	2003-2009	1.663	1.231	0.261
Mexico	N.A.	Middle	1990-2000	28.676	23.234	19.942
Moldova	EU	Low	1994-2009	23.009	18.671	9.447
Mongolia	AS	Low	1992-2002	36.980	35.897	27.637
Morocco	AF	Middle	2002-2009	10.265	6.747	5.445
Netherlands	EU	High	1995-2009	32.411	28.910	8.164
New Zealand	OC	High	2001-2007	8.444	8.482	8.078
Norway	EU	High	2000-2009	23.723	30.294	18.245
Paraguay	S.A.	Middle	1990-2009	8.842	7.451	5.058
Peru	S.A.	Middle	1990-2009	22.147	13.470	3.886

Poland	EU	Middle	2001-2009	31.077	26.726	15.453
Portugal	EU	High	1995-2009	14.281	11.692	4.697
Romania	EU	Middle	1990-2001	17.090	15.651	14.767
Russia	AS	Middle	1994-2009	43.715	40.657	31.754
Serbia	EU	Middle	2007-2009	16.064	14.158	11.523
Slovakia	EU	Middle	2003-2009	17.650	15.752	8.113
Slovenia	EU	Middle	1992-2009	15.204	12.877	9.809
South Africa	AF	Middle	1990-2002	22.083	18.004	10.395
Spain	EU	High	1995-2009	40.682	35.110	15.370
Sweden	EU	High	1995-2009	38.665		
Switzerland	EU	High	1990-2008	53.512	54.585	42.396
Tajikistan	AS	Low	1999-2004	27.285	29.641	23.165
Thailand	AS	Middle	1990-2009	6.515	5.379	
Ukraine	EU	Middle	1999-2009	31.306	28.010	20.431
United Kingdom	EU	High	1995-2009	26.207	22.450	6.498
United States	N.A.	High	1990-2001	49.477	45.640	35.581

Table 6: Cross-Sectional Data (Treisman, 2008; Ivanyna and Shah, 2014 Decentralization Indicators)

Country	Continent	Income	Legislate	Federal	Tiers	Election	LG Population	LG Area
Albania	EU	Low	0	0	3	1	24.6	0.033
Argentina	S.A.	Middle	1	1	3	1	17.4	0.133
Armenia	EU	Middle	0	0	3		6.4	0.021
Australia	OC	High	0	1	3	1	29.0	0.394
Austria	EU	High	1	1	4	1	3.5	0.022
Azerbaijan	EU	Low	1	0	3		5.9	0.021
Belarus	EU	Middle	0	0	4	0	16.2	0.040
Belgium	EU	High	1	1	4	0		
Bolivia	S.A.	Low	0	0	4	0	54.7	0.216
Brazil	SA	Middle	1	1	4	0	33.6	0.147
Bulgaria	EU	Middle	0	0	4	1	29.3	0.077
Canada	N.A.	High	1	1	4	1	16.4	0.190
Chile	S.A.	Middle	0	0	4	1	90.5	0.173
China	AS	Middle	0	0	5		117.8	0.056
Colombia	S.A.	Middle	0	0	3	1	75.9	0.120
Costa Rica	N.A.	Middle	0	0	4	1	23.6	0.036
Croatia	EU	Middle	0	0	3	1	15.6	0.037
Cyprus	EU	High	1	0	3	0	1.6	0.016
Czech Republic	EU	High	0	0	3	1		
Denmark	EU	High	0	0	3	1	105.2	0.077
El Salvador	N.A.	Middle		0	3	1	48.3	0.033
Estonia	EU	Middle	0	0	3	1	11.1	0.052
Finland	EU	High	0	0	3	1	12.6	0.107
France	EU	High	0	0	4	1	5.0	0.015
Georgia	EU	Low	0	0	4	0	8.6	0.031
Germany	EU	High	1	1	4	1	12.8	0.020
Greece	EU	High	0	0	4.5	1	20.4	0.042
Honduras	N.A.	Middle		0	3	1	43.3	0.071
Hungary	EU	Middle	0	0	3	1	6.3	0.020
Iceland	EU	High	0	0	2	1	3.8	0.136
India	AS	Low	1	1	5		4.4	0.014
Indonesia	AS	Low	0	0	5	0	427.4	0.230
Iran	AS	Middle	0	0	4		59.2	0.071
Ireland	EU	High	0	0	3	1	36.5	0.094
Israel	AS	High	0	0	3	1	26.7	0.034
Italy	EU	High	1	0	4	1	21.4	0.023
Jordan	AS	Middle	0	0	3		97.5	0.109
Kazakhstan	AS	Middle	0	0	4	0	17.9	0.123
Latvia	EU	Middle	0	0	3	1	8.3	0.041
Lithuania	EU	Middle	0	0	3	1	56.9	0.124
Luxembourg	EU	High	1	0	3	0	3.9	0.018
Macedonia	EU	Middle	0	0			23.9	0.065
Malaysia	AS	Middle	1	1	3	0	178.1	0.180
Malta	EU	High	0	0	3	1	5.9	0.008
Mexico	N.A.	Middle	1	1	3	1	42.3	0.107
Moldova	EU	Low	0	0	3		10.8	0.026
Mongolia	AS	Low	0	0			3.8	0.105
Morocco	AF	Middle	0	0	3	1	38.6	0.064
Netherlands	EU	High	0	0	3	0	71.7	0.036
New Zeal	OC	High	0	0	3	1	91.9	0.206
Norway	EU	High	0	0	3	1	20.5	0.101
Paraguay	S.A.	Middle	0	0	3	1	47.6	0.153
Peru	S.A.	Middle	0	0	4	1	40.0	0.094

Poland	EU	Middle	0	0	3	1	41.7	0.040
Portugal	EU	High	0	0	4	1	6.9	0.017
Romania	EU	Middle	0	0	3	1	13.5	0.032
Russia	AS	Middle	1	1	4	1	11.8	0.100
Serbia	EU	Middle					90.2	0.089
Slovakia	EU	Middle	0	0	4	1	3.7	0.015
Slovenia	EU	Middle	0	0	2	1	9.5	0.037
South Africa	AF	Middle	1	0	3	1	337.4	0.250
Spain	EU	High	1	1	4	1	10.6	0.030
Sweden	EU	High	0	0	3	1	58.2	0.144
Switzerland	EU	High	1	1	3	1	2.7	0.015
Tajikistan	AS	Low	0	0	4		6.2	0.025
Thailand	AS	Middle	0	0	5	1	15.8	0.030
Ukraine	EU	Middle		0	4	1	11.7	0.027
United Kingdom	EU	High	0	0	4	1	382.0	0.086
United States	N.A.	High	1	1	4	1	6.8	0.040

3. Poverty, Income Distribution and Fiscal Decentralization

The Human Development Report (2005) provides a summary of the significant variations in income based poverty between developed and developing countries and the trend of growing inequality in some of the largest countries in the world. Efforts to tackle poverty have often focused on sustained economic development, government expenditure on social programs and primary public services and the importance of good governance. In this empirical research I contribute to this area of study by investigating whether fiscal decentralization has an impact on poverty and income distribution.

The aim of this empirical research is to identify whether fiscal decentralization is associated with poverty and income distribution, and if so, whether fiscal decentralization helps to reduce poverty and income inequality, or fiscal decentralization instead hinders efforts by the national government to reduce poverty. Using a selection of low, middle and high income countries, 57 in all, over a period of 20 years between 1990 and 2009, I carry out this empirical investigation. I provide results for the general effects of tax, expenditure decentralization and fiscal autonomy on measures of poverty and income inequality. I also investigate whether fiscal decentralization has different impacts on poverty and income inequality when local executives are elected by and accountable to local citizens. I contrast the effects of fiscal decentralization between federal and unitary governments and I examine whether the size of local jurisdictions have a bearing on the relationship between fiscal decentralization and poverty and income distribution. Finally, I examine whether fiscal decentralization has different effects during periods of higher economic growth, when total government expenditure is higher, and when the quality of government is better.

My final results provide evidence that fiscal decentralization is associated with poverty and income distribution. However, the nature of that association is sensitive to a number of conditions. My main findings are:

i) Fiscal decentralization can help to reduce income inequality in high income countries and lead to higher levels of absolute poverty in low and middle income countries.

ii) Decentralization observes different effects depending on the size of the local jurisdiction. Often, decentralization increases inequality and absolute poverty when the size of the local jurisdiction is larger.

iii) Fiscal decentralization can also help to reduce poverty when total government expenditure is lower and quality of government is lower.

This chapter is organised into seven sections. In section 3.1 I discuss the relevant literature and establish links between income distribution, poverty and fiscal decentralization. In section 3.2 I outline the data used in this empirical research, and include explanations for why I have chosen certain indicators for absolute poverty, income distribution and fiscal decentralization. In section 3.3 I provide an overview of the data used in this research, including descriptive statistics and correlations. In section 3.4 I explain the different econometric methods used to produce credible estimates of the key relationships and the various problems encountered in this empirical research. In section 3.5 I provide estimates for the relationship between fiscal decentralization and income distribution and poverty, and include additional estimations based on various interactions between the share of government activity, autonomous expenditure share and the other aspects of fiscal decentralization. In section 3.6 I provide further interactions between decentralization and economic growth, total government spending and quality of government overall. I end this chapter with my conclusions and closing remarks, in section 3.7.

3.1. Related Literature

In this literature review I identify the different ways that fiscal decentralization may be associated with poverty and income distribution. I use some of the key arguments in the decentralization literature to explain how fiscal decentralization may enhance local economic development and reduce poverty through local growth; how fiscal decentralization could improve the outcomes of government spending on the poorest; and how fiscal decentralization may improve the quality of government, reduce corruption and ensure that governments tackle the issue of poverty. I also provide counter arguments for each of these points. I consider how fiscal decentralization may lead to inter-regional inequality in spending; how different regions of the country may grow at faster rates if local governments are responsible for raising own revenues; and how fiscal decentralization could have a negative impact on the central government's aims of reducing poverty and redistributing income at the national level.

The literature review is broken down for each of the different areas (economic growth, government spending and quality of government). The final section of my literature review considers mitigating factors on the relationship between fiscal decentralization and income distribution and poverty.

3.1.1. Economic Growth, Poverty and Fiscal Decentralization

Efforts to tackle poverty have often focused on the importance of sustained economic development; increasing opportunities for long-term employment and a secure income for the poorest. Dollar and Kraay (2002) explains that policies associated with economic development, such as liberal economic policies, open markets and trade, help to create jobs and provide long term incomes for the poorest. The empirical evidence supports this theory, as poverty often falls during periods of economic growth (Ravallion and Guarev, 2002; Besley and Burgess, 2003; Ravallion and Chen, 2007). Similarly, the absence of sustained economic development in some of the poorest countries is a cause of persistent poverty (Collier, 2008).

Though there is a consensus in the literature that economic growth is good for the poor, recent empirical research has investigated the heterogeneity of the growth-poverty

relationship (Loayza and Raddatz, 2010). In this research, I consider how the degree of fiscal decentralization may explain variations in the effects of growth on poverty.

Fiscal decentralization could improve the outcomes of growth for the poorest by shifting the focus from national economic development to local economic development. Innocents (2011) argues that local governments with responsibility to raise revenue and allocate expenditure will invest in local infrastructure; local productivity and boost the local economy. The decentralization of revenue and expenditure functions to local governments would also lead to fiscal competition, where local governments reduce taxes on capital and increase spending on infrastructure in order to attract capital and wealth to the local area (Hoyt, 1991; Keen and Marchand, 1997).

On the other hand, fiscal decentralization may harm efforts to reduce poverty and inequality through national growth. Some areas of the country may observe faster rates of growth than others. For example, regions with higher levels of human capital and better infrastructure may observe a productivity advantage (Cai and Treisman, 2005). Consequently, more capital will be invested in the area, and over time inter-regional inequalities will grow. We may also observe inter-regional inequalities through unequal tax capacities where some regions observe a higher tax intake and are able to invest more in infrastructure and boost local growth.

Essentially, poverty may fall faster in some areas of the country than others (Prud'homme, 1995). This presents a new problem of inter-regional inequality in growth and poverty. Whilst local economic development can help alleviate poverty and inequality at the local level, it is the central government that will need to address national inequality (Elbers et al., 2007). Boadway and Shah (2009) also support the need for a strong central government to harmonize efforts to reduce poverty between regions. This can be achieved by equalising expenditure between regional and local governments through transfers and block grants. Ultimately the central government will be required to harmonise regional efforts to tackle local poverty. Too much decentralization will weaken the central government and increase likelihood of inter-regional inequalities arising through tax and expenditure competition.

The empirical evidence, though limited, appears to support both points of view. Pappa (2005) provides empirical evidence that in the US, spending at the state level is more productive, increasing employment opportunities and wages more than equal spending by the federal government. Thießon (2003) also identifies a positive relationship between productivity and fiscal decentralization. However, Thießon (2003)

identifies a non-linear relationship between decentralization and productivity. Specifically, the relationship is hump-shaped, where too little or too much decentralization can have a negative effect on productivity.

Most of the empirical evidence in the decentralization literature focuses on the relationship between fiscal decentralization and national growth. The empirical evidence in this area is inconclusive. Davoodi and Zou (1998) provide evidence that fiscal decentralization is negatively associated with economic growth in less developed countries and Akai and Sakata (2002) observe a positive relationship between decentralization and growth in the USA. However, Thornton (2007) uses new data on subnational government autonomy[21] and finds no significant relationship between decentralization and growth. Gemmell et al. (2013) compare the effects of revenue and expenditure decentralization on economic growth. They find that expenditure decentralization is associated with lower economic growth, but in contrast, revenue decentralization is associated with higher growth.

Overall, the empirical evidence does not provide a clear picture on the relationship between fiscal decentralization and growth, at the local or national level. Even if fiscal decentralization is associated with higher growth at the national level, this is not evidence that fiscal decentralization improves the outcomes of growth for the poorest. For example, if fiscal decentralization enhances growth only in the wealthier areas of the country, then income inequality could rise and poverty may remain unchanged. It is essential that poorer areas grow as well (see Ravallion and Chen, 2007).

3.1.2. Tax, Expenditure and Poverty

Economic growth alone may not be sufficient to reduce absolute poverty and inequality. When the benefits of growth do not accrue to the poorest (Boadway and Shah, 2009) then the government can tackle poverty and inequality directly through taxation and expenditure. They can do this through progressive taxation and through spending on poverty alleviation programs; employment programs and social services.

Gupta et al. (2002), reflects on the importance of a progressive tax system in addressing inequality. Progressive taxation ensures that governments can raise sufficient

[21] Thornton uses decentralization on subnational government autonomy (i.e. whether subnational government sets tax rate and tax base of tax revenue) from the OECD Fiscal Decentralization Database

revenue without taxing the poorest, and use that revenue for expenditure on services vital for the poor (education, healthcare, social services). On the expenditure side, Fan et al. (2000) distinguish between the direct and indirect effects of government spending on the poorest. Governments can address poverty directly by providing employment opportunities for the poorest or by boosting incomes through cash transfers (Boadway and Shah, 2009). However, allocating expenditure to infrastructure, research and development and education are more effective in reducing poverty (Fan et al., 2000).

The empirical evidence suggests that increasing government expenditure can reduce poverty by increasing employment opportunities and boosting real wages. Pappa (2005) and Owyang and Zubairy (2013) provide empirical evidence of a positive association between government spending and employment and real wages, in the public and private sector. However, Ravallion and Chen (2007) argue that increasing government spending may not be the most effective way for governments to reduce poverty. Instead, governments should try to cut taxes that hurt the poor. Ravallion and Chen provide empirical evidence that tax cuts, specifically in agriculture, helped reduce poverty in rural areas in China. The cuts in taxes are more effective in reducing poverty than equivalent increases in government spending.

3.1.2.1. Tax and Expenditure Decentralization and Poverty

Supporters argue that decentralized spending can improve the allocation of public expenditure and thereby reduce the cost incurred by citizens for the set of public policies (Oates, 1972). This includes the provision of essential public goods, public services and programs aimed at alleviating poverty. Tanzi (1996) explains that local governments are more informed of the local needs and preferences and are better placed to address them through local public expenditure. Elbers et al. (2007) addresses this point specifically, where local governments in regions with higher levels of poverty are able to focus on helping the local poor through the provision of services and employment programs than may otherwise be provided by a distant central government. Fiscal decentralization could also empower the poorest citizens to move to a local area where the set of public policies best meet their demands (Tiebout, 1956). However, the poorest citizens may be the least mobile, due to the costs associated with moving from one jurisdiction to the other. Nevertheless, as tax and spending functions are devolved to the

smallest government units (i.e. the local governments), the poorest households will be more able to move to a particular area (jurisdiction) that provides essential public goods and services that will help them to climb out of poverty.

Fiscal decentralization could help address some of the administrative issues associated with direct spending on the poorest. Boadway and Shah (2009) argue that spending on the poorest doesn't always reach the intended targets. Should targets fail to receive aid, and those who are not targets consume some of the goods and services provided for the poorest, then ultimately this will harm efforts by government to reduce poverty. In less developed countries where resources are scarce, expenditure will need to be allocated strictly based on who is most in need of aid (Elbers et al., 2007; Coady and Morley, 2003). The inefficient allocation of already scarce resources will hurt the poorest more, particularly in less developed countries where the incidence of absolute poverty is higher.

A consequence of a more efficient allocation of public expenditure may be that taxes will fall, as the cost of providing public goods and services tends toward the minimum point through decentralized expenditures (Oates, 1972 and Tiebout, 1956). Fiscal decentralization may also constrain the rent-maximising central government (Brennan and Buchanan, 1980), which would reduce taxes for citizens and in turn remove barriers to prosperity (Ravallion and Chen, 2007).

Opponents of fiscal decentralization often consider the problems of redistribution at the subnational government level (Oates, 1972) and inter-regional inequalities arising from unequal endowments (i.e. infrastructure, human capital) between regions (Boadway and Shah, 2009). Such problems arise where local government face incentives to reduce taxes on the wealthiest citizens (Prud'homme, 1995) and divert expenditures from welfare spending to productivity enhancing expenditures, i.e. infrastructure (Keen and Marchand, 1997).

First, expenditure decentralization may lead to a different composition of public expenditures that is harmful for the poorest. Local governments may seek to attract capital investment in their local area by spending on productivity enhancing goods and services: infrastructure and airports, for example (Keen and Marchand, 1997). As a consequence, less resources will be allocated to social services and on redistribution.

Second, tax decentralization may lead to a race to the bottom in taxes on capital, again with a motivation to attract capital to the region. As Hoyt (1991) demonstrates, in a decentralized setting, the competition for capital between local governments will lead

to sub-optimal taxation of capital, and consequently a sub-optimal provision of public goods and services (Hoyt, 1991). Though both tax and spending competition could improve economic development (Chu and Yang, 2012), if the poorest citizens are not receiving the benefits of growth, then governments will still need to provide essential public services and redistribute wealth. Prud'homme (1995) also argues that tax on wealthier citizens will fall because those citizens can move more freely, away from regions with higher taxes on wealth, and to other regions with lower taxes. If there is asymmetric mobility, local governments will resort to taxing the less mobile, and reduce taxes on those who are more mobile (Boadway and Shah 2009; Treisman, 2007). Oates (1972) points out that if decentralization does reduce inequality, it will only do so within the local area by separating the population according to wealth.

Third, fiscal decentralization may lead to inter-regional inequalities, in growth, in local government tax and spending capacity, and in poverty. Cai and Treisman (2005) explain that the return to capital may be different between regions, due to the current infrastructure, human capital, natural resources, location (i.e. landlocked), and therefore those regions observe a competitive advantage. All other things equal (capital tax rate, infrastructure spending), better endowed regions will observe greater capital investments, higher growth, and higher tax revenues and spending. Boadway and Shah (2009) explain that in the event of inter-regional inequality, the central government will be required to harmonise tax and spending between regions, through transfers. However, another problem may develop through fiscal decentralization that would weaken the central government's capacity to tackle inter-regional inequality.

Fiscal decentralization could limit the tax resources accruing to the central government, thereby reducing the central government's capacity to reduce inter-regional inequalities. Vertical tax competition, where subnational government and central government compete to tax the same subject, could reduce the taxes set by the central government (Keen and Kotsogiannis, 2004; Treisman, 2007) reduce the capacity of central government to tackle poverty and inequality between regions. This argument is also true for differences in taxation and spending between regions. In areas where there is a higher concentration of poverty, local governments may be unable to raise sufficient tax revenues to tackle absolute poverty. Central governments can equalize efforts to reduce poverty through expenditure by providing additional resources to poorer areas through intergovernmental transfers (Boadway and Shah, 2009). Salmon (1987) and Tanzi (1996) argue that the central government will be required to provide grants to

poorer regions in order to reduce the inter-regional inequality between wealthy and less well-off regions

There is only limited research on the effects of decentralization on tax and spending, specifically the relationship between decentralization and government size. Oates (1985) concludes that decentralization does not reduce the size of government (measured by tax revenue) for a selection of low, middle and high income countries. Ehdaie (1994) however observes a negative relationship between decentralization and government size, whilst Jin and Zou (2002) observe that the relationship is positive for the decentralization of expenditure, but negative for the decentralization of revenue.

Overall it is unclear whether fiscal decentralization will improve the outcomes of government spending on the poorest, or instead lead to lower taxes on capital and lower spending on welfare. In practice, different types of decentralization may produce different outcomes. Expenditure decentralization could boost efficiency and effectiveness of government spending overall, where local governments are best placed to address local needs. However, revenue decentralization and local government autonomy could lead to fiscal competition between local governments and hinder efforts by the central government to tackle poverty and inequality nationally.

3.1.3. Governance and Poverty

Finally, the quality of government will also determine the ability of governments to address poverty through taxation and spending. Collier (2008) argues that the prevalence of corruption is strongly associated with persistent poverty in some of the poorest countries. Poor governance is associated with the misuse of funds, specifically funds intended for the poorest (Collier, 2008). The negative consequence of poor governance will be greater in less developed countries, where absolute poverty is higher and fiscal capacity is more limited (Rodden and Rose-Ackerman, 1997).

There are a few reasons why corruption has a greater negative effect on the poorest. First, corruption can limit revenues and increase the cost of government. Gupta et al. (2002) argue that corruption threatens the "progressivity of tax systems" (pp. 25) and increases the operating costs of government. Consequently, corruption will further limit the resources available for tackling poverty and for increasing the provision of vital public services. Second, weaker governments are less accountable to the electorate,

particularly the poorest, and corrupt governments spend less on the poorest (Rose-Ackerman, 1999). Third, corruption may change the composition of spending, specifically from education, healthcare and social services, to military and technology programs (see Mauro, 1998).

Mauro (1998) and Gupta et al. (2002) provide some evidence of a link between corruption and increased poverty and income inequality. Mauro (1998) examines the effects of corruption on the composition of government spending, and conclude that higher levels of corruption result in less spending on social programs, intended for the poorest. Gupta et al. (2002) examine the direct link between corruption and income based poverty and inequality. They provide robust evidence of an association between higher levels of corruption and higher levels of absolute poverty and income inequality. Their empirical research covers a selection of low, middle and high income countries, and covers a period of 18 years, between 1970 and 1987.

3.1.3.1. Governance, Poverty and Fiscal Decentralization

The decentralization literature offers conflicting views on how fiscal decentralization may affect the quality of government.

On the one hand, fiscal decentralization can empower citizens to hold local governments to account (Salmon, 1987). First, local elections mean that local government decision making is driven by local welfare. As Seabright (1996) demonstrates, in order for local governments to be elected they must improve the welfare of local citizens through a set of local policies. This is in contrast to a central government that needs to satisfy only a sufficient number of localities, but not all of them. Second, local citizens can contrast the performance of their home government with governments of neighbouring jurisdictions. As Besley and Case (1995) explain, yardstick competition provides disincentives for rent-seeking governments, which will be found out should they seek to over-charge local citizens for public goods and services. As a consequence of local elections and yardstick competition, local governments must cut waste, inefficiency and corruption in order to be re-elected. Finally, Fan et al. (2009) explain that if fiscal decentralization helps to reduce waste and inefficiency, by any means, then politicians will face greater risks from rent-seeking, as citizens will be better able to distinguish between inefficient government and corrupt government.

However, Prud'homme (1995) and Tanzi (1996) argue that decentralization provides greater incentives for corruption at the local government level. Tanzi explains that corruption is stimulated by the proximity of government to elite groups. Therefore, by bringing governments closer to those affected by government policy, there is a greater risk of elite capture – local politicians responding to the demands of local elites (Prud'homme, 1995). The design of decentralization policy could also increase corruption. If responsibilities are not clearly assigned to governments, or are shared, then local citizens may be unable to discipline governments effectively (Fukasaku and de Mello, 1999). Local government accountability depends on whether local governments are in fact directly elected, or instead, appointed centrally. Tanzi (1996) argues that the nature of the relationship between decentralization and governance depends on the incentives for local government executives. If the local government and executives are democratically elected, then they will be more responsive to the local citizens. However, if the central government appoints local government executives, then the incentive to provide for local citizens would not exist.

Empirical studies in this area have often supported the view that decentralization is improves the quality of government; however, the results are sensitive to the choice of indicator for fiscal decentralization and the selection of control variables. Fisman and Gatti (2002) observe a positive relationship between expenditure decentralization and the quality of government in a cross-country analysis. Enikolopov and Zhuravskaya (2007) show that fiscal decentralization can improve the quality of government, however this relationship is conditional on the existence of strong national parties. Treisman (2000) argues that the nature of the relationship between decentralization and governance is sensitive to the type of decentralization. Altunbas and Thornton (2011) find that fiscal decentralization helps reduce corruption, but this relationship is mitigated when including information on vertical administration and local government autonomy.

3.1.4. Summary of Related Literature

Overall, the literature provides contrasting views on the relationship between fiscal decentralization and poverty. On the one hand, decentralization can help improve efficiency of public spending (Oates, 1972), help reduce tax rates (Brennan and Buchanan, 1980) and ensure that local governments are directly accountable to local

citizens (Seabright, 1996). On the other hand, fiscal decentralization may lead to competition between local governments through tax (Hoyt, 1991) and spending (Keen and Marchand, 1997), and consequently reduce spending on social services and redistribution. Fiscal decentralization may also lead to inter-regional inequality in growth, taxation and spending (Cai and Treisman, 2005).

However, there may be certain aspects of decentralization that are good for the poor, and other aspects that could be quite harmful. In my empirical research I consider aspects of decentralization that are relevant to the arguments above. For example, electoral decentralization is essential for local government accountability. On the other hand, appointment of local government executives can ensure that local governments deliver according to central government suggestion. Another potentially important factor is the degree of mobility of citizens. The size of local governments may have a bearing on the relationship between fiscal decentralization and poverty. As the size of the local jurisdictions falls, citizens become more mobile and have a greater range of local jurisdictions that they can move to. Therefore, the average size of the local jurisdiction is inversely related to Tiebout (1956) and Hoyt's (1991) arguments on fiscal competition. Federal governments may exhibit different effects to Unitary governments. One reason may be that Federal governments are typically more devolved (Altunbas and Thornton, 2011), and the benefits of greater decentralization may depend on the degree of decentralization at the time (Thießon, 2003). Federal governments are also likely to observe greater subnational government decision making in other areas (i.e. the construction of poverty alleviation programs). The merits of fiscal decentralization may also depend on other mitigating factors.

The relationship between fiscal decentralization and poverty may be sensitive to how economically developed a country is. There are a number of reasons why fiscal decentralization may perform differently in low income countries than in high income countries. Boadway and Shah (2009) argue that the incidence of poverty is greater in less developed countries where tax resources are more limited. Rodden and Rose-Ackerman (1997) suggest that for decentralization to prosper there needs to be sufficient tax resources to distribute between the different tiers of government. Similarly, Boadway and Shah (2009) explain that the definition of 'resources' is not limited to tax and spending, but also personnel. For decentralized government to prosper there needs to be skilled managers at every tier of government. The absence of a large pool of skilled managers may strengthen the case for centralized administration. On the other hand,

decentralization may improve democracy and the quality of government in less developed countries, and therefore have a greater positive effect on the poor relative to more economically developed countries. In this empirical research I class countries into two income groups: i) high income countries, ii) low and middle income countries, and provide further estimations on the effects of fiscal decentralization according to these samples.

Finally, fiscal decentralization may perform differently during periods of stronger growth, higher levels of government expenditure and better quality government. For example, Loayza and Raddatz (2010) provide evidence that the degree to which economic growth reduces poverty depends on the strength of growth. The final aim of my research is to see whether fiscal decentralization has a stronger effect on poverty and income distribution under certain conditions, or whether fiscal decentralization mitigates against the negative or positive direct effects of the control variables for growth, spending and governance.

3.2. Data Definitions

In this section I outline the data that I will use in this empirical research. I explain the choice of data that I will use to represent the poverty, income distribution and fiscal decentralization, and include references to previous work that is comparable to this study. I also provide a list of control variables to represent the other determinants of poverty.

3.2.1. Poverty and Income Distribution Indicators

I use two variables to examine changes in poverty and income distribution. The first variable captures changes in absolute poverty – the percentage of the population earning below $1.25 a day (World Bank). The headcount measure is often used to capture changes in absolute poverty (see Beck et al., 2007); however, I opt for a slightly higher threshold of $1.25[22]. Data for absolute poverty is available for low and middle income countries. The second variable captures changes in income distribution – the Gini coefficient. The Gini coefficient provides a numerical value for the difference between equal distribution of income across the entire population and the Lorenz curve. The Gini

[22] Ravallion et al. (2008) advocate a $1.25/day threshold for absolute poverty.

coefficient ranges between 0 (perfect equality) and 1 (perfect inequality). An increase in the Gini coefficient reflects an increase in income inequality. The Gini coefficient is often used in empirical research on income distribution (see Dollar and Kraay, 2002; Beck et al., 2007; Ravallion and Chen, 2007). My Gini coefficient data is comprised of three sources: World Bank, OECD and unu-Wider, and covers low, middle and high income countries. The definition of the Gini coefficient is consistent between the three sources and there is little overlap between the individual datasets[23]. By combining them I have increased the scope of the research substantially.

The final panel dataset covers 57 countries over a period of 20 years, between 1990 and 2009. The dataset is unbalanced and the data available for each country is often less than the maximum 20 observations between 1990 and 2009. Gini coefficient is available for low, middle and high income countries[24], with 592 observations in total[25]. The poverty data is available for low and middle income countries only. All poverty and income distribution data is transformed to their logarithms. The logarithm of the data means I can examine changes in the dependent variables, particularly where observations are close to 0 (i.e. the levels of absolute poverty).

For examining cross-sectional variations in the indicators I convert the panel data into averages for the time period. Due to gaps in the panel data, the length of time that a single observation represents is often less than the maximum 20 years. The average length of time between first and last observations for each of the countries is 11 years. Gini coefficient data is available for all 57 countries and absolute poverty data is available for 28 low and middle income countries.

3.2.2. Decentralization Indicators

To capture the different aspects of decentralization I use a wide range of indicators. I capture the share of government activity, SCG Revenue and SCG Expenditure. I capture

[23] When data is available (for a given year, given country) in more than one source, there Gini coefficient is not identical. This could mean that data was taken at a different time of the year between the two sources, or that there is measurement error. The fact that the data is not identical between the two sources is a cause for concern, even if the difference is relatively small. Therefore, in such instances where there is overlapping data between the sources, I have chosen only one source, covering the longest period of time.
[24] Income classification is based on World Bank definition: available here http://data.worldbank.org/about/country-classifications. Some countries change income groups during the time period. The classification in this table is based on an average across the time period
[25] 592 observations for 57 countries is roughly 10.4 observations per country.

subnational government autonomy using SCG Autonomous Expenditure. Alongside these indicators I capture other aspects of decentralization with a wide range of qualitative indicators from Treisman (2008) and Ivanyna and Shah (2014). These indicators are: local government area size (Ivanyna and Shah), federal constitution and electoral decentralization (Treisman, 2008). I omit an additional interaction between the panel decentralization indicators and legislative decentralization, though I did initially estimate this relationship. The main reason for omitted this interaction is due to similar results between legislative decentralization and federal constitution in their interactions with the tax and spending indicators. Though some unitary countries observed legislative decentralization, for example, the results themselves were similar in magnitude, and the sign of the coefficients were the same.

The decentralization dataset for this chapter covers 57 countries over the 20-year period. SCG Revenue data covers all 57 countries, with 592 observations. There are only a few gaps in the SCG Expenditure data (587 observations). Finally, SCG Autonomous Expenditure covers 55 countries, but contains more gaps, with 447 observations. Data is complete for local government size, and of the 57 countries covered in this research, 45 of them observe electoral decentralization, whilst 12 observe appointments by central government. 13 have a federal constitution, whilst 40 do not (data is missing for four countries).

3.2.3. Control Variables

I also include a selection of control variables to represent other determinants of poverty and income distribution. I include four controls for economic indicators based on a similar piece of research (see Beck et al., 2007). I control for income level (logarithm of real GDP per capita), economic growth (annual growth of GDP per capita in nominal terms), inflation (consumer price index) and foreign trade (logarithm of total trade as a share of GDP). I also include controls for government spending, the quality of government and short selection of indicators for public services. My additional controls include government expenditure (logarithm of general government consumption expenditure, in current US dollars), governance (Corruption Perception Index)[26], primary

[26] The corruption perception index ranges between 0 (high perceived corruption) to 10 (low perceived corruption). Therefore, a higher value indicates better quality of government/better governance. Gupta et

enrolment (the logarithm of primary school enrolment), immunization (the logarithm of immunization) and sanitation (the logarithm of access to improved sanitation facilities). All of the data is available in the World Bank World Development Indicators dataset, with the exception of the Corruption Perception Index (Transparency International).

I list each of the control variables above in table 7. I include an expectation of the coefficient sign, i.e. the expected association between the control variable and poverty/income inequality.

The final dataset covers a maximum of 57[27] low, middle and high income countries, over a period of 20 years, from 1990 to 2009. The panel dataset is unbalanced: there are gaps in the absolute poverty data, and for some of the control variables. However, I have ensured that data is complete for the Gini coefficient and SCG Revenue Decentralization.

al., (2002) included this data in their empirical research on corruption and poverty. Treisman (2002) also used the same corruption perception index in his research on decentralization and governance.

[27] For a full list of countries featured in Chapter 3, see Appendix B

Table 7: List of Control Variables

Determinant of Poverty	Expected Coefficient Sign (to poverty)
Income *(logarithm of real GDP per capita)*	Negative
Economic Growth *(annual growth in nominal GDP per capita)*	Negative
Inflation *(consumer price index)*	Positive[28]
Trade *(logarithm of total trade as a share of GDP)*	Unknown[29]
Government Expenditure *(logarithm of general government consumption expenditure, in US $)*	Negative
Governance *(corruption perception index)*	Negative
Healthcare *(logarithm of immunization coverage)*	Negative
Education *(logarithm of primary school enrolment)*	Negative
Infrastructure *(logarithm of improved sanitation facilities)*	Negative

[28] Most of the literature considers the negative consequences of high inflation on the poor, where a large increase in prices affects the poorest more (see Cudjoe et al., 2010; Alem and Sodermon, 2012; Fujii, 2013)
[29] Liberalization seen as positive for the poor (Donaldson, 2008) and trade associated with job creation (Bene et al., 2010). However, in practice trade and liberalization has had mixed effects (see O'Rourke, 2000; Clemens and Williamson, 2001)

3.3. Descriptive Statistics and Correlations

In this section I provide a description of the data used in this research. I provide descriptive statistics for the cross-sectional dataset, including the average levels of the poverty and income distribution indicators between 1990 and 2009 for this set of countries. I also include additional statistics for the growth of the dependent variables for the time period. These statistics can provide some evidence of the changes in the dependent variables between 1990 and 2009. All statistics are provided for the entire sample, and for each of three income groups (low, middle and high income). The last statistics I provide are the pairwise correlation coefficients for the panel dataset for all of the variables used in this research.

3.3.1. Descriptive Statistics

The descriptive statistics are for the cross-sectional dataset. The statistics reflect the average levels of all dependent and independent variables for the cross-sectional indicators (table 8). I also include statistics for the growth in the Gini coefficient and growth in poverty over the time period. I provide further statistics according to income group: low, middle and high income

3.3.1.1. Poverty and Income Distribution

In table 8, panel A, there is evidence of large variations in income distribution and absolute poverty. Across the sample of 57 countries, the deviation, minimum and maximum statistics demonstrate the range of observations in this dataset. More equal countries appear to be in the European continent, with the lowest degree of income inequality in Denmark (0.2273) and Finland (0.2346). At the opposite end of the spectrum, countries in South America exhibit larger degrees of income inequality: in Colombia (0.5783) and Bolivia (0.5618). Across all observations for the Gini coefficient there is a positive skew. Most countries exhibit lower than the mean level of income inequality, with a few countries exhibiting much higher degrees of income inequality.

In the sample of 28 low and middle countries, 5.8% of the population earn below $1.25 a day. There is a large variation within the dataset. The distribution of countries

is characterized by a sharp positive skew. Of the 28 countries, in 11 of them under 1% of the population earns below the poverty income threshold, and in 18 of them under 5%. However, there is only one statistical outlier – Tajikistan. In Tajikistan, 33% of the population earn below the $1.25 income threshold. Removing this outlier brings the mean absolute poverty down below 5% (4.79%).

In terms of the growth coefficients, there appears to be an increase in income inequality, but a decline in absolute poverty. The Gini coefficient has increased gradually over the time period. Across the 57 countries, there is an even distribution of positive and negative changes in income inequality. 28 of 57 countries observe a decline in inequality (a fall in the Gini coefficient).

The largest negative change is in Kazakhstan where over 8 years there has been a -4.34% annual change in the Gini coefficient. Croatia (-2.27% over 10 years) and Romania (-2.64% over 14 years) also observe large changes in income distribution. Those countries observing positive changes in income inequality are more clustered, near a 1% annual change in the Gini coefficient.

Absolute poverty has declined over the last 20 years in most of the low and middle income countries, with an overall decline across the sample. There has been sharp falls in absolute poverty in a few countries in the sample. Kazakhstan observes the largest decline in poverty – a staggering -60% annual change in headcount over 8 years. Argentina is at the opposite end of the scale, with an 18.7% increase in headcount (over 13 years).

Table 8: Descriptive Statistics (cross-sectional dataset)

Panel A: Poverty and Income Distribution

	Obs.	Mean	Std. Dev	Min	Max
Gini Coefficient	57	0.3524	0.0966	0.2273	0.5839
Absolute Poverty	28	5.8017	7.9249	0.0746	33.1267
Growth in Gini	57	0.0935	1.162701	-4.3447	2.9437
Growth in Poverty	26	-12.40	19.7795	-60.24	18.7446

Panel B: Decentralization

	Obs.	Mean	Std. Dev	Min	Max
SCG Revenue	57	24.53	13.03	1.52	59.7
SCG Expenditure	57	23.59	13.3	1.28	58.65
SCG Autonomous Expenditure	55	15.19	11.03	0.01	44.16
Local Government Size	57	75.23	71.59	7.92	394.16

Panel C: Selection of Covariates

	Obs.	Mean	Std. Dev	Min	Max
Real GDP/capita	56	22530	16101	1426	83565
Economic Growth	55	3.179	2.133	0.28	11.93
Inflation	55	11.25	24.92	0.8	129
Trade	57	0.8829	0.4295	0.24	2.793
Immunization Coverage	57	0.9226	0.0482	0.736	0.99
Primary Enrolment	45	0.9436	0.0429	0.821	0.998
Improved Sanitation	56	0.9088	0.1393	0.3709	0.100
Government Expenditure	57	8.451	22.925	0.016	160
Corruption Perception Index (CPI)	56	5.34	2.38	1.9	9.59

3.3.1.2. Decentralization and Controls

In panel B it is clear that tax and expenditure in most countries is heavily centralized. SCG Revenue and SCG Expenditure are very similar: in average, deviation and the ranking of countries within the sample is similar between both variables. Canada (59.7%) and Switzerland (51.0%) are the only two countries where sub-central government accounts for more than half of general government revenue. United States (49.7%) is not far behind. The least decentralized countries are Costa Rica, Armenia and Greece, all hovering around 5% revenue decentralization. Less than 20 per cent of the sample observes below 10% revenue decentralization.

When accounting for fiscal autonomy it is clear that SCG Revenue and SCG Expenditure overestimate the degree of fiscal decentralization. SCG Autonomous Expenditure is 15% for the entire sample. However, there are large variations in the data. Canada is the most decentralized (44.16%), yet this is large decline from the administrative decentralization data of close to 60%. For some countries fiscal decentralization is considerably lower than administrative decentralization: United Kingdom shows a decline from 23% administrative decentralization to 7% fiscal decentralization. In the Czech Republic sub-central governments account for over 21% of total government expenditure, but the degree of fiscal decentralization is less than 1%. This evidence appears to support the view that administrative decentralization data overestimates the degree of decentralization (Ebel and Yilmaz, 2002). Of the total number of countries included in the sample (55), 23 observe less than 10% of fiscal decentralization. Finally, there is a wide range of local government sizes (area). The largest LG size is Australia, 394 square kilometres, whilst the smallest tend to be European countries: France, Portugal and Germany all below the average level.

In panel C we see that on average there has been economic growth over the time period. Economic growth was positive between 1990 and 2009, across the entire sample the average growth per annum is 3.18%. None of the countries observed negative average growth over the time period. Also, the large deviations in the control variables illustrate that this dataset contains a wide variety of countries. Income per capita, government expenditure and the provision of healthcare, education and access to sanitation facilities all exhibit large variations in the cross-sectional dataset.

3.3.1.3. Income Groups Comparison

In table 9 there are noticeable differences in the control variables between income groups (low, middle and high income). The first differences are in the Gini coefficient (in levels and in growth). First, high income countries, particularly in Europe, have much lower levels of income inequality. In the low and middle income samples, the Gini coefficient is roughly the same, near a 0.40 coefficient. In high income countries the average is 10 points lower, near 0.30. Within the samples, high income countries are more clustered around the mean of the Gini coefficient for the sample, whilst low and middle income countries observe a wide range of observations.

Second, in low and high income countries income inequality has risen, but in middle income countries income inequality has fallen. Within the middle income group, there is a larger variation in the Gini coefficient. Again, higher income countries are more clustered, often observing increases in income inequality. Even with the exclusion of the outlier (Kazakhstan), middle income countries are more spread around the mean negative change in the Gini coefficient.

The third difference is in the fiscal decentralization indicators. High income countries observe higher degrees of decentralization for each of the indicators. This finding is consistent with previous analysis of fiscal decentralization between less and more economically developed counties (see Oates, 1972; Bahl, 1999; Davoodi and Zou, 1998). There is not much different in local government size between the income groups. The two countries with the largest local government size are high income countries (Australia and Canada), but the average of the income group samples are similar.

Fourth, there are large differences between groups for the selection of control variables. There is evidence that the poorest countries observe faster economic growth, though the sample is small. Middle income countries have also grown faster than higher income countries. High income countries are more clustered. Trade accounts for a higher proportion of GDP in lower and middle income countries. Inflation is highest in the middle income sample, and is steady in the high income sample. The provision of public services also varies between income groups. For example, access to improved sanitation facilities is 70.4% in low income countries, 86.7% in middle income countries, and almost 100% in high income countries. Government expenditure is lower and perceived corruption higher in low and middle income countries

Table 9: Descriptive Statistics, Income Group Comparison

Panel A: Low Income

	Obs.	Mean	Std. Dev	Min	Max
Gini Coefficient	5	0.3942	0.1005	0.3168	0.5618
Growth in Gini	5	0.7887	1.5698	-0.6772	2.9437
SCG Revenue	5	28.34	3.46	25.45	32.48
SCG Expenditure	5	26.58	6.30	22.09	36.05
SCG Autonomous Expenditure	5	19.88	3.02	16.21	23.29
Local Government Size	5	80.57	82.70	25.24	215.54
Real GDP/capita	5	3353.39	1192.46	1426.28	4343.19
Economic Growth	5	4.602	2.517	1.47	7.24
Inflation	5	8.338	3.727	3.44	12.29
Trade	5	0.9872	0.3472	0.549	1.3289
Immunization Coverage	5	0.8614	0.0841	0.736	0.9492
Primary Enrolment	4	0.9124	0.0465	0.8575	0.9692
Improved Sanitation	5	0.7044	0.2613	0.3709	0.9495
Government Expenditure	5	0.0638	0.0500	0.016	0.13
Corruption Perception Index (CPI)	4	2.4625	0.4034	1.9	2.76

Panel B: Middle Income

	Obs.	Mean	Std. Dev	Min	Max
Gini Coefficient	27	0.3963	0.1088	0.2414	0.5839
Growth in Gini	27	-0.0623	1.4521	-4.3447	2.6380
SCG Revenue	27	20.20	11.31	4.87	43.63
SCG Expenditure	27	18.09	10.96	3.48	40.51
SCG Autonomous Expenditure	25	13.18	9.46	2.64	33.87
Local Government Size	27	72.16	48.97	15.47	180.37
Real GDP/capita	26	11967.75	4820.87	4060.02	24186.3
Economic Growth	27	3.9133	2.4092	0.28	11.93
Inflation	25	20.42	35.03	3.63	129.1
Trade	27	0.8733	0.3434	0.24	1.7613
Immunization Coverage	27	0.9404	0.0284	0.873	0.99
Primary Enrolment	20	.09167	0.0389	0.821	0.9652
Improved Sanitation	27	0.8673	0.1156	0.6513	1.00
Government Expenditure	27	1.601	2.969	0.066	15
Corruption Perception Index (CPI)	27	3.781	1.180	2.32	7.07

Panel C: High Income

	Obs.	Mean	Std. Dev	Min	Max
Gini Coefficient	25	0.2966	0.0389	0.2273	0.3673
Growth in Gini	25	0.1571	0.5605	-0.9196	1.4085
SCG Revenue	25	28.44	14.67	1.52	59.70
SCG Expenditure	25	28.92	14.50	1.28	58.65
SCG Autonomous Expenditure	25	16.27	13.16	0.01	44.16
Local Government Size	25	77.47	90.55	7.92	394.16
Real GDP/capita	25	37836.98	11978.33	24718.8	83564.8
Economic Growth	23	2.009	0.7935	0.720	3.96
Inflation	25	2.670	1.380	0.800	7.26
Trade	25	0.8818	0.5384	0.2437	2.793
Immunization Coverage	25	0.9143	0.0472	0.805	0.9775
Primary Enrolment	21	0.9752	0.0181	0.9367	0.998
Improved Sanitation	24	0.9987	0.0038	0.9847	1.000
Government Expenditure	25	18.12	33.17	0.120	160
Corruption Perception Index (CPI)	25	7.535	1.617	4.44	9.59

3.3.2. Correlations

In table 10 I provide the pairwise correlation coefficients for the entire dataset. There are some interesting correlations to note. First, the Gini coefficient for all countries is correlated with all of the decentralization indicators. The negative correlation indicates that when fiscal decentralization is higher (for all indicators), income inequality is lower and income distribution more equal. The correlation coefficients are significant at the 1% level. Second, only SCG Expenditure is correlated with absolute poverty. The coefficient is negative, which indicates that at higher levels of decentralization, absolute poverty is lower.

Third, the correlations between the Gini coefficient and absolute poverty and the control variables present some interesting results. Income is negatively correlated with poverty (and also with income distribution), which is expected. However, at higher levels of growth the Gini coefficient is higher, indicating higher levels of income inequality. Trade is negatively correlated with income inequality and absolute poverty, which could indicate that openness to trade benefits the poorest. Better quality of government is correlated with lower inequality and poverty. Finally, the public service indicators are mostly negatively correlated with inequality and poverty, with the exception of primary enrolment. Primary enrolment is positively associated with absolute poverty.

The correlation coefficients are not evidence of causation, though they show which variables move with higher inequality and poverty, and which variables do not.

Table 10: Pairwise Correlation Coefficients (Decentralization and Poverty, Income Distribution, Panel Data)

	Distribut-ion	Poverty	SCG Revenue	SCG Expend.	SCG Aut. Exp.	Income	Growth	Inflation	Trade	Govern. Exp.	Corrupti-on	Immuniz-ation	Sanitation	Primary Enrolment
Distribution	1.000													
Poverty	0.7019***	1.000												
SCG Revenue	-0.1408***	-0.0485	1.000											
SCG Expenditure	-0.2247***	-0.1317*	0.9364***	1.000										
SCG Autonomous Expenditure	-0.1208**	-0.1004	0.8901***	0.8800***	1.000									
Income	-0.5185***	-0.7209***	0.2848***	0.3604***	0.1888***	1.000								
Growth	0.0847**	-0.0532	-0.1049**	-0.0780*	0.0066	-0.2191***	1.000							
Inflation	-0.0490	-0.0950	-0.0578	-0.0648	-0.0425	-0.1821***	-0.1429***	1.000						
Trade	-0.3131***	-0.2491***	-0.3836***	-0.2859***	-0.3259***	-0.0317	0.1470***	0.0244	1.000					
Government Expenditure	-0.2436***	-0.4616***	0.4672***	0.5066***	0.3289***	0.7451***	-0.2653***	-0.1630***	-0.4352***	1.000				
Corruption	-0.5107***	-0.2614***	0.3428***	0.4059***	0.2625***	0.8174***	-0.2108***	-0.2390***	0.0391	0.5406***	1.000			
Immunization	-0.1637***	-0.3615***	-0.0872**	-0.0656	-0.0061	0.0663	0.0188	0.0516	0.1931***	0.0125	-0.0698	1.000		
Sanitation	-0.5879***	-0.4572***	0.0999**	0.1799***	0.1277***	0.6023***	-0.0215	-0.0374	0.1589***	0.4215***	0.5414***	0.2930**	1.000	
Primary Enrolment	-0.1842***	0.1524*	0.2597***	0.3107***	0.1631***	0.5736***	-0.2103***	-0.1552***	-0.1438***	0.5396***	0.5448***	0.0206	0.3370***	1.000

Statistical significance of the pairwise correlation coefficients: 0.10 (*), 0.05 (**), 0.01 (***)

3.4. Methodology

In this section I outline the methods used to produce estimates of the relationship between poverty and income distribution, and fiscal decentralization. I outline the initial estimates of the relationship using a cross-sectional dataset, before discussing the potential endogeneity problems in the initial estimations. I consider the possibility that fiscal decentralization is endogenous (correlated with the error terms), which would bias the estimates of the true relationship between decentralization and poverty. To correct against this potential bias, I produce further estimates using a cross-sectional instrument variable model, and a panel model with random effects.

3.4.1. Cross-sectional Estimates

The first set of estimations I produce using ordinary least squares, for the cross-sectional dataset. In function 3.1 I examine the relationship between the average level of income distribution and poverty (P_i) and the average level of tax and spending decentralization and control variables over the time period[30]. The independent variables include the average level of each of the three decentralization indicators (D_i), and interactions between decentralization and LG area size, electoral decentralization and federal constitution ($D_i.INT_i$). Finally, I include the average level for each of the control variables (represented in vector of X_i).

$$P_i = \alpha + \beta_1 D_i + \beta_2 D_i.INT_i + \gamma X_i + \varepsilon_i \qquad 3.1$$

3.4.2. Endogeneity

One of the problems with estimating the true relationship between fiscal decentralization and various dependent variables, including poverty and income distribution in this research, is that fiscal decentralization could be endogenous in function 3.1. If this is the

[30]For most countries data is not available for every single year between 1990 and 2009. Data often covers a shorter time period, with an average of 10 years' data per country, across the entire dataset. Therefore, the cross-sectional observations do not necessarily cover the entire time period for each country.

case, then one of the Gauss Markov conditions would be invalidated, as the covariance between decentralization (D_i) and the residuals (ε_i) would not be equal to 0.

$$Cov(D_i, \varepsilon_i) \neq 0$$

The consequence of endogeneity is that the estimates of the relationship between decentralization and the dependent variables, β_1, would be biased and inconsistent. Essentially, the estimate of β_1 in the true model may be over/understated in the initial OLS estimates in 3.1. Consequently, this would invalidate tests of significance of the estimated parameter and the conclusions of this research.

There are several reasons decentralization could be endogenous in 3.1. First, the relationship between fiscal decentralization and poverty may work both ways. In the literature survey (section 3.1) I established how fiscal decentralization could impact on poverty and income distribution – forward causality. However, it is possible that the level of poverty and inequality could affect central government decision making, with respect to decentralization policy. Poverty, often seen as a bellwether of government performance, may lead to further centralization of powers (control) or devolution of blame.

Second, the absence of explanatory variables in function 3.1 will be contained within the residuals as the unexplained variation in the dependent variable. If fiscal decentralization is correlated with those omitted variables, this could bias the estimate of β_1, the relationship between decentralization and poverty.

To correct against the above problems of reverse causality and omitted variable bias, I produce further estimates using a cross-sectional instrument variable model, and a random effects panel estimator.

3.4.3. Cross-sectional Instrument Variable Estimates

One possible way to eliminate the problem of endogeneity in 3.1 is to instrument the endogenous variable, D_i. Essentially, instruments are used to capture the variation in the dependent variable, that is caused by variations in the endogenous variable. Hence the trust effect of decentralization, β_1, can be estimated using a two stage least squares model. To produce estimates for a cross-sectional IV model, I require valid instruments for

decentralization. Valid instruments must meet two conditions. The first condition is that instruments must be associated with the endogenous variable, in this case, decentralization 'D_i'. This is known as the first stage, where the instrument(s) are used to explain variations in the decentralization variable.

$$D_i = \alpha + \delta_1 Z_{1,i} + \delta_1 Z_{2,i} \ldots + \theta X_i + \varepsilon_i \qquad 3.2$$

The stronger the instrument(s), the more precise the instruments are in capturing variations in decentralization. Therefore, the first stage can be used to identify links between the instruments variables and the decentralization variable, through δ_1, δ_2 and so forth. Collective strength of the instrument variables can also be collective using an f-test. Essentially, the covariance between the instrument variable(s) and the endogenous variable, must be different from 0.

$$Instrument\ Strength: Cov(Z_i, D_i) \neq 0$$

However, there is a second condition that must also be met. That condition is known as the exclusion restriction, where the instrument variable(s) should affect the dependent variable only through their association with the endogenous variable. Hence, the instruments must be exogenous, uncorrelated with the error term, thereby eliminating the problem of endogeneity in the OLS estimations in 3.1:

$$Instrument\ Validity\ (Exogeneity): Cov(Z_i, \varepsilon_i) = 0$$

If the instrument variables affect the dependent variable, P_i, either directly or indirectly, through ε_i, then the problem of endogeneity will remain in the new estimates for the cross-sectional instrument variable model. Therefore, instruments must be strong (condition 1) and valid (condition 2)

Identifying good instruments presents a challenge. As this is the first empirical research into the effects of decentralization on poverty, no previous research could be used to identify potential instruments. Though other studies on the effects of decentralization on governance (Fisman and Gatti, 2002; Altunbas and Thornton, 2011); trust (de Mello, 2004 and Dincer, 2010), political ideology and various dependent

variables (Enikolopov and Zhurakskaya, 2007) have encountered problems of endogeneity, there is no certainty that their instruments will satisfy the two conditions for my research.

Instead, I use two instruments for decentralization that I expect to be exogenous, and associated with variations in decentralization. The first instrument I have chosen is ethnolinguistic fractionalisation. De Mello (2004) explains that "in ethnically diverse or polarized societies, fiscal decentralization has been an important measure to satisfy the minorities' demands for self-governance" (page 20). Furthermore, Oates (1972) and Tiebout (1956) explain the merits of decentralization with respect to heterogenous demands and communities. There is also empirical evidence that the degree of tax and spending decentralization depends on fractionalisation. Wallis and Oates (1988) and Panizza (1999) investigate the effects of a selection of variables on the degree of decentralization, in the US and across a broad selection of countries. One of those variables, fractionalisation, is found to be positively associated with fiscal decentralization.

Another reason why fractionalisation may be a suitable instrument for decentralization, is that it should explain variations in poverty and income distribution through variations in decentralization. De Mello (2004) explains how decentralization is used to cater to heterogenous demands, partly driven by ethnic diversity. Furthermore, any indirect link ethnic fractionalisation could share with poverty, for example, through liberal economic policy, will be captured by covariates already included in the model (i.e. trade openness).

In addition to ethnolinguistic fractionalisation, I include a second instrument which is expected to be strongly correlated with decentralization. Recently, new datasets from Treisman (2008) and Ivanyna and Shah (2014) contain various indicators of government decentralization that may be correlated with the tax and spending measures, D_i. I have opted for one of Ivanyna and Shah (2014) indicators for local democracy. The qualitative indicator for local democracy captures legislative provisions for local public approval and local democracy (such as local referenda on spending and taxing decisions at the local level). I include this instrument as I believe it meets the two conditions for valid instruments. First, countries that observe higher tax and spending decentralization, typically observe other forms of decentralization, such as local government accountability and legislative powers of subnational governments (Treisman, 2008; Ivanyna and Shah, 2014). Therefore, I expect a positive correlation to exist between further legislative

provisions for local government accountability and local democracy, and tax and spending decentralization. Second, local democracy is expected to affect income based poverty and distribution through tax and spending decentralization only. As local democracy is worth only what local governments are able to do with respect to local tax and expenditure decision making, local democracy should not affect poverty directly. Furthermore, indirect links between democracy (locally and nationally), would be captured in other covariates, for example, real income and government spending. As more developed countries may exhibit greater local democracy, as they do national democracy.

Therefore, the first stage estimations are outlined below in function 3.2:

$$D_i = \alpha + \delta_1 FRACT_i + \delta_2 DEM_i + \theta X_i + u_i \qquad 3.2$$

Function 3.2 outlines the first stage estimations. The instrument variables are ethnic fractionalisation ($FRACT_i$) and local democracy (DEM_i). The first stage regression also contains all the exogenous variables[31] in function 3.1. In the results sections in this chapter, sections 3.5 and 3.6, I provide the estimates for the first stage. I expect that local democracy will be positively associated with tax and spending decentralization (D_i), therefore $\delta_1 > 0$. Treisman (2008) and Ivanyna and Shah (2014) examine various aspects of decentralization and find that countries with higher levels of tax and spending decentralization, exhibit other forms of decentralization, including local democracy and local government accountability. I also expect that ethnic fractionalisation will be positively associated with the degree of fiscal decentralization, so that $\delta_2 > 0$, based on work by Wallis and Oates (1988) and Panizza (1998)

Along with the first stage estimates I provide the p-value for the f-test of collective significance of the instrument variables. If the null hypothesis is rejected, then this indicates collective statistical significance of the instrument variables. It is also important that the instrument variables are exogenous. In second stage estimations, I provide the J-

[31] I based my first stage estimations on the work of Altunbas and Thornton (2011). I instrument decentralization, D_i, but treat the interaction terms, $D_i.INT$ in 3.1 as exogenous. Therefore, they are contained within the vector of X_i in the first stage estimations in function 3.2. I performed additional IV estimations, where I instrument the interaction terms as well (two endogenous variables), and included additional instruments – interactions between the instruments in 3.2 and the interactions (LG size, federal constitution, electoral decentralization). The coefficient estimates were similar, though the standard errors were different and, consequently, changes in statistical significance.

Hansen statistic of instrument exogeneity. If the null hypothesis is not rejected in the J-Hansen statistic, then the instruments are valid (exogenous). Finally, I include the p-value for the Durbin-Wu-Hausman test as evidence that decentralization may, or may not be endogenous. If the null-hypothesis is rejected, then the cross-sectional IV estimation is the preferred estimator for examining links between decentralization and poverty, between countries.

3.4.4. Random Effects Panel Estimator

To counter the problem of omitted variable bias, I consider including fixed or random effects in a panel estimation. The preference would be to use random effects, for two reasons. One, to exploit cross-section variability in the decentralization panel dataset (see Kyriacou and Roca-Sagales, 2011). Two, the large number of countries and shorter time dimension. The consequence of using fixed effects for this dataset would be a loss of[32].

However, though the random effects estimator is preferred, it would not be suitable if decentralization is correlated with the unobserved country effects. If such a correlation exists, then the estimates in the random effects panel estimator would be inconsistent. One way to determine whether to use fixed effects or random effects is to use Hausman's test (1978). The test compares the estimations from the fixed effects and random effects estimator. If the null hypothesis is not rejected, then the random effects estimator is more efficient and is the preferred estimator. If the null hypothesis is rejected, then the random effects estimator is inconsistent – there is correlation between the explanatory variables and the country specific errors, and the fixed effects estimator is preferred.

After comparing the fixed effects and random effects estimator using the Hausman specification test, the results of that test support the use of the random effects panel estimator[33]. The estimation is outlined in function 3.3

$$P_{it} = \alpha + \beta_1 D_{it} + \beta_2 D_{it} . INT_i + + \gamma X_{it} + (v_i + \varepsilon_{it}) \qquad 3.3$$

[32] The dataset contains up to 57 countries. Using fixed effects would generate a further 56 explanatory variables in the form of intercept dummies for each country.
[33] The results of the Hausman test are not consistent across all tax and spending decentralization indicators. When comparing fixed effects and random effects estimations for SCG Revenue and SCG Expenditure, the null hypothesis is not rejected at the 10% level. Yet for SCG Autonomous Expenditure, the null hypothesis is rejected at the 1% level.

3.5. Main Results

In this section I present estimates of the relationship between fiscal decentralization and poverty and income distribution. I utilise the cross-sectional and panel dataset, and produce results using cross-sectional OLS estimations, cross-sectional IV estimations, and random effects panel estimations. The results are organised according to two dependent variables: i) income distribution in 3.5.1, and ii) absolute poverty in 3.5.2. When using panel data to examine variations in decentralization and poverty over-time, I split the dataset between high income countries, and low and middle income countries. Due to data limitations, it is not possible to provide the same analysis for the cross-sectional dataset. All estimates are produced using a single specification containing all control variables outlined in section 3.2.3[34]

3.5.1. Income Distribution

In the first set of estimates for cross-sectional OLS, fiscal decentralization appears to have some effect on income distribution (table 11). SCG Revenue and SCG Expenditure are negatively associated with income distribution (1 and 5). The negative coefficient indicates that greater decentralization between countries reduces income inequality. A one percentage point difference between countries explains a 0.4% variation in the Gini coefficient.

Interactions between tax and spending decentralization and other aspects of decentralization produce some significant results. Though local jurisdiction size appears to have little effect on the relationship between decentralization and the Gini coefficient, federal constitution produces contrasting results. In unitary countries, fiscal decentralization reduces income inequality, and in federal countries fiscal decentralization has the opposite effect (3, 7 and 11). Finally, SCG Revenue and SCG Expenditure also reduce inequality when the local government executive is appointed (4 and 8).

[34] Primary enrolment data is excluded from cross-sectional estimates due to lack of data.

Table 11: Cross Sectional OLS Estimates, Dependent Variable: Income Distribution (Entire Sample)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	3.748	3.982*	3.574	4.159*	3.640	4.001*	3.306	3.949*	3.288	3.709	2.963	3.748
	(2.415)	(2.207)	(2.316)	(2.236)	(2.460)	(2.249)	(2.346)	(2.343)	(2.380)	(2.349)	(2.131)	(2.415)
Decentralization Indicator												
SCG Revenue	-0.403*	-0.350	-0.709**	-0.581*								
	(0.227)	(0.210)	(0.322)	(0.298)								
SCG					-0.413**	-0.383*	-0.703**	-0.562**				
Expenditure					(0.200)	(0.194)	(0.289)	(0.251)				
SCG									-0.374	-0.261	-0.941**	-0.606
Autonomous									(0.229)	(0.217)	(0.391)	(0.382)
Expenditure												
Decentralization Interactions												
Decentralization		0.099				0.112				0.108		
x LG Area		(0.066)				(0.069)				(0.105)		
Decentralization			0.400*				0.397*				0.760**	
x Federal			(0.216)				(0.208)				(0.342)	
Decentralization				0.261				0.214				0.316
x Election				(0.245)				(0.215)				(0.399)
Controls												
Real GDP per	-0.069	-0.055	-0.098	-0.075	-0.061	-0.045	-0.088	-0.067	-0.064	-0.056	-0.112*	-0.070
capita	(0.057)	(0.059)	(0.061)	(0.057)	(0.054)	(0.054)	(0.056)	(0.054)	(0.055)	(0.059)	(0.062)	(0.056)
Economic	-0.005	-0.018	-0.005	-0.002	-0.006	-0.018	-0.005	-0.003	-0.004	-0.013	-0.002	-0.001
Growth	(0.015)	(0.014)	(0.017)	(0.016)	(0.015)	(0.013)	(0.016)	(0.015)	(0.015)	(0.014)	(0.018)	(0.016)
Inflation	-0.002*	-0.002**	-0.001	-0.002	-0.002*	-0.002**	-0.002*	-0.002*	-0.002*	-0.002*	-0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Trade	-0.080	-0.061	-0.078	-0.050	-0.068	-0.045	-0.062	-0.043	-0.073	-0.054	-0.072	-0.051
	(0.072)	(0.069)	(0.073)	(0.080)	(0.069)	(0.066)	(0.070)	(0.079)	(0.073)	(0.073)	(0.073)	(0.080)
Government	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Expenditure	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Governance	-0.011	-0.032	-0.002	-0.012	-0.014	-0.034	-0.006	-0.015	-0.017	-0.031	-0.004	-0.018
	(0.022)	(0.022)	(0.025)	(0.023)	(0.020)	(0.020)	(0.023)	(0.021)	(0.021)	(0.022)	(0.025)	(0.022)
Immunization	-0.136	-0.409	-0.028	-0.222	-0.170	-0.479	-0.056	-0.242	-0.070	-0.316	0.090	-0.161
	(0.526)	(0.485)	(0.549)	(0.504)	(0.528)	(0.478)	(0.540)	(0.515)	(0.516)	(0.504)	(0.509)	(0.510)
Sanitation	-0.667***	-0.453*	-0.678***	-0.695***	-0.636**	-0.418*	-0.624***	-0.647***	-0.654**	-0.510*	-0.648***	-0.659**
	(0.243)	(0.247)	(0.225)	(0.233)	(0.242)	(0.244)	(0.220)	(0.236)	(0.248)	(0.256)	(0.216)	(0.244)
Observations	51	48	51	51	51	48	51	51	49	47	49	49
R-squared	0.607	0.654	0.639	0.614	0.613	0.669	0.645	0.618	0.602	0.628	0.649	0.606

***, ** and * represent significance at the 1, 5 and 10% levels respectively. Robust standard errors are in parenthesis

Most of the control variables are statistically insignificant, apart from inflation (in some specifications) and sanitation. Surprisingly, the relationship between inflation and the Gini coefficient is negative. Sanitation is also negatively associated with the annual growth in the Gini coefficient in every relationship. A one percent increase in access to sanitation facilities results in a decline in income inequality, between 0.418 and 0.695, across the specifications.

The second set of estimates are produced using a cross-sectional IV model. The estimates for the first stage of the two-stage model are presented in table 12, and the second stage estimates are presented in table 13. The first stage estimates provide evidence that local democracy and ethnolinguistic fractionalisation explain variations in decentralization between countries. The local democracy dummy is a stronger instrument, statistically significant in all but a few specifications. Ethnolinguistic fractionalisation is often statistically insignificant at the 10% level – though this is marginal in some specifications. The collective significance of the instrument variables is indicated in the f-tests in table 12. The instruments together are found to explain variations in decentralization in most specifications. Of the variables assumed to be exogenous in the IV estimations, governance shares some correlation with fiscal decentralization, which suggests that a link between governance (corruption) and decentralization could exist (see Fisman and Gatti, 2002; Altunbas and Thornton, 2011). Other aspects of decentralization in the interactions are also found be to associated with decentralization.

The second stage estimates in table 13 are largely insignificant. The only statistically significant result is in interactions between tax and spending decentralization, and local jurisdiction size. In specifications 2, 6 and 10, greater tax and spending decentralization is positively associated with income inequality, as the size of the local jurisdiction increases. In the ordinary least squares estimations, this interaction was statistically insignificant. The change in the coefficients between OLS and IV estimations may indicate weak instrument variables or that decentralization was endogenous in OLS estimations, and instrumentation has resolved the endogeneity bias. However, the Durbin-Wu-Hausman test suggests that decentralization may be exogenous and the ordinary least squares estimator may be suitable for estimating the relationship between tax and spending decentralization and income distribution. Therefore, the contrast in results between ordinary least squares and instrument variable estimation may be down to weak instruments in the first stage.

Table 12: Cross Sectional IV Estimates (1st Stage), Dependent Variable: Decentralization (Entire Sample)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	0.625	1.288	-0.522	0.072	-1.378	-0.098	-2.441	-1.351	-0.100	-0.409	-1.371	-0.552
	(2.567)	(3.072)	(2.487)	(1.942)	(2.496)	(2.763)	(2.599)	(1.870)	(2.559)	(2.675)	(2.076)	(1.543)
Instrument Variables												
Local	0.116**	0.110*	-0.173**	0.047	0.168***	0.164***	-0.180	0.093**	0.122**	0.114*	-0.109***	0.018
Democracy	(0.055)	(0.058)	(0.066)	(0.039)	(0.046)	(0.050)	(0.125)	(0.043)	(0.057)	(0.057)	(0.035)	(0.031)
Ethnic	0.161	0.200*	0.106	0.145	0.073	0.160	0.013	0.094	0.152*	0.142	0.105	0.104
Fractionalisation	(0.097)	(0.110)	(0.089)	(0.089)	(0.115)	(0.101)	(0.115)	(0.085)	(0.089)	(0.109)	(0.080)	(0.073)
Second Stage Controls												
Real GDP per	-0.053	-0.056	-0.032	-0.032	-0.039	-0.056	-0.025	-0.028	-0.052	-0.049	-0.041	-0.026
capita	(0.040)	(0.044)	(0.041)	(0.038)	(0.043)	(0.042)	(0.045)	(0.037)	(0.037)	(0.041)	(0.033)	(0.032)
Economic	0.005	0.006	0.006	0.011	0.006	0.007	0.008	0.011	0.008	0.010	0.008	0.012
Growth	(0.011)	(0.012)	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)	(0.009)	(0.010)	(0.010)	(0.008)	(0.008)
Inflation	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Trade	-0.074	-0.093*	-0.051	0.012	-0.020	-0.048	-0.020	0.050	-0.044	-0.055	-0.030	0.033
	(0.046)	(0.051)	(0.040)	(0.037)	(0.044)	(0.043)	(0.042)	(0.040)	(0.042)	(0.046)	(0.032)	(0.029)
Government	0.000	-0.000	-0.000	0.000	0.000	-0.000	-0.000	0.000	0.000	0.000	-0.000	0.001**
Expenditure	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Governance	0.042**	0.047**	0.028	0.025*	0.027	0.040**	0.016	0.014	0.035**	0.035*	0.023	0.011
	(0.016)	(0.020)	(0.017)	(0.013)	(0.020)	(0.018)	(0.023)	(0.014)	(0.014)	(0.017)	(0.014)	(0.011)
Immunization	0.067	0.140	-0.040	-0.059	-0.130	0.054	-0.166	-0.195	0.335	0.388	0.191	-0.042
	(0.308)	(0.341)	(0.257)	(0.261)	(0.314)	(0.265)	(0.292)	(0.276)	(0.326)	(0.331)	(0.277)	(0.226)
Sanitation	-0.016	-0.020	-0.029	-0.088	0.067	0.049	0.045	0.001	-0.037	-0.070	-0.008	-0.051
	(0.119)	(0.148)	(0.113)	(0.101)	(0.122)	(0.142)	(0.111)	(0.095)	(0.125)	(0.140)	(0.102)	(0.083)
Decentralization		-0.025	0.774***	0.499***		-0.016	0.876***	0.504***		-0.057	0.908***	0.760***
(Interaction)		(0.026)	(0.149)	(0.139)		(0.026)	(0.307)	(0.140)		(0.040)	(0.127)	(0.112)
F-test (p-value) for instruments	0.008	0.004	0.042	0.013	0.001	0.000	0.215	0.018	0.005	0.174	0.016	0.093
Observations	42	39	42	42	42	39	42	42	41	39	41	41
R-squared	0.561	0.570	0.648	0.698	0.566	0.646	0.614	0.724	0.521	0.524	0.686	0.754

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 13: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Income Distribution (Entire Sample)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	1.730	1.868	1.647	1.708	2.119	2.136	2.266	2.202	3.030	2.606	3.274	3.503
	(3.936)	(3.806)	(4.042)	(3.902)	(3.800)	(3.845)	(4.774)	(3.877)	(4.082)	(3.890)	(4.641)	(4.514)
Decentralization Indicator												
SCG Revenue	0.196	0.213	0.427	0.214								
	(0.253)	(0.292)	(0.643)	(0.534)								
SCG					0.152	0.192	0.222	0.238				
Expenditure					(0.247)	(0.246)	(0.993)	(0.431)				
SCG Autonom									0.175	0.269	0.422	0.810
Expenditure									(0.252)	(0.323)	(0.844)	(1.160)
Decentralization Interactions												
Decentralization		0.082*				0.093**				0.123*		
x LG Area		(0.043)				(0.047)				(0.069)		
Decentralization			-0.096				-0.042				-0.179	
x Federal			(0.351)				(0.518)				(0.655)	
Decentralization				-0.001				-0.096				-0.769
x Election				(0.418)				(0.337)				(1.066)
Controls												
Real GDP per	-0.007	0.006	0.004	-0.007	-0.012	0.007	-0.009	-0.011	-0.002	0.006	0.011	0.009
capita	(0.049)	(0.052)	(0.067)	(0.051)	(0.048)	(0.051)	(0.062)	(0.050)	(0.049)	(0.053)	(0.076)	(0.068)
Economic	-0.013	-0.024*	-0.014	-0.013	-0.013	-0.025*	-0.014	-0.014	-0.016	-0.025*	-0.018	-0.025
Growth	(0.013)	(0.013)	(0.014)	(0.014)	(0.013)	(0.013)	(0.015)	(0.014)	(0.014)	(0.013)	(0.015)	(0.019)
Inflation	-0.002**	-0.002**	-0.002*	-0.002*	-0.002**	-0.002**	-0.002*	-0.002*	-0.002**	-0.002**	-0.002*	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Trade	-0.040	-0.022	-0.029	-0.038	-0.049	-0.022	-0.049	-0.061	-0.053	-0.027	-0.050	-0.112
	(0.061)	(0.059)	(0.062)	(0.086)	(0.064)	(0.059)	(0.064)	(0.082)	(0.060)	(0.060)	(0.059)	(0.113)
Government	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.000
Expenditure	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Governance	-0.046**	-0.065***	-0.053*	-0.047**	-0.043**	-0.066***	-0.044	-0.042**	-0.047**	-0.064***	-0.053*	-0.044**
	(0.021)	(0.022)	(0.031)	(0.021)	(0.018)	(0.020)	(0.028)	(0.017)	(0.020)	(0.021)	(0.031)	(0.022)
Immunization	0.000	-0.238	0.020	0.004	0.016	-0.295	0.025	0.049	-0.108	-0.344	-0.149	0.080
	(0.591)	(0.528)	(0.596)	(0.578)	(0.615)	(0.531)	(0.593)	(0.632)	(0.582)	(0.561)	(0.694)	(0.662)
Sanitation	-0.637***	-0.435*	-0.628***	-0.636**	-0.652***	-0.431*	-0.656***	-0.644***	-0.587**	-0.432*	-0.579**	-0.542**
	(0.229)	(0.228)	(0.243)	(0.248)	(0.227)	(0.229)	(0.232)	(0.231)	(0.239)	(0.237)	(0.259)	(0.276)
DWH test (p-value)	0.189	0.213	0.142	0.141	0.123	0.019	0.539	0.051	0.132	0.197	0.094	0.118
Hansen J-statistic (p-value)	0.880	0.595	0.867	0.861	0.772	0.569	0.767	0.819	0.795	0.588	0.933	0.834
Observations	42	39	42	42	42	39	42	42	41	39	41	41
R-squared	0.643	0.687	0.603	0.640	0.646	0.690	0.634	0.633	0.649	0.678	0.607	0.564

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using a local democracy dummy variable and ethnic fractionalisation, from the first stage. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

The instruments are valid however, as indicated by the Hansen J-statistic. The test of instrument exogeneity does not reject the null hypothesis at the 10% level in any specification.

The control variables are largely consistent with the OLS estimations. Inflation, governance and access to improved sanitation facilities are negatively associated with income inequality. These results are broadly expected based on the theory. However, inflation is negatively associated with the Gini coefficient – an unexpected result[35]

The final set of estimates for income distribution are produced using the random effects panel estimator. I produce three set of estimates for the panel dataset: i) entire sample (table 14), high income sample (table 15) and low and middle income sample (table 16).

When estimating the effects of decentralization on income distribution for the entire sample, there is only one statistically significant effect. Spending decentralization is statistically associated with income inequality through interactions with local jurisdiction size. This result, which is consistent with the cross-sectional IV estimates, suggests that higher spending decentralization leads to greater inequality, as the size of the local jurisdiction increases (in specifications 6 and 10).

When estimating the same relationship for high income countries, there is more evidence that fiscal decentralization is associated with income distribution. Tax, spending and autonomous spending decentralization are statistically associated with income distribution (specifications 1, 5 and 9). The effect is always negative. This result suggests that, when controlling for random effects, greater tax, spending and autonomous spending decentralization reduces income inequality over time. The size of the effect varies between indicator, and is strongest for tax decentralization (1). A 1% increase in tax decentralization, reduces income inequality according to the GINI coefficient, by 0.44%.

There is also evidence that other types of decentralization have a bearing on the relationship between tax and spending decentralization and income inequality. Tax and spending decentralization reduces income inequality when the local government size is smaller, and increases inequality when the local government size is sufficiently large (2, 6 and 10). This supports the findings in previous estimations for the cross-sectional dataset.

[35] This result has also been observed in Cudjoe et al., 2010; Alem and Sodermon, 2012; Fujii, 2013

Table 14: Random Effects Panel Estimates, Dependent Variable: Income Distribution (Entire Sample)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	2.874**	2.669**	2.886**	2.928**	2.876**	2.530**	2.891**	2.875**	3.109***	2.755**	3.222***	3.067***
	(1.200)	(1.209)	(1.204)	(1.180)	(1.204)	(1.205)	(1.210)	(1.208)	(1.122)	(1.163)	(1.175)	(1.152)
Decentralization Indicator												
SCG Revenue	-0.119	-0.090	-0.128	-0.204								
	(0.132)	(0.148)	(0.172)	(0.301)								
SCG					0.034	0.143	0.102	0.003				
Expenditure					(0.140)	(0.169)	(0.162)	(0.381)				
SCG Autonom									0.015	0.403	0.098	0.368
Expenditure									(0.222)	(0.279)	(0.382)	(0.477)
Decentralization Interactions												
Decentralization		0.026				0.074*				0.191**		
x LG Area		(0.038)				(0.042)				(0.081)		
Decentralization			0.018				-0.175				-0.167	
x Federal			(0.155)				(0.137)				(0.367)	
Decentralization				0.105				0.035				-0.491
x Election				(0.282)				(0.345)				(0.481)
Controls												
Real GDP per	-0.119**	-0.122**	-0.117**	-0.121**	-0.119*	-0.124*	-0.118*	-0.120*	-0.152**	-0.154**	-0.147**	-0.140**
capita	(0.059)	(0.061)	(0.058)	(0.058)	(0.065)	(0.066)	(0.065)	(0.062)	(0.074)	(0.075)	(0.070)	(0.071)
Economic	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
Growth	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Inflation	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001**	-0.001**	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Trade	0.036	0.032	0.035	0.039	0.032	0.030	0.024	0.033	0.028	0.037	0.023	0.012
	(0.039)	(0.039)	(0.040)	(0.037)	(0.037)	(0.037)	(0.038)	(0.038)	(0.043)	(0.042)	(0.042)	(0.039)
Government	0.038**	0.037**	0.037**	0.037**	0.036**	0.036*	0.039**	0.036**	0.040**	0.037*	0.043**	0.045**
Expenditure	(0.016)	(0.017)	(0.017)	(0.016)	(0.018)	(0.019)	(0.018)	(0.018)	(0.018)	(0.019)	(0.019)	(0.018)
Governance	-0.005	-0.008	-0.005	-0.005	-0.007	-0.010	-0.007	-0.007	0.000	-0.001	0.000	0.002
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Immunization	-0.043	-0.037	-0.045	-0.040	-0.016	0.005	-0.009	-0.015	-0.003	0.039	-0.010	-0.000
	(0.078)	(0.082)	(0.078)	(0.079)	(0.077)	(0.079)	(0.074)	(0.076)	(0.080)	(0.071)	(0.086)	(0.078)
Sanitation	-0.781***	-0.736***	-0.784***	-0.787***	-0.779***	-0.730***	-0.789***	-0.779***	-0.751***	-0.712***	-0.772***	-0.756***
	(0.158)	(0.157)	(0.157)	(0.154)	(0.165)	(0.162)	(0.168)	(0.164)	(0.166)	(0.171)	(0.167)	(0.174)
Primary	-0.015	0.000	-0.013	-0.018	-0.039	-0.012	-0.050	-0.038	-0.085	-0.079	-0.105	-0.108
Enrolment	(0.224)	(0.231)	(0.220)	(0.223)	(0.222)	(0.232)	(0.215)	(0.223)	(0.194)	(0.198)	(0.202)	(0.204)
Observations	339	329	339	339	334	324	334	334	286	282	286	286
Groups	45	42	45	45	45	42	45	45	43	41	43	43

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 15: Random Effects Panel Estimates, Dependent Variable: Income Distribution (High Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	12.189*	10.695	12.073*	9.565	13.356*	11.880*	13.355*	11.068	18.144**	17.167**	18.266***	14.246**
	(6.598)	(6.571)	(6.588)	(6.951)	(7.445)	(7.081)	(7.572)	(7.817)	(7.046)	(7.028)	(6.551)	(7.040)
Decentralization Indicator												
SCG Revenue	-0.436***	-0.440***	-0.538**	-1.345**								
	(0.142)	(0.159)	(0.234)	(0.684)								
SCG					-0.199**	-0.168*	-0.147**	-0.914***				
Expenditure					(0.085)	(0.087)	(0.071)	(0.191)				
SCG Autonom									-0.250***	-0.017	-0.381**	-2.281**
Expenditure									(0.088)	(0.110)	(0.182)	(0.983)
Decentralization Interactions												
Decentralization		0.005				0.053**				0.099**		
x LG Area		(0.029)				(0.026)				(0.044)		
Decentralization			0.178				-0.103				0.154	
x Federal			(0.169)				(0.093)				(0.223)	
Decentralization				0.904				0.721***				2.020**
x Election				(0.652)				(0.177)				(0.971)
Controls												
Real GDP per	0.029	0.032	0.022	0.031	0.036	0.047	0.039	0.045	0.022	0.021	0.031	0.060
capita	(0.096)	(0.102)	(0.089)	(0.094)	(0.117)	(0.128)	(0.118)	(0.117)	(0.127)	(0.137)	(0.115)	(0.133)
Economic	-0.001	-0.001	-0.001	-0.001	-0.000	-0.001	-0.000	-0.001	-0.000	-0.000	0.000	-0.000
Growth	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Inflation	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Trade	0.026	0.033	0.036	0.041	0.033	0.039	0.028	0.053	0.013	0.029	-0.003	0.017
	(0.044)	(0.046)	(0.042)	(0.040)	(0.042)	(0.045)	(0.045)	(0.038)	(0.046)	(0.047)	(0.042)	(0.046)
Government	0.030*	0.028	0.027	0.027	0.024	0.023	0.026	0.021	0.032	0.030	0.029*	0.019
Expenditure	(0.017)	(0.020)	(0.018)	(0.017)	(0.021)	(0.024)	(0.021)	(0.021)	(0.020)	(0.023)	(0.016)	(0.022)
Governance	-0.000	0.001	-0.001	0.003	-0.005	-0.002	-0.004	-0.002	0.006	0.006	0.005	0.008
	(0.010)	(0.011)	(0.009)	(0.009)	(0.009)	(0.011)	(0.010)	(0.009)	(0.009)	(0.010)	(0.009)	(0.010)
Immunization	-0.397*	-0.403*	-0.400*	-0.379*	-0.346	-0.344	-0.339	-0.339	-0.254	-0.251	-0.225	-0.250
	(0.213)	(0.228)	(0.214)	(0.205)	(0.225)	(0.241)	(0.221)	(0.219)	(0.269)	(0.262)	(0.296)	(0.257)
Sanitation	-2.290	-1.956	-2.248	-1.697	-2.600	-2.279	-2.617	-2.087	-3.835**	-3.574**	-3.875**	-2.923*
	(1.593)	(1.612)	(1.586)	(1.678)	(1.810)	(1.756)	(1.836)	(1.889)	(1.735)	(1.717)	(1.599)	(1.742)
Primary	-0.457	-0.464	-0.449	-0.501*	-0.450	-0.480	-0.449	-0.492*	-0.359	-0.415	-0.358	-0.448
Enrolment	(0.287)	(0.296)	(0.291)	(0.283)	(0.303)	(0.307)	(0.305)	(0.291)	(0.369)	(0.339)	(0.362)	(0.361)
Observations	188	184	188	188	184	180	184	184	158	157	158	158
Groups	24	22	24	24	24	22	24	24	23	22	23	23

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Unitary and federal governments also observe contrasting effects of greater tax and spending decentralization. In unitary countries, greater decentralization reduces inequality. However, there is no effect in federal countries (3, 7 and 11). Finally, decentralization has different effects depending on whether the local government executive is appointed or elected. When the executive is appointed, higher tax and spending decentralization reduces inequality (specifications 4, 8 and 12). When the executive is elected, higher spending decentralization has the opposite effect – increasing inequality in specifications 8 and 12. The magnitude of the effect is stronger than all other results in table 15. In specification 12, a 1% increase in autonomous spending will reduce inequality by 2.28% if the executive is appointed, but increase inequality by 2.02% if the executive is elected. This suggests that central government control, at least with respect to local government accountability, is essential for reducing poverty through tax and spending decentralization.

In the corresponding estimations for the low and middle income sample in table 16, there is limited evidence that tax and spending decentralization can reduce. Only through interactions with local government area size is tax and spending decentralization statistically significant (specifications 2, 6 and 10). The relationship is positive regardless of the size of the local government. This would indicate that the size of the local jurisdiction is important with respect to the effects of tax and spending decentralization on the poorest. However, as the effect is positive whatever the size of the local jurisdiction, this would suggest that a smaller local government merely mitigates against the undesirable effects of tax and spending decentralization for the poorest.

Of the control variables, there are different effects between the two income groups. The only variables that explain variations in income distribution in the high-income group are vaccination coverage and sanitation – both share a negative association with income inequality. They are statistically significant only in a selection of specifications. Nevertheless, it is interesting that none of the economic variables: income, growth and trade have any effect over time. However, in the low and middle income group, income, growth and inflation are associated with income distribution. Higher income reduces income inequality, as does higher inflation – an unexpected result. Economic growth actually increases income inequality over time, which contradicts the findings of Dollar and Kraay (2002). Government spending appears to help the better off disproportionately. Though sanitation remains statistically, negatively associated with inequality.

Table 16: Random Effects Panel Estimates, Dependent Variable: Income Distribution (Low and Middle Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	2.133	1.287	2.118	2.325	2.304	1.237	2.319	2.225	2.951*	1.479	2.993*	2.587*
	(1.666)	(1.663)	(1.658)	(1.587)	(1.672)	(1.659)	(1.654)	(1.565)	(1.520)	(1.627)	(1.538)	(1.401)
Decentralization Indicator												
SCG Revenue	0.161	0.361**	0.148	0.058								
	(0.202)	(0.177)	(0.214)	(0.306)								
SCG					0.261	0.554**	0.271	0.354				
Expenditure					(0.263)	(0.252)	(0.283)	(0.401)				
SCG Autonom									0.242	0.575***	0.269	0.461
Expenditure									(0.356)	(0.213)	(0.400)	(0.431)
Decentralization Interactions												
Decentralization		0.192**				0.256***				0.311***		
x LG Area		(0.082)				(0.097)				(0.100)		
Decentralization			0.126				-0.051				-0.173	
x Federal			(0.251)				(0.321)				(0.390)	
Decentralization				0.177				-0.139				-0.518
x Election				(0.333)				(0.438)				(0.501)
Controls												
Real GDP per	-0.202***	-0.183**	-0.201***	-0.211***	-0.195***	-0.161**	-0.197***	-0.191***	-0.229***	-0.175**	-0.231***	-0.232***
capita	(0.077)	(0.076)	(0.078)	(0.075)	(0.074)	(0.070)	(0.076)	(0.074)	(0.086)	(0.086)	(0.088)	(0.083)
Economic	0.006***	0.005***	0.006***	0.006***	0.005***	0.005***	0.005***	0.005***	0.006***	0.005***	0.006***	0.006***
Growth	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Inflation	-0.001**	-0.001***	-0.001**	-0.001**	-0.001**	-0.001***	-0.001**	-0.001**	-0.000	-0.001*	-0.000	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Trade	-0.015	-0.019	-0.014	-0.011	-0.021	-0.026	-0.021	-0.024	-0.032	-0.027	-0.034	-0.042
	(0.038)	(0.039)	(0.038)	(0.038)	(0.040)	(0.040)	(0.040)	(0.042)	(0.041)	(0.042)	(0.042)	(0.041)
Government	0.058***	0.047**	0.056**	0.057**	0.056**	0.039*	0.057**	0.058***	0.063**	0.036	0.066**	0.072***
Expenditure	(0.022)	(0.023)	(0.024)	(0.022)	(0.022)	(0.024)	(0.024)	(0.022)	(0.026)	(0.025)	(0.029)	(0.027)
Governance	0.003	0.001	0.003	0.004	0.001	-0.001	0.001	0.001	0.017	0.013	0.017	0.017
	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)	(0.013)	(0.015)	(0.014)	(0.017)	(0.013)	(0.016)	(0.015)
Immunization	-0.013	-0.004	-0.017	-0.010	-0.012	0.014	-0.011	-0.011	-0.097	-0.002	-0.094	-0.076
	(0.109)	(0.112)	(0.111)	(0.112)	(0.106)	(0.102)	(0.105)	(0.103)	(0.124)	(0.104)	(0.124)	(0.112)
Sanitation	-0.663***	-0.593***	-0.656***	-0.666***	-0.674***	-0.606***	-0.677***	-0.679***	-0.626***	-0.604***	-0.637***	-0.622***
	(0.150)	(0.157)	(0.151)	(0.149)	(0.148)	(0.150)	(0.152)	(0.152)	(0.142)	(0.154)	(0.141)	(0.143)
Primary	0.102	0.237	0.105	0.074	0.071	0.242	0.068	0.079	0.003	0.241	-0.007	0.033
Enrolment	(0.273)	(0.291)	(0.272)	(0.272)	(0.274)	(0.297)	(0.268)	(0.267)	(0.252)	(0.287)	(0.254)	(0.236)
Observations	151	145	151	151	150	144	150	150	128	125	128	128
Groups	27	25	27	27	27	25	27	27	25	24	25	25

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Overall, the evidence suggests that fiscal decentralization is associated with income distribution, but the nature of the relationship is sensitive to other forms of decentralization and how economically developed the country is.

The cross-sectional estimates are significant, and suggest that tax and spending decentralization are negatively associated with the GINI coefficient, thereby reducing poverty. However, this result is not robust to econometric technique. The cross-sectional IV estimations eliminate almost all evidence of a statistical link between decentralization and inequality. The only effect observed in the IV estimations are for local jurisdiction size, which has a negative effect on the relationship between decentralization and inequality.

Finally, the random effects provide some evidence that fiscal decentralization can affect income distribution over time. The strongest results are in the high-income country sample, where fiscal decentralization reduces inequality. Only when the size of the local jurisdiction is sufficiently large, does tax and spending decentralization increase inequality.

3.5.2. Absolute Poverty

The cross-sectional estimates in table 17 provide only limited evidence of an association between fiscal decentralization and absolute poverty. The evidence is restricted to specifications including interactions with other aspects of decentralization. Fiscal decentralization increases absolute poverty when the average size of local government is larger (2, 6 and 10), a result that is consistent with the income distribution results. Federal countries also observe a positive relationship between decentralization and absolute poverty (3, 7 and 11). In Federal countries, a 1% change in decentralization would result in between 11.5% (SCG Revenue, 2) and 21% (SCG Autonomous Expenditure, 11) increase in absolute poverty. Finally, greater SCG Autonomous Expenditure reduces absolute poverty when the local executive is elected (12).

Of the controls, real income has a strong negative effect on absolute poverty, which is expected. A one percent increase in real income reduces absolute poverty by more than two percent. Economic growth is also negatively associated with absolute poverty, but the effect is small and restricted to a single specification. Trade and government spending is negatively associated with absolute poverty between countries.

Finally, public services do not appear to explain variations in absolute poverty between countries.

The next set of estimates are produced using the cross-sectional IV model. The first stage results are presented in table 18. The same instrument variables that were found to explain variations in decentralization for the entire sample (in table 12), are weak instruments for low and middle income countries in table 18. Neither local democracy or ethnolinguistic fractionalisation explain variations in decentralization in most specification. This is evident in the high p-values for the f-test of collective significance. When either of the instruments are statistically associated with tax and spending decentralization, the effects are as we would expect – positive for either local democracy or fractionalization. As a consequence of the weak effects of the instrument variables in the first stage, the second stage results may not provide credible estimates of the effect of decentralization on absolute poverty.

Despite this, the results in the second stage in table 19 do support the corresponding results in the OLS estimation, in table 17. Greater tax and spending decentralization increase absolute poverty when the local jurisdiction size is larger, and in federal countries. Once again, the Durbin-Wu-Hausman test suggests that decentralization may not be endogenous, and that the OLS estimations may be valid. The instruments are also found to be exogenous, as expected. The p-value for the Hansen J-statistic is greater than 0.10 in every specification. Hence, the null hypothesis of instrument exogeneity cannot be rejected at the 10% level.

Table 17: Cross Sectional OLS Estimates, Dependent Variable: Absolute Poverty (Low and Middle Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	34.840	30.755	31.092	23.379	34.048	28.285*	29.888	21.952	33.263	24.565	29.957	26.427
	(26.198)	(17.905)	(23.325)	(28.177)	(25.111)	(15.727)	(21.669)	(27.116)	(26.857)	(21.287)	(21.356)	(26.074)
Decentralization Indicator												
SCG Revenue	-2.399	-1.399	-1.874	-1.380								
	(3.606)	(1.915)	(3.603)	(3.340)								
SCG					-2.832	-1.123	-2.240	-1.193				
Expenditure					(3.775)	(1.795)	(3.807)	(3.452)				
SCG									-1.772	1.713	-2.202	-1.645
Autonomous									(4.606)	(2.564)	(4.515)	(3.433)
Expenditure												
Decentralization Interactions												
Decentralization		2.346***				2.846***				3.991***		
x LG Area		(0.746)				(0.728)				(1.289)		
Decentralization			11.541***				13.506***				20.992***	
x Federal			(2.681)				(2.890)				(3.934)	
Decentralization				-4.732				-5.743				-10.177*
x Election				(3.854)				(3.907)				(5.351)
Controls												
Real GDP per	-2.363***	-2.441***	-2.389***	-2.451***	-2.407***	-2.567***	-2.429***	-2.438***	-2.133***	-2.694***	-2.127***	-1.933***
capita	(0.730)	(0.558)	(0.719)	(0.695)	(0.769)	(0.489)	(0.756)	(0.698)	(0.593)	(0.596)	(0.564)	(0.591)
Economic	-0.006	-0.154***	-0.056	-0.081	0.005	-0.134***	-0.058	-0.064	-0.027	-0.136***	-0.108	-0.130
Growth	(0.123)	(0.038)	(0.127)	(0.123)	(0.121)	(0.030)	(0.126)	(0.116)	(0.109)	(0.042)	(0.124)	(0.098)
Inflation	-0.004	0.001	-0.005	-0.008	-0.004	0.002	-0.005	-0.008	-0.006	0.002	-0.005	-0.007
	(0.008)	(0.005)	(0.008)	(0.009)	(0.008)	(0.005)	(0.008)	(0.009)	(0.009)	(0.006)	(0.008)	(0.008)
Trade	-1.272	-1.305**	-1.681**	-1.852*	-1.214	-1.256**	-1.783***	-1.727*	-1.230	-1.347**	-2.113***	-1.573
	(0.787)	(0.477)	(0.593)	(0.878)	(0.788)	(0.460)	(0.593)	(0.845)	(0.847)	(0.558)	(0.628)	(0.890)
Government	-0.028	-0.053	-0.369**	0.044	-0.008	-0.040	-0.427**	0.080	-0.055	-0.084*	-0.579***	0.129
Expenditure	(0.126)	(0.054)	(0.151)	(0.098)	(0.144)	(0.050)	(0.176)	(0.099)	(0.134)	(0.042)	(0.166)	(0.114)
Governance	0.233	0.112	0.113	0.396	0.238	0.147	0.110	0.410	0.153	0.194	-0.059	0.153
	(0.439)	(0.246)	(0.401)	(0.388)	(0.447)	(0.218)	(0.410)	(0.377)	(0.417)	(0.259)	(0.323)	(0.355)
Immunization	-0.919	-2.477	-0.513	2.014	-0.799	-1.830	-0.311	2.258	-1.545	-0.454	-1.424	-0.620
	(6.443)	(5.123)	(5.953)	(7.139)	(6.201)	(4.554)	(5.634)	(6.927)	(7.131)	(6.350)	(6.042)	(6.953)
Sanitation	-1.790	1.328	-0.741	-1.405	-1.717	1.369	-0.478	-1.529	-1.255	1.019	0.546	-0.495
	(2.026)	(1.254)	(2.022)	(2.119)	(2.011)	(1.134)	(2.035)	(2.040)	(2.248)	(1.583)	(2.199)	(1.994)
Observations	26	24	26	26	26	24	26	26	24	23	24	24
R-squared	0.721	0.879	0.789	0.744	0.723	0.896	0.794	0.754	0.718	0.873	0.830	0.765

***, ** and * represent significance at the 1, 5 and 10% levels respectively. Robust standard errors are in parenthesis

Table 18: Cross Sectional IV Estimates (1st Stage), Dependent Variable: Decentralization (Low and Middle Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-2.349	-3.058	-0.610	-2.486	-2.775	-3.614	-1.592	-2.871	-0.701	-1.286	-0.306	0.565
	(3.789)	(3.506)	(3.102)	(4.281)	(3.105)	(2.817)	(2.870)	(3.492)	(3.211)	(3.207)	(3.152)	(2.620)
Instrument Variables												
Local	-0.152	-0.119	2.338**	-0.154	-0.120	-0.100	0.679	-0.121	-0.051	-0.036	0.269	-0.014
Democracy	(0.108)	(0.064)	(0.798)	(0.118)	(0.077)	(0.050)	(0.377)	(0.083)	(0.067)	(0.063)	(0.246)	(0.069)
Ethnic	0.310*	0.248	0.376**	0.310*	0.259*	0.217	0.304**	0.259*	0.169	0.134	0.201	0.134
Fractionalisation	(0.141)	(0.135)	(0.118)	(0.144)	(0.112)	(0.119)	(0.109)	(0.116)	(0.120)	(0.131)	(0.121)	(0.100)
Second Stage Controls												
Real GDP per	0.010	0.067	-0.001	0.009	-0.000	0.044	-0.008	-0.000	0.021	0.051	0.014	0.035
capita	(0.066)	(0.062)	(0.056)	(0.066)	(0.055)	(0.050)	(0.050)	(0.056)	(0.056)	(0.061)	(0.054)	(0.047)
Economic	0.008	0.005	0.013	0.007	0.011	0.008	0.015	0.011	0.006	0.005	0.009	-0.005
Growth	(0.011)	(0.010)	(0.010)	(0.011)	(0.009)	(0.008)	(0.009)	(0.009)	(0.010)	(0.009)	(0.010)	(0.010)
Inflation	0.002**	0.001	0.002**	0.001*	0.001***	0.001*	0.001***	0.001**	0.002***	0.001*	0.002**	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Trade	-0.014	-0.034	0.082	-0.023	0.012	-0.003	0.078	0.009	0.038	0.026	0.077	0.026
	(0.057)	(0.057)	(0.064)	(0.066)	(0.047)	(0.049)	(0.059)	(0.051)	(0.044)	(0.045)	(0.060)	(0.042)
Government	0.027**	0.019**	0.083***	0.029*	0.029***	0.023***	0.067**	0.031**	0.022***	0.018**	0.045*	0.036***
Expenditure	(0.010)	(0.007)	(0.021)	(0.012)	(0.007)	(0.005)	(0.020)	(0.009)	(0.006)	(0.006)	(0.020)	(0.009)
Governance	-0.020	-0.046	-0.011	-0.017	-0.020	-0.040	-0.013	-0.017	-0.038	-0.050	-0.034	-0.029
	(0.037)	(0.037)	(0.035)	(0.036)	(0.033)	(0.031)	(0.033)	(0.030)	(0.033)	(0.038)	(0.034)	(0.024)
Immunization	-0.163	-0.593	0.020	-0.158	-0.223	-0.525	-0.099	-0.223	-0.441	-0.619	-0.322	-0.726
	(0.581)	(0.592)	(0.405)	(0.596)	(0.436)	(0.446)	(0.362)	(0.444)	(0.537)	(0.571)	(0.462)	(0.437)
Sanitation	0.014	0.131	-0.160	0.030	0.071	0.161	-0.048	0.080	0.096	0.134	0.010	0.242
	(0.157)	(0.152)	(0.130)	(0.184)	(0.123)	(0.104)	(0.130)	(0.135)	(0.128)	(0.126)	(0.114)	(0.125)
Decentralization		-0.080	-8.729**	-0.084		-0.063	-3.326*	-0.069		-0.074	-1.930	-0.755
(Interaction)		(0.070)	(2.818)	(0.354)		(0.064)	(1.573)	(0.309)		(0.114)	(1.495)	(0.539)
F-test (p-value) for instruments	0.103	0.217	0.026	0.125	0.097	0.202	0.066	0.120	0.412	0.589	0.297	0.422
Observations	20	18	20	20	20	18	20	20	19	18	19	19
R-squared	0.759	0.861	0.862	0.761	0.828	0.909	0.878	0.830	0.831	0.863	0.853	0.881

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 19: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Absolute Poverty (Low and Middle Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-20.778	12.591	-8.778	-21.707	-25.035	14.919	-13.400	-26.782	3.048	25.505	16.796	14.063
	(52.769)	(31.216)	(49.003)	(55.793)	(53.837)	(35.959)	(49.092)	(56.350)	(52.210)	(26.839)	(50.398)	(46.185)
Decentralization Indicator												
SCG Revenue	-4.566	0.266	-2.915	-4.596								
	(4.620)	(5.071)	(3.418)	(4.571)								
SCG					-5.253	0.483	-3.288	-5.247				
Expenditure					(5.605)	(5.697)	(4.274)	(5.494)				
SCG Autonom									-7.622	7.525	-8.357	-5.621
Expenditure									(8.723)	(7.575)	(7.043)	(12.081)
Decentralization Interactions												
Decentralization		2.698***				3.028***				5.385***		
x LG Area		(0.880)				(0.889)				(1.236)		
Decentralization			8.952***				10.773***				17.795***	
x Federal			(2.451)				(2.990)				(3.471)	
Decentralization				-0.585				-1.352				-9.203
x Election				(4.402)				(4.423)				(15.215)
Controls												
Real GDP per	-2.047***	-2.693***	-2.195***	-2.055***	-2.100***	-2.719***	-2.226***	-2.102***	-1.812***	-3.398***	-1.825**	-1.765**
capita	(0.701)	(0.741)	(0.688)	(0.665)	(0.697)	(0.650)	(0.680)	(0.677)	(0.659)	(0.724)	(0.727)	(0.810)
Economic	0.074	-0.123**	0.026	0.065	0.096	-0.116*	0.034	0.081	0.030	-0.158***	-0.046	-0.096
Growth	(0.148)	(0.051)	(0.146)	(0.142)	(0.151)	(0.063)	(0.146)	(0.145)	(0.152)	(0.053)	(0.157)	(0.191)
Inflation	0.000	0.000	-0.003	-0.000	0.001	0.001	-0.003	0.000	0.004	-0.001	0.004	-0.000
	(0.008)	(0.006)	(0.006)	(0.008)	(0.009)	(0.006)	(0.007)	(0.009)	(0.014)	(0.008)	(0.013)	(0.016)
Trade	-1.956**	-1.258**	-1.998**	-2.016**	-1.825**	-1.242**	-2.026**	-1.893**	-1.564**	-1.361***	-1.863***	-1.766**
	(0.876)	(0.591)	(0.830)	(0.972)	(0.880)	(0.499)	(0.841)	(0.933)	(0.743)	(0.353)	(0.695)	(0.771)
Government	-0.101	-0.089*	-0.354***	-0.088	-0.068	-0.080	-0.401***	-0.034	-0.029	-0.147*	-0.427**	0.143
Expenditure	(0.127)	(0.053)	(0.119)	(0.134)	(0.155)	(0.076)	(0.149)	(0.165)	(0.197)	(0.087)	(0.175)	(0.520)
Governance	-0.292	0.209	-0.178	-0.269	-0.300	0.216	-0.187	-0.248	-0.463	0.613	-0.437	-0.259
	(0.425)	(0.423)	(0.405)	(0.390)	(0.430)	(0.414)	(0.404)	(0.389)	(0.435)	(0.527)	(0.427)	(0.462)
Immunization	3.916	5.946	4.596	3.915	3.645	5.062	4.436	3.627	-0.587	11.903	-3.076	-0.977
	(6.503)	(7.261)	(6.155)	(6.531)	(6.642)	(6.919)	(6.380)	(6.612)	(8.627)	(7.412)	(8.577)	(13.557)
Sanitation	-2.841	-0.819	-2.317	-2.725	-2.569	-0.513	-1.967	-2.387	-1.408	-1.753	0.306	-0.288
	(2.325)	(1.500)	(2.327)	(2.342)	(2.354)	(1.649)	(2.354)	(2.383)	(2.724)	(1.491)	(2.867)	(4.734)
DWH test (p-value)	0.428	0.541	0.254	0.453	0.371	0.438	0.268	0.407	0.483	0.990	0.209	0.783
Hansen J-statistic (p-value)	0.190	0.146	0.738	0.195	0.193	0.150	0.840	0.202	0.162	0.165	0.806	0.128
Observations	20	18	20	20	20	18	20	20	19	18	19	19
R-squared	0.748	0.913	0.801	0.747	0.744	0.914	0.802	0.746	0.708	0.933	0.765	0.747

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using a local democracy dummy variable and ethnic fractionalisation, from the first stage. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided

The third and final estimates are produced using a random effects panel estimator. The random effects estimator can provide evidence of a relationship between decentralization and poverty over time. These results are presented in table 20.

Spending and autonomous spending are found to be statistically associated with absolute poverty in specifications 5 and 9. An increase of 1% in spending decentralization would lead to an increase in absolute poverty of just under 5% increase (5) in absolute poverty for general spending decentralization, and close to 7% increase for autonomous spending (9). Tax and spending decentralization is also positively associated with poverty in interactions with local government size, a result that is consistent with the income distribution results. There is only one result that suggests tax and spending decentralization could actually reduce absolute poverty. In specification 12, greater autonomous spending decentralization reduces absolute poverty when the local executive is elected. In contrast, when the local government executive is appointed, greater tax and spending decentralization increases absolute poverty. This result suggests that local government accountability can reverse the generally positive association between decentralization and absolute poverty.

Across all estimations, the control variables exhibit expected effects on absolute poverty. Real income reduces absolute poverty, both in cross-sectional estimates and the random effects estimations. Economic growth explains cross-sectional variations in absolute poverty, but has no effect in random effect estimations. Government spending can help reduce absolute poverty over-time in the random effects estimations, but does not explain cross-sectional variations in absolute poverty. Of the remaining control variables, most are found to be statistically insignificant or not robust between cross-sectional OLS and cross-sectional IV estimations

Table 20: Random Effects Panel Estimates, Dependent Variable: Absolute Poverty (Low and Middle Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	14.447	6.722	14.957	16.105	20.022	9.558	20.127	19.100	22.251	10.054	22.373	16.531
	(21.879)	(20.799)	(21.671)	(21.867)	(21.912)	(20.469)	(21.957)	(21.523)	(20.940)	(22.582)	(20.756)	(20.124)
Decentralization Indicator												
SCG Revenue	2.512	4.132**	2.075	2.105								
	(1.705)	(1.673)	(1.660)	(1.769)								
SCG					4.946*	5.694**	4.879	6.016**				
Expenditure					(2.973)	(2.817)	(3.046)	(3.043)				
SCG Autonom									6.975**	7.683**	8.030***	9.636***
Expenditure									(3.033)	(3.082)	(2.797)	(2.756)
Decentralization Interactions												
Decentralization		1.898***				2.070**				1.723		
x LG Area		(0.718)				(0.893)				(1.081)		
Decentralization			2.968				0.727				-4.254	
x Federal			(4.566)				(5.087)				(7.326)	
Decentralization				1.057				-1.703				-7.203*
x Election				(2.075)				(2.737)				(4.201)
Controls												
Real GDP per	-1.851**	-1.935**	-1.806**	-1.892**	-1.640**	-1.779**	-1.628**	-1.541*	-1.216	-1.439*	-1.174	-1.049
capita	(0.825)	(0.802)	(0.837)	(0.842)	(0.814)	(0.771)	(0.828)	(0.867)	(0.906)	(0.859)	(0.940)	(0.984)
Economic	0.031	0.038	0.029	0.029	0.022	0.031	0.021	0.020	0.021	0.026	0.020	0.020
Growth	(0.028)	(0.027)	(0.027)	(0.028)	(0.023)	(0.022)	(0.023)	(0.023)	(0.022)	(0.023)	(0.022)	(0.022)
Inflation	-0.004	-0.006	-0.005	-0.004	-0.003	-0.005	-0.004	-0.005	-0.018	-0.014	-0.018	-0.024
	(0.010)	(0.010)	(0.009)	(0.010)	(0.009)	(0.010)	(0.009)	(0.010)	(0.014)	(0.015)	(0.013)	(0.015)
Trade	-0.423	-0.438	-0.329	-0.323	-0.519	-0.561	-0.472	-0.473	-0.340	-0.371	-0.347	-0.308
	(0.569)	(0.543)	(0.560)	(0.553)	(0.601)	(0.585)	(0.588)	(0.562)	(0.685)	(0.742)	(0.631)	(0.620)
Government	-0.575*	-0.593**	-0.642*	-0.605*	-0.640**	-0.626**	-0.661**	-0.646**	-0.638**	-0.613**	-0.576*	-0.537*
Expenditure	(0.319)	(0.278)	(0.345)	(0.325)	(0.322)	(0.273)	(0.336)	(0.321)	(0.320)	(0.303)	(0.338)	(0.321)
Governance	0.006	0.091	0.022	0.001	-0.011	0.085	-0.007	-0.008	0.010	0.016	-0.024	0.053
	(0.191)	(0.235)	(0.194)	(0.193)	(0.170)	(0.220)	(0.173)	(0.176)	(0.226)	(0.244)	(0.220)	(0.221)
Immunization	1.281	0.885	1.140	1.409	1.388	0.963	1.374	1.437	0.461	0.948	0.629	0.781
	(2.094)	(2.161)	(2.148)	(2.154)	(1.880)	(1.892)	(1.949)	(1.917)	(2.013)	(1.965)	(2.026)	(1.912)
Sanitation	-2.270	-1.327	-2.103	-2.272	-2.416*	-1.538	-2.361*	-2.441*	-2.728*	-2.356	-3.015*	-2.918*
	(1.420)	(1.484)	(1.414)	(1.449)	(1.380)	(1.476)	(1.406)	(1.469)	(1.568)	(1.602)	(1.704)	(1.768)
Primary	3.588	5.066	3.593	3.216	2.301	4.493	2.266	2.268	2.015	4.273	1.730	2.324
Enrolment	(3.541)	(3.654)	(3.548)	(3.611)	(3.476)	(3.587)	(3.531)	(3.418)	(3.652)	(4.220)	(3.610)	(3.400)
Observations	121	114	121	121	120	113	120	120	99	96	99	99
Groups	25	23	25	25	25	23	25	25	23	22	23	23

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Overall, there is some evidence that fiscal decentralization has an effect on poverty. The evidence suggests that decentralization is not good for those in absolute poverty. In both sets of cross-sectional estimates, tax and spending decentralization leads to higher absolute poverty when the size of local government is larger, and in federal countries. Furthermore, the random effects panel estimations provide evidence that spending decentralization increases absolute poverty. The only contrasting result in the absolute poverty regressions is in interactions between autonomous spending and local government accountability. In cross-sectional OLS and random effects panel estimations (tables 17 and 20), greater spending decentralization when the local government executive is elected, leads to lower poverty.

3.5.3. Main Results Summary

Across all results there are several key findings:

- Fiscal decentralization appears to reduce income distribution between countries in the cross-sectional estimates. Unitary countries, and countries with smaller local jurisdiction size, benefit from greater decentralization. However, this result is not robust to IV estimation. The instruments for decentralization were weak in some specifications however. IV estimations do confirm that local jurisdiction size has an effect on the relationship between tax and spending decentralization and income inequality.
- Fiscal decentralization reduces inequality over time in the high-income country group, with little effects observed in the low and middle income group. Tax and spending decentralization are negatively associated with inequality over time, for high income countries. Larger local government size mitigates against this positive effect, as does local government elections. The only effect in low and middle income countries is in interactions between tax and spending decentralization and local jurisdiction size. Decentralization harms the poor regardless of local jurisdiction size, though the magnitude of the effect is greater as local jurisdiction size is larger.
- Despite lack of evidence in income distribution estimations, tax and spending decentralization shares some association with absolute poverty. The majority of evidence suggests that greater decentralization leads to more absolute poverty.

This effect is strongest in federal countries, and when the local jurisdiction size is larger. The only contrasting result is in interactions between spending decentralization and local government accountability. This result suggests that higher autonomous spending, combined with local government accountability, can lead to lower poverty

One of the more interesting results comes in interactions between decentralization and local jurisdiction size, particularly for low and middle income countries. Often, tax and spending decentralization to larger local government size (area) leads to higher inequality and absolute poverty. The decentralization literature covered in chapter 1 may have suggested a different result regarding LG size. Prud'homme (1995) argues that decentralization could be harmful for the poorest due to wealthier citizens being more mobile. Another theory is that when government size is smaller (i.e. the size of the local government), this leads to greater competition between governments, which could exacerbate certain effects, such as lower taxes on capital or mobile citizens, and less spending on the poorest (Hoyt, 1991; Keen and Marchand, 1997; Boadway and Shah, 2009). However, in the results we see that when the local government size is larger, fiscal decentralization is bad for the poor. This may mean that wealthier citizens and capital is already freely mobile, regardless of local government size, and that by reducing local government size this doesn't have any negative on the poorest with respect to the arguments above on mobility and competition. However, when local government size is smaller, poorer citizens may be more mobile, and consequently, will also be able to discipline governments through mobility. Also, smaller local governments will be more responsive to local citizens, which could empower the poorest further, improving poverty alleviation programs and policy at the local level. These ideas are difficult to test; however, the main finding here is that lower government area size is not detrimental for the poor, the opposite true in fact.

3.6. Additional Interactions

In the final set of results, I provide estimates for the effects of fiscal decentralization on income distribution and poverty through three interactions: economic growth, government expenditure and governance. The aim of these interactions is to determine whether fiscal decentralization has a different effect during periods of higher or lower

growth; when government spending is higher and when corruption is lower (better quality government). I restrict my estimations in this section to the cross-sectional IV model and the random effects panel estimator.

3.6.1. Income Distribution

The first stage results for the cross-sectional IV estimator are presented in table 21. Once again, local democracy and ethnolinguistic fractionalisation observe some individual significance. The nature of the relationship is as expected (positive for both). The f-test of collective significance often rejects the null hypothesis at the 1 or 5% level. The only exception is when interactions between tax and spending decentralization, and electoral decentralization are included in the second stage, and are exogenous variables in the first stage.

The corresponding results for the second stage are presented in table 22. Tax and spending decentralization are found to be statistically significant in only two specifications. First, greater tax decentralization helps to reduce income inequality during periods of higher growth (2). A similar result is observed in interactions between autonomous spending decentralization and growth in specification 10. The diagnostic statistics in table 22 suggest that the instruments are exogenous (Hansen J-statistic) and that decentralization may also be exogenous in the OLS estimations, as indicated by the high p-values for the Durbin-Wu-Hausman test – above 0.10 in every specification.

The final set of estimates are for the random effects panel estimator. I produce estimates for the entire sample in table 23, high income countries in table 24, and low and middle income countries in table 25. The results are mostly insignificant, and sensitive to the selection of countries chosen in the estimations.

There is limited evidence that fiscal decentralization has an effect on income distribution for the entire sample, in table 23. This was the case in the initial interactions in table 14. Greater tax decentralization helps to reduce income inequality, when the quality of government is higher, as measured by the corruption perception index (specification 4). This effect is not consistent between the different indicators of tax and spending decentralization, as there is no statistical relationship in specifications 8 and 12. The only other statistical relationship is in specification 10

Table 21: Cross Sectional IV Estimates (1st Stage) Dependent Variable: Decentralization, with Additional Interactions (Entire Sample)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	0.625	4.760**	0.223	-1.859	-1.378	3.351*	-1.786	-2.647**	-0.100	3.555**	-0.569	-1.432
	(2.567)	(1.778)	(2.531)	(1.310)	(2.496)	(1.823)	(2.458)	(1.283)	(2.559)	(1.534)	(2.454)	(1.305)
Instrument Variables												
Local	0.116**	0.071**	0.108*	-0.011	0.168***	0.100***	0.148***	0.003	0.122**	0.059*	0.112*	0.010
Democracy	(0.055)	(0.034)	(0.057)	(0.023)	(0.046)	(0.029)	(0.050)	(0.024)	(0.057)	(0.032)	(0.057)	(0.023)
Ethnic	0.161	0.082	0.123	0.048	0.073	0.034	0.029	0.012	0.152*	0.095*	0.107	0.009
Fractionalisation	(0.097)	(0.062)	(0.102)	(0.047)	(0.115)	(0.079)	(0.120)	(0.049)	(0.089)	(0.047)	(0.095)	(0.048)
Second Stage Controls												
Real GDP per	-0.053	-0.061***	-0.044	0.041*	-0.039	-0.043*	-0.029	0.037*	-0.052	-0.045***	-0.043	0.025
capita	(0.040)	(0.017)	(0.041)	(0.022)	(0.043)	(0.024)	(0.045)	(0.021)	(0.037)	(0.013)	(0.036)	(0.023)
Economic	0.005	-0.036***	0.004	0.006	0.006	-0.035***	0.005	0.008	0.008	-0.022***	0.007	0.008
Growth	(0.011)	(0.008)	(0.011)	(0.006)	(0.010)	(0.011)	(0.010)	(0.006)	(0.010)	(0.005)	(0.010)	(0.005)
Inflation	0.001	0.000	0.001	0.000	0.001	-0.000	0.001	0.000	0.001	0.000	0.001	0.000
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Trade	-0.074	-0.077***	-0.077	0.009	-0.020	-0.041	-0.030	0.021	-0.044	-0.054**	-0.048	0.018
	(0.046)	(0.028)	(0.046)	(0.025)	(0.044)	(0.027)	(0.042)	(0.025)	(0.042)	(0.023)	(0.041)	(0.023)
Government	0.000	-0.000	-0.004	0.000	0.000	-0.000	-0.006*	0.000	0.000	-0.000	-0.003	0.000
Expenditure	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
Governance	0.042**	0.042***	0.037**	-0.050***	0.027	0.031**	0.021	-0.051***	0.035**	0.034***	0.029**	-0.032***
	(0.016)	(0.010)	(0.017)	(0.011)	(0.020)	(0.014)	(0.021)	(0.009)	(0.014)	(0.007)	(0.013)	(0.011)
Immunization	0.067	-0.140	-0.048	-0.063	-0.130	-0.211	-0.273	-0.057	0.335	0.041	0.180	-0.061
	(0.308)	(0.207)	(0.308)	(0.147)	(0.314)	(0.238)	(0.351)	(0.157)	(0.326)	(0.183)	(0.339)	(0.151)
Sanitation	-0.016	0.047	0.007	-0.057	0.067	0.090	0.099	-0.024	-0.037	0.016	-0.001	-0.036
	(0.119)	(0.067)	(0.126)	(0.064)	(0.122)	(0.066)	(0.132)	(0.070)	(0.125)	(0.055)	(0.127)	(0.067)
Decentralization		0.182***	0.008	0.146***		0.184***	0.013*	0.146***		0.189***	0.010*	0.141***
(Interaction)		(0.023)	(0.005)	(0.014)		(0.028)	(0.007)	(0.012)		(0.020)	(0.005)	(0.014)
F-test (p-value) for instruments	0.008	0.050	0.049	0.602	0.001	0.006	0.017	0.910	0.005	0.030	0.032	0.760
Observations	42	42	42	42	42	42	42	42	41	41	41	41
R-squared	0.561	0.867	0.576	0.908	0.566	0.842	0.602	0.915	0.521	0.877	0.552	0.904

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 22: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Income Distribution, with Additional Interactions (Entire Sample)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	1.730	-3.014	1.541	4.506	2.119	-2.465	2.002	26.278	3.030	-2.666	3.014	14.396
	(3.936)	(5.675)	(3.864)	(7.807)	(3.800)	(5.507)	(3.657)	(64.435)	(4.082)	(5.279)	(4.037)	(17.072)
Decentralization Indicator												
SCG Revenue	0.196	0.658	0.122	1.208								
	(0.253)	(0.510)	(0.339)	(3.166)								
SCG					0.152	0.611	0.117	9.140				
Expenditure					(0.247)	(0.528)	(0.350)	(23.313)				
SCG Autonom									0.175	0.907*	0.159	7.515
Expenditure									(0.252)	(0.528)	(0.350)	(10.105)
Decentralization Interactions												
Decentralization		-0.197*				-0.204				-0.297**		
x Growth		(0.120)				(0.133)				(0.129)		
Decentralization			0.004				0.002				0.000	
x Expenditure			(0.010)				(0.012)				(0.012)	
Decentralization				-0.199				-1.379				-1.123
x Governance				(0.471)				(3.434)				(1.463)
Controls												
Real GDP per	-0.007	0.026	-0.006	-0.070	-0.012	0.011	-0.011	-0.368	-0.002	0.027	-0.002	-0.238
capita	(0.049)	(0.049)	(0.048)	(0.127)	(0.048)	(0.043)	(0.047)	(0.907)	(0.049)	(0.042)	(0.048)	(0.345)
Economic	-0.013	0.029	-0.013	-0.019	-0.013	0.030	-0.013	-0.085	-0.016	0.025	-0.016	-0.071
Growth	(0.013)	(0.030)	(0.012)	(0.021)	(0.013)	(0.032)	(0.013)	(0.185)	(0.014)	(0.024)	(0.013)	(0.077)
Inflation	-0.002**	-0.002**	-0.002**	-0.002*	-0.002**	-0.002**	-0.002**	-0.004	-0.002**	-0.002*	-0.002**	-0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)	(0.001)	(0.004)
Trade	-0.040	-0.001	-0.048	-0.088	-0.049	-0.015	-0.052	-0.271	-0.053	-0.009	-0.054	-0.221
	(0.061)	(0.070)	(0.067)	(0.101)	(0.064)	(0.076)	(0.070)	(0.585)	(0.060)	(0.068)	(0.065)	(0.251)
Government	0.001	0.001	-0.001	0.001	0.001	0.001	-0.000	-0.002	0.000	0.001	0.000	-0.001
Expenditure	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)	(0.001)	(0.005)	(0.008)	(0.001)	(0.001)	(0.005)	(0.003)
Governance	-0.046**	-0.066**	-0.046**	0.036	-0.043**	-0.060**	-0.042**	0.450	-0.047**	-0.071***	-0.047**	0.227
	(0.021)	(0.028)	(0.021)	(0.170)	(0.018)	(0.024)	(0.018)	(1.224)	(0.020)	(0.026)	(0.020)	(0.364)
Immunization	0.000	0.186	-0.051	0.073	0.016	0.158	-0.009	0.534	-0.108	0.121	-0.111	0.567
	(0.591)	(0.637)	(0.618)	(0.586)	(0.615)	(0.650)	(0.665)	(1.799)	(0.582)	(0.576)	(0.604)	(1.618)
Sanitation	0.119	0.928	0.209	-0.536	0.050	0.891	0.097	-5.634	-0.097	0.881	-0.090	-3.166
	(0.612)	(0.818)	(0.634)	(1.836)	(0.598)	(0.798)	(0.627)	(15.017)	(0.689)	(0.825)	(0.710)	(4.474)
DWH test (p-value)	0.189	0.242	0.308	0.514	0.123	0.146	0.203	0.263	0.132	0.187	0.205	0.197
Hansen J-statistic (p-value)	0.880	0.814	0.932	0.216	0.772	0.724	0.781	0.826	0.795	0.925	0.793	0.879
Observations	42	42	42	42	42	42	42	42	41	41	41	41
R-squared	0.643	0.649	0.654	0.584	0.646	0.646	0.651		0.649	0.662	0.651	

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using a local democracy dummy variable and ethnic fractionalisation, from the first stage. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided

Greater autonomous spending increases inequality when there is economic growth. This result is in contrast to the cross-sectional IV results, and is only significant at the 10% level.

Despite the lack of evidence of a relationship for the entire sample in table 23, high income countries once again observe stronger effects of decentralization on inequality. First, tax, spending and autonomous spending all help to reduce income inequality when growth is 0 (specifications 2, 6 and 10). There is no effect when there is growth (or negative growth). This suggests that during periods of lower growth, greater decentralization can help reduce income inequality.

Second, revenue decentralization, interacting with government spending produces a significant effect. The negative coefficient in specification 3 indicates that higher tax decentralization, combined with lower government spending, can help reduce income inequality.

Third, greater autonomous spending decentralization can reduce income inequality when the quality of government is lower, and increase income inequality when it is higher. This result is rather interesting. This result suggests that instead of fiscal decentralization having (more) positive effects when the quality of government is greater, fiscal decentralization appears to mitigate against the potential negative consequences of corruption on inequality, as observed in Gupta et al. (2002).

The final estimations are for low and middle income countries in table 25. There is almost no evidence that fiscal decentralization has an effect on income distribution in low and middle income countries. There is only one significant result. When the quality of government is lower – as indicated with a lower score on the corruption perception index – greater spending decentralization increases income inequality (specification 8). This result is statistically significant at the 10% level only, and does not appear in interactions between governance and tax or autonomous spending decentralization. Nevertheless, this suggests that greater spending decentralization can be harmful for the poor, if the quality of government is lower and corruption is higher, as measured by the CPI.

Overall the results in the additional interactions do not provide a greater insight into the effects of fiscal decentralization. Once again, high income countries exhibit the strongest effects in table 21 for the random effects panel estimator. The results indicate that tax and spending decentralization can continue to reduce income inequality during periods of low growth, low spending and when the quality of government is lower.

Table 23: Random Effects Panel Estimates, Dependent Variable: Income Distribution, with Additional Interactions (Entire Sample)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	2.874**	2.946**	2.829**	2.842**	2.876**	2.945**	2.958**	3.103***	3.109***	3.361***	3.367***	3.028***
	(1.200)	(1.214)	(1.247)	(1.179)	(1.204)	(1.216)	(1.229)	(1.167)	(1.122)	(1.110)	(1.207)	(1.116)
Decentralization Indicator												
SCG Revenue	-0.119	-0.139	1.215	0.498								
	(0.132)	(0.120)	(1.746)	(0.361)								
SCG					0.034	0.002	2.075	0.568				
Expenditure					(0.140)	(0.117)	(1.777)	(0.438)				
SCG Autonom									0.015	-0.165	2.479	0.431
Expenditure									(0.222)	(0.130)	(2.116)	(0.511)
Decentralization Interactions												
Decentralization		0.012				0.015				0.032*		
x Growth		(0.016)				(0.014)				(0.017)		
Decentralization			-0.056				-0.085				-0.102	
x Expenditure			(0.070)				(0.071)				(0.082)	
Decentralization				-0.107**				-0.088				-0.074
x Governance				(0.053)				(0.062)				(0.067)
Controls												
Real GDP per	-0.119**	-0.115**	-0.118**	-0.120**	-0.119*	-0.117*	-0.115*	-0.108*	-0.152**	-0.143*	-0.144**	-0.132**
capita	(0.059)	(0.058)	(0.058)	(0.060)	(0.065)	(0.065)	(0.065)	(0.063)	(0.074)	(0.074)	(0.071)	(0.067)
Economic	0.003***	0.000	0.003***	0.003***	0.003***	-0.000	0.003***	0.003***	0.003***	-0.001	0.003***	0.003***
Growth	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Inflation	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001**	-0.001***	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Trade	0.036	0.039	0.033	0.031	0.032	0.037	0.028	0.027	0.028	0.029	0.020	0.015
	(0.039)	(0.040)	(0.039)	(0.038)	(0.037)	(0.038)	(0.038)	(0.037)	(0.043)	(0.040)	(0.041)	(0.038)
Government	0.038**	0.038**	0.053**	0.037**	0.036**	0.038**	0.058**	0.033*	0.040**	0.041**	0.058**	0.038**
Expenditure	(0.016)	(0.016)	(0.025)	(0.016)	(0.018)	(0.018)	(0.025)	(0.018)	(0.018)	(0.019)	(0.024)	(0.017)
Governance	-0.005	-0.006	-0.005	0.025	-0.007	-0.008	-0.007	0.016	0.000	0.001	0.002	0.010
	(0.007)	(0.007)	(0.007)	(0.019)	(0.007)	(0.007)	(0.007)	(0.019)	(0.006)	(0.006)	(0.006)	(0.012)
Immunization	-0.043	-0.053	-0.040	-0.038	-0.016	-0.026	-0.009	-0.019	-0.003	-0.041	-0.018	0.002
	(0.078)	(0.080)	(0.078)	(0.077)	(0.077)	(0.077)	(0.073)	(0.074)	(0.080)	(0.080)	(0.082)	(0.081)
Sanitation	-0.781***	-0.804***	-0.795***	-0.757***	-0.779***	-0.802***	-0.819***	-0.792***	-0.751***	-0.780***	-0.791***	-0.747***
	(0.158)	(0.158)	(0.167)	(0.160)	(0.165)	(0.167)	(0.174)	(0.161)	(0.166)	(0.158)	(0.177)	(0.164)
Primary	-0.015	-0.008	-0.073	-0.059	-0.039	-0.034	-0.141	-0.104	-0.085	-0.094	-0.194	-0.107
Enrolment	(0.224)	(0.225)	(0.214)	(0.207)	(0.222)	(0.223)	(0.214)	(0.206)	(0.194)	(0.192)	(0.224)	(0.196)
Observations	339	339	339	339	334	334	334	334	286	286	286	286
Groups	45	45	45	45	45	45	45	45	43	43	43	43

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 24: Random Effects Panel Estimates, Dependent Variable: Income Distribution, with Additional Interactions (High Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	12.189*	12.940**	8.402	11.758*	13.356*	13.412*	13.311*	12.487*	18.144**	17.674***	17.344**	19.049***
	(6.598)	(6.392)	(7.932)	(6.676)	(7.445)	(7.033)	(7.557)	(6.924)	(7.046)	(6.333)	(7.443)	(6.149)
Decentralization Indicator												
SCG Revenue	-0.436***	-0.433***	-4.206*	-1.048								
	(0.142)	(0.142)	(2.386)	(0.751)								
SCG					-0.199**	-0.198**	0.024	-0.852				
Expenditure					(0.085)	(0.083)	(1.525)	(0.673)				
SCG Autonom									-0.250***	-0.258***	-1.346	-2.000***
Expenditure									(0.088)	(0.076)	(2.071)	(0.731)
Decentralization Interactions												
Decentralization		-0.008				0.005				0.004		
x Growth		(0.011)				(0.009)				(0.014)		
Decentralization			0.150				-0.009				0.042	
x Expenditure			(0.093)				(0.062)				(0.081)	
Decentralization				0.079				0.088				0.233**
x Governance				(0.094)				(0.088)				(0.098)
Controls												
Real GDP per	0.029	0.027	0.007	0.029	0.036	0.036	0.037	0.029	0.022	0.022	0.026	-0.005
capita	(0.096)	(0.093)	(0.090)	(0.096)	(0.117)	(0.115)	(0.120)	(0.114)	(0.127)	(0.129)	(0.127)	(0.109)
Economic	-0.001	0.001	-0.001	-0.001	-0.000	-0.002	-0.001	-0.001	-0.000	-0.001	-0.000	-0.001
Growth	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Inflation	-0.002	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Trade	0.026	0.023	0.037	0.031	0.033	0.031	0.035	0.040	0.013	0.015	0.011	0.051
	(0.044)	(0.045)	(0.039)	(0.045)	(0.042)	(0.042)	(0.043)	(0.043)	(0.046)	(0.047)	(0.045)	(0.038)
Government	0.030*	0.030*	-0.015	0.032*	0.024	0.025	0.026	0.026	0.032	0.032	0.024	0.046***
Expenditure	(0.017)	(0.017)	(0.040)	(0.017)	(0.021)	(0.020)	(0.025)	(0.021)	(0.020)	(0.020)	(0.025)	(0.017)
Governance	-0.000	0.001	0.001	-0.020	-0.005	-0.006	-0.004	-0.029	0.006	0.006	0.007	-0.018
	(0.010)	(0.009)	(0.009)	(0.028)	(0.009)	(0.009)	(0.009)	(0.021)	(0.009)	(0.009)	(0.009)	(0.012)
Immunization	-0.397*	-0.390*	-0.373*	-0.413**	-0.346	-0.349	-0.346	-0.366*	-0.254	-0.263	-0.235	-0.365
	(0.213)	(0.215)	(0.215)	(0.210)	(0.225)	(0.222)	(0.224)	(0.222)	(0.269)	(0.276)	(0.295)	(0.238)
Sanitation	-2.290	-2.478	-1.378	-2.127	-2.600	-2.603	-2.593	-2.342	-3.835**	-3.707**	-3.670**	-3.771***
	(1.593)	(1.538)	(1.882)	(1.616)	(1.810)	(1.696)	(1.827)	(1.659)	(1.735)	(1.528)	(1.818)	(1.463)
Primary	-0.457	-0.433	-0.289	-0.495*	-0.450	-0.459	-0.462	-0.460	-0.359	-0.377	-0.334	-0.526*
Enrolment	(0.287)	(0.286)	(0.294)	(0.284)	(0.303)	(0.285)	(0.319)	(0.289)	(0.369)	(0.329)	(0.361)	(0.298)
Observations	188	188	188	188	184	184	184	184	158	158	158	158
Groups	24	24	24	24	24	24	24	24	23	23	23	23

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 25: Random Effects Panel Estimates, Dependent Variable: Income Distribution, with Additional Interactions (Low and Middle Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	2.133	1.990	1.461	2.045	2.304	2.067	1.882	2.325	2.951*	2.402*	2.766*	2.927*
	(1.666)	(1.602)	(1.705)	(1.687)	(1.672)	(1.561)	(1.643)	(1.684)	(1.520)	(1.392)	(1.475)	(1.521)
Decentralization Indicator												
SCG Revenue	0.161	0.077	3.892	0.589								
	(0.202)	(0.185)	(2.924)	(0.415)								
SCG					0.261	0.132	3.561	0.754*				
Expenditure					(0.263)	(0.216)	(2.676)	(0.454)				
SCG Autonom									0.242	-0.129	3.417	0.782
Expenditure									(0.356)	(0.341)	(2.320)	(0.535)
Decentralization Interactions												
Decentralization		0.025				0.022				0.036		
x Growth		(0.018)				(0.017)				(0.024)		
Decentralization			-0.168				-0.150				-0.145	
x Expenditure			(0.128)				(0.116)				(0.100)	
Decentralization				-0.125				-0.140				-0.183
x Governance				(0.093)				(0.085)				(0.181)
Controls												
Real GDP per	-0.202***	-0.184***	-0.200***	-0.212***	-0.195***	-0.187***	-0.199***	-0.196***	-0.229***	-0.205***	-0.243***	-0.233***
capita	(0.077)	(0.065)	(0.075)	(0.079)	(0.074)	(0.068)	(0.076)	(0.073)	(0.086)	(0.077)	(0.086)	(0.088)
Economic	0.006***	-0.001	0.005***	0.006***	0.005***	0.000	0.005***	0.005***	0.006***	0.000	0.006***	0.006***
Growth	(0.002)	(0.005)	(0.001)	(0.002)	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Inflation	-0.001**	-0.001***	-0.001***	-0.001**	-0.001**	-0.001***	-0.001***	-0.001**	-0.000	-0.001**	-0.001	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Trade	-0.015	-0.001	-0.012	-0.014	-0.021	-0.005	-0.024	-0.021	-0.032	-0.009	-0.039	-0.033
	(0.038)	(0.041)	(0.038)	(0.038)	(0.040)	(0.042)	(0.039)	(0.039)	(0.041)	(0.041)	(0.041)	(0.039)
Government	0.058***	0.056***	0.101**	0.059***	0.056**	0.057***	0.095**	0.056**	0.063**	0.059**	0.093***	0.065**
Expenditure	(0.022)	(0.021)	(0.041)	(0.022)	(0.022)	(0.021)	(0.039)	(0.023)	(0.026)	(0.025)	(0.035)	(0.027)
Governance	0.003	0.003	0.000	0.035	0.001	0.002	-0.001	0.033	0.017	0.010	0.017	0.038
	(0.015)	(0.015)	(0.015)	(0.032)	(0.015)	(0.014)	(0.014)	(0.028)	(0.017)	(0.014)	(0.015)	(0.029)
Immunization	-0.013	-0.021	-0.003	-0.025	-0.012	-0.018	-0.003	-0.025	-0.097	-0.067	-0.085	-0.113
	(0.109)	(0.108)	(0.104)	(0.104)	(0.106)	(0.105)	(0.102)	(0.097)	(0.124)	(0.097)	(0.120)	(0.117)
Sanitation	-0.663***	-0.733***	-0.693***	-0.643***	-0.674***	-0.721***	-0.715***	-0.669***	-0.626***	-0.692***	-0.664***	-0.615***
	(0.150)	(0.149)	(0.160)	(0.148)	(0.148)	(0.151)	(0.155)	(0.141)	(0.142)	(0.137)	(0.151)	(0.137)
Primary	0.102	0.172	0.052	0.099	0.071	0.145	0.020	0.050	0.003	0.123	-0.042	-0.005
Enrolment	(0.273)	(0.264)	(0.258)	(0.274)	(0.274)	(0.260)	(0.264)	(0.278)	(0.252)	(0.236)	(0.246)	(0.253)
Observations	151	151	151	151	150	150	150	150	128	128	128	128
Groups	27	27	27	27	27	27	27	27	25	25	25	25

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

3.6.2. Absolute Poverty

The final set of estimates I present in this research are for interactions between tax and spending decentralization and growth, spending and governance, and absolute poverty and low and middle income countries. In the previous estimations in section 3.5.2, I found some evidence that fiscal decentralization, specifically spending decentralization was positively associated with absolute poverty.

The cross-sectional IV estimations produce little evidence that tax and spending decentralization explain cross-sectional variations in poverty. The first stage estimates in table 26 are similar to those in table 17, where ethnolinguistic fractionalisation and local democracy are not as effective in capturing variations in tax and spending decentralization for low and middle income countries. Occasionally ethnolinguistic fractionalisation captures variations in decentralization, and occasionally the f-test of collective significance of the instruments is rejected at the 10% level. However, the instrumentation of decentralization for low and middle income countries remains an issue.

With this in mind, the second stage estimates provide only limited evidence of an association between tax and spending decentralization and absolute poverty through the additional interactions of growth, total public spending and governance. Tax decentralization in specification 3, and spending decentralization in specification 7, reduce absolute poverty when government spending is lower. This suggests that decentralization is potentially helpful to the poor when tax resources are scarce. The effect is stronger for tax decentralization – a 1% increase in tax decentralization, when government spending is close to 0, can reduce absolute poverty by over 10%. However, there is no similar effect for autonomous spending in specification 11.

The only other statistically significant effect is in specification 12. When the quality of government is lower, reflected by a low score on the corruption perception index, greater autonomous spending decentralization can reduce income inequality substantially. If the CPI score is 0, then a 1% increase in autonomous spending decentralization, reduces absolute poverty by 50% between countries. However, when the quality of government is sufficiency higher (approximately 3/10 on the CPI score), further autonomous spending decentralization increases absolute poverty. This result has been observed in previous estimations, namely table 24, random effects panel estimates for income distribution in high income countries.

Table 26: Cross Sectional IV Estimates (1st Stage), Dependent Variable: Decentralization, with Additional Interactions (Low and Middle Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-2.349	3.648	-1.656	0.131	-2.775	1.790	-1.923	-0.236	-0.701	2.900	-0.358	-0.705
	(3.789)	(2.720)	(4.684)	(0.787)	(3.105)	(2.081)	(3.549)	(0.873)	(3.211)	(1.578)	(3.565)	(0.707)
Instrument Variables												
Local	-0.152	-0.032	-0.189	-0.027	-0.120	-0.024	-0.185**	-0.032	-0.051	0.021	-0.075	-0.036
Democracy	(0.108)	(0.082)	(0.100)	(0.017)	(0.077)	(0.069)	(0.058)	(0.017)	(0.067)	(0.048)	(0.069)	(0.019)
Ethnic	0.310*	0.108	0.344**	0.070	0.259*	0.109	0.304**	0.067	0.169	0.049	0.190	0.053
Fractionalisation	(0.141)	(0.110)	(0.130)	(0.047)	(0.112)	(0.088)	(0.119)	(0.044)	(0.120)	(0.081)	(0.132)	(0.036)
Second Stage Controls												
Real GDP per	0.010	-0.041	0.004	0.008	-0.000	-0.032	-0.006	-0.003	0.021	-0.008	0.019	-0.003
capita	(0.066)	(0.037)	(0.078)	(0.016)	(0.055)	(0.030)	(0.059)	(0.017)	(0.056)	(0.028)	(0.059)	(0.013)
Economic	0.008	-0.023*	0.010	0.002	0.011	-0.016*	0.015	0.002	0.006	-0.014**	0.008	0.004*
Growth	(0.011)	(0.010)	(0.012)	(0.003)	(0.009)	(0.008)	(0.010)	(0.003)	(0.010)	(0.005)	(0.011)	(0.002)
Inflation	0.002**	0.000	0.002**	-0.000	0.001***	0.001*	0.001***	0.000	0.002***	0.000*	0.002**	-0.000
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Trade	-0.014	-0.087*	0.007	0.012	0.012	-0.058	0.060	0.000	0.038	-0.020	0.061	0.008
	(0.057)	(0.040)	(0.084)	(0.014)	(0.047)	(0.032)	(0.072)	(0.014)	(0.044)	(0.024)	(0.070)	(0.011)
Government	0.027**	0.011	0.081	0.005	0.029***	0.012	0.091	0.007	0.022***	0.007	0.044	0.005
Expenditure	(0.010)	(0.007)	(0.106)	(0.003)	(0.007)	(0.007)	(0.053)	(0.004)	(0.006)	(0.004)	(0.040)	(0.003)
Governance	-0.020	0.011	-0.018	-0.070***	-0.020	0.004	-0.017	-0.066***	-0.038	0.000	-0.037	-0.041***
	(0.037)	(0.019)	(0.045)	(0.015)	(0.033)	(0.015)	(0.037)	(0.016)	(0.033)	(0.013)	(0.036)	(0.009)
Immunization	-0.163	-0.346	-0.127	0.034	-0.223	-0.189	-0.128	0.026	-0.441	-0.399	-0.393	0.094
	(0.581)	(0.431)	(0.603)	(0.167)	(0.436)	(0.327)	(0.415)	(0.178)	(0.537)	(0.316)	(0.521)	(0.164)
Sanitation	0.014	0.081	-0.028	-0.027	0.071	0.076	-0.018	0.011	0.096	0.095	0.053	-0.038
	(0.157)	(0.115)	(0.191)	(0.045)	(0.123)	(0.083)	(0.150)	(0.053)	(0.128)	(0.061)	(0.129)	(0.044)
Primary	0.678	-0.353	0.511	-0.021	0.768	-0.145	0.521	0.062	0.450	-0.282	0.343	0.116
Enrolment	(0.682)	(0.503)	(0.827)	(0.120)	(0.560)	(0.426)	(0.676)	(0.158)	(0.501)	(0.321)	(0.583)	(0.164)
Decentralization		0.137***	-0.134	0.302***		0.122***	-0.140	0.287***		0.127***	-0.058	0.321***
(Interaction)		(0.027)	(0.256)	(0.026)		(0.026)	(0.112)	(0.036)		(0.020)	(0.099)	(0.044)
F-test (p-value) for instruments	0.103	0.628	0.060	0.338	0.097	0.498	0.045	0.243	0.412	0.734	0.408	0.179
Observations	20	20	20	20	20	20	20	20	19	19	19	19
R-squared	0.759	0.926	0.766	0.982	0.828	0.951	0.849	0.978	0.831	0.968	0.837	0.984

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 27: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Absolute Poverty, with Additional Interactions (Low and Middle Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-20.778	50.917	-67.330	-0.300	-25.035	24.528	-38.148	-3.336	3.048	-34.330	-5.802	-16.417
	(52.769)	(91.258)	(53.965)	(39.627)	(53.837)	(66.267)	(56.672)	(40.758)	(52.210)	(109.967)	(58.982)	(54.614)
Decentralization Indicator												
SCG Revenue	-4.566	-13.431	-10.723***	-27.980								
	(4.620)	(14.713)	(4.155)	(29.530)								
SCG					-5.253	-11.816	-8.226*	-38.837				
Expenditure					(5.605)	(13.674)	(4.640)	(26.126)				
SCG Autonom									-7.622	15.411	-11.941	-49.527**
Expenditure									(8.723)	(37.094)	(8.664)	(21.727)
Decentralization Interactions												
Decentralization		2.197				1.942				-1.567		
x Growth		(2.318)				(1.961)				(4.851)		
Decentralization			5.760				0.886				0.994	
x Expenditure			(3.876)				(2.261)				(2.242)	
Decentralization				9.437				12.936				17.701**
x Governance				(9.989)				(8.475)				(7.912)
Controls												
Real GDP per	-2.047***	-2.821***	-1.624*	-1.902***	-2.100***	-2.655***	-2.003**	-2.220***	-1.812***	-2.231***	-1.634*	-2.177***
capita	(0.701)	(0.787)	(0.907)	(0.665)	(0.697)	(0.624)	(0.836)	(0.674)	(0.659)	(0.605)	(0.854)	(0.664)
Economic	0.074	-0.340	0.061	0.085	0.096	-0.240	0.106	0.072	0.030	0.168	0.028	0.163
Growth	(0.148)	(0.459)	(0.154)	(0.118)	(0.151)	(0.334)	(0.166)	(0.116)	(0.152)	(0.542)	(0.168)	(0.166)
Inflation	0.000	-0.003	0.007	-0.014	0.001	-0.004	0.005	-0.015	0.004	-0.018	0.010	-0.029
	(0.008)	(0.007)	(0.009)	(0.012)	(0.009)	(0.007)	(0.008)	(0.011)	(0.014)	(0.016)	(0.015)	(0.018)
Trade	-1.956**	-3.240*	-2.990***	-1.464**	-1.825**	-2.843**	-2.108*	-1.965***	-1.564**	-1.660	-1.814	-1.619**
	(0.876)	(1.711)	(1.110)	(0.664)	(0.880)	(1.297)	(1.178)	(0.623)	(0.743)	(1.188)	(1.129)	(0.690)
Government	-0.101	-0.074	-2.232	-0.146	-0.068	-0.092	-0.379	-0.106	-0.029	-0.307	-0.300	-0.141
Expenditure	(0.127)	(0.136)	(1.530)	(0.103)	(0.155)	(0.137)	(0.978)	(0.147)	(0.197)	(0.282)	(0.824)	(0.150)
Governance	-0.292	0.040	-0.558	-2.317	-0.300	-0.026	-0.409	-3.042	-0.463	0.072	-0.665	-2.247***
	(0.425)	(0.399)	(0.522)	(2.257)	(0.430)	(0.357)	(0.506)	(1.868)	(0.435)	(0.419)	(0.523)	(0.809)
Immunization	3.916	0.862	0.475	6.956	3.645	4.551	1.257	7.311	-0.587	15.265	-4.154	8.139
	(6.503)	(10.575)	(8.357)	(5.603)	(6.642)	(7.720)	(7.395)	(6.425)	(8.627)	(19.034)	(10.264)	(9.145)
Sanitation	8.897	-1.880	21.570**	2.823	9.803	-0.085	14.487	3.724	6.048	1.659	10.533	5.941
	(9.049)	(11.361)	(9.960)	(6.593)	(9.832)	(9.890)	(9.854)	(7.873)	(10.086)	(10.359)	(11.244)	(9.113)
DWH Test (p-value)	0.428	0.708	0.085	0.678	0.371	0.772	0.170	0.415	0.483	0.565	0.189	0.122
Hansen J-statistic (p-value)	0.190	0.196	0.132	0.163	0.193	0.175	0.148	0.203	0.162	0.015	0.136	0.376
Observations	20	20	20	20	20	20	20	20	19	19	19	19
R-squared	0.748	0.739	0.692	0.766	0.744	0.765	0.711	0.720	0.708	0.706	0.659	0.638

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, Expenditure and Autonomous Expenditure are instrumented using a local democracy dummy variable and ethnic fractionalisation, from the first stage. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided

The final estimates are produced using a random effects panel estimator in table 28. These results suggest that tax and spending decentralization can affect absolute poverty over time, through various interactions. The first effect is in interactions between decentralization and economic growth. Whilst decentralization has no effect on poverty when growth is close to 0, greater tax and spending decentralization can lead to higher absolute poverty when growth is higher. This effect is consistent between the different decentralization indicators in specifications 2, 6 and 10. Economic growth is found to be negatively associated with poverty in specifications 2 and 6, which suggests that growth is good for the poor. However, greater tax and spending decentralization mitigates against this positive effect, and ultimately increases poverty during periods of higher growth.

The second consistent result is in interactions with government spending. When government spending is near to 0, higher tax and spending decentralization have strong positive effects on the level of absolute poverty. Increasing absolute poverty, year on year, by as much as 80.5% (specification 12). As government spending increases, higher levels of tax and spending decentralization can begin to reduce absolute poverty – as indicated by the negative coefficient for the interaction between decentralization and expenditure.

The third result, which applies to tax and spending decentralization, is in interactions with government quality (specifications 4 and 8). Once more, greater tax and spending decentralization increases absolute poverty when the quality of government is higher. In slight contrast to the cross-sectional instrument variable estimates in table 27, there is no effect when the quality of government is very low (close to 0 on CPI score).

Overall, new interactions in the absolute poverty dataset confirm previous estimations of the relationship between decentralization and absolute poverty – further tax and spending decentralization appears to increase absolute poverty in most conditions. The random effects estimations provide evidence that decentralization increases absolute poverty during periods of higher growth, when spending is lower, and when there is less corruption. Perhaps the most interesting result is in interactions between decentralization and the governance indicator. The result, where decentralization increases absolute poverty when the government is perceived to be of better quality, suggests that decentralization may mitigate against the positive effects of a better government quality (see Gupta et al. 2002).

Table 28: Random Effects Panel Estimates, Dependent Variable: Absolute Poverty, with Additional Interactions (Low and Middle Income Countries)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	14.447	12.917	3.932	16.375	20.022	16.377	12.151	20.929	22.251	13.971	18.987	20.730
	(21.879)	(18.429)	(19.880)	(21.297)	(21.912)	(17.237)	(19.435)	(21.571)	(20.940)	(18.366)	(18.227)	(21.269)
Decentralization Indicator												
SCG Revenue	2.512	0.040	68.039**	-4.961								
	(1.705)	(1.387)	(33.837)	(4.169)								
SCG					4.946*	0.956	75.246***	-3.336				
Expenditure					(2.973)	(2.129)	(27.428)	(5.744)				
SCG Autonom									6.975**	0.437	80.485***	-2.678
Expenditure									(3.033)	(2.689)	(21.505)	(8.013)
Decentralization Interactions												
Decentralization		0.557***				0.591***				0.649***		
x Growth		(0.183)				(0.182)				(0.180)		
Decentralization			-2.972**				-3.206***				-3.354***	
x Expenditure			(1.499)				(1.182)				(0.930)	
Decentralization				2.343**				2.619**				3.538
x Governance				(1.040)				(1.269)				(2.244)
Controls												
Real GDP per	-1.851**	-1.528*	-1.838**	-1.629*	-1.640**	-1.390*	-1.599*	-1.504*	-1.216	-0.742	-1.129	-1.193
capita	(0.825)	(0.792)	(0.847)	(0.842)	(0.814)	(0.804)	(0.834)	(0.781)	(0.906)	(0.883)	(0.888)	(0.895)
Economic	0.031	-0.110**	0.028	0.032	0.022	-0.102**	0.024	0.024	0.021	-0.060	0.024	0.017
Growth	(0.028)	(0.046)	(0.024)	(0.028)	(0.023)	(0.040)	(0.022)	(0.021)	(0.022)	(0.037)	(0.023)	(0.022)
Inflation	-0.004	-0.004	-0.005	-0.007	-0.003	-0.001	-0.006	-0.006	-0.018	-0.016	-0.023*	-0.018
	(0.010)	(0.008)	(0.009)	(0.010)	(0.009)	(0.008)	(0.009)	(0.010)	(0.014)	(0.012)	(0.014)	(0.013)
Trade	-0.423	0.002	-0.293	-0.436	-0.519	0.058	-0.556	-0.519	-0.340	0.100	-0.497	-0.343
	(0.569)	(0.520)	(0.523)	(0.570)	(0.601)	(0.556)	(0.551)	(0.593)	(0.685)	(0.692)	(0.587)	(0.647)
Government	-0.575*	-0.624**	0.208	-0.622*	-0.640**	-0.632**	0.162	-0.666**	-0.638**	-0.690**	-0.025	-0.674**
Expenditure	(0.319)	(0.308)	(0.451)	(0.321)	(0.322)	(0.311)	(0.394)	(0.323)	(0.320)	(0.332)	(0.386)	(0.316)
Governance	0.006	0.025	-0.058	-0.604	-0.011	0.046	-0.072	-0.618	0.010	-0.090	0.001	-0.444
	(0.191)	(0.170)	(0.158)	(0.395)	(0.170)	(0.164)	(0.152)	(0.393)	(0.226)	(0.180)	(0.183)	(0.379)
Immunization	1.281	0.491	1.392	1.334	1.388	0.502	1.694	1.447	0.461	0.447	0.914	0.861
	(2.094)	(1.696)	(1.879)	(2.085)	(1.880)	(1.654)	(1.767)	(1.822)	(2.013)	(1.670)	(1.917)	(2.135)
Sanitation	-2.270	-3.310**	-2.530	-2.576	-2.416*	-3.430**	-3.039**	-2.582*	-2.728*	-3.682**	-3.563*	-2.799*
	(1.420)	(1.429)	(1.571)	(1.601)	(1.380)	(1.407)	(1.532)	(1.496)	(1.568)	(1.605)	(1.864)	(1.630)
Primary	3.588	5.029	2.189	3.644	2.301	4.000	0.499	2.493	2.015	3.908	0.153	2.445
Enrolment	(3.541)	(3.095)	(3.486)	(3.538)	(3.476)	(2.856)	(3.262)	(3.475)	(3.652)	(3.434)	(2.952)	(3.758)
Observations	121	121	121	121	120	120	120	120	99	99	99	99
Groups	25	25	25	25	25	25	25	25	23	23	23	23

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

3.6.3. Additional Interactions Summary

Once again, interactions between decentralization and various conditions: growth, government spending and governance, produce different results for high income countries and low and middle income countries:

i) Higher income countries continue to observe negative effects of decentralization on inequality. During periods of low growth, when government spending is lower, and (perceived) corruption is higher, decentralization helps to reduce income inequality over time (random effects estimations). There is no effect in the low and middle income sample

ii) Fiscal decentralization continues to increase absolute poverty in low and middle income countries, particularly over time. During periods of higher growth, when government spending is lower, and when the quality of government is higher, greater tax and spending decentralization result in higher levels of absolute poverty. Only when there is sufficient levels of government spending, does tax and spending decentralization benefit the absolute poor

3.7. Conclusions and Closing Remarks

In this chapter I investigated whether the degree of fiscal decentralization and aspects of government decentralization had an effect on the level of income inequality and the extent of absolute poverty. The aim of this chapter was to determine whether fiscal decentralization had any effect on poverty and income distribution, and if so, whether further decentralization helped to reduce poverty, or exacerbate poverty, at the national level. Any evidence could then be used to support the various arguments addressed in the related literature (3.1). To achieve this aim I used the fiscal decentralization dataset (chapter 2), and data on income distribution and absolute poverty for low and middle income countries. I used various econometric methods to produce two sets of cross-sectional estimates, one with ordinary least squares, and another with instrument variables, and a set of random effects panel estimates. The conclusions of the empirical research are summarised below:

1. Across the estimations, there is evidence that fiscal decentralization could reduce income inequality in higher income countries and increase absolute poverty in low and middle income countries. In income distribution estimations, when the sample is split into a high-income group and a low and middle income group, there is contrasting fortunes with respect to decentralization. High income countries observe consistent, negative effects of decentralization on income inequality. Low and middle income groups observe either no effect, or positive effects in the corresponding estimates.
2. These results are also supported by additional interactions. Further tax and spending decentralization reduces income inequality during periods of lower growth, when government spending is lower and when the quality of government is lower, in the high-income group. There is no effect for low and middle income countries.
3. Tax and spending decentralization leads to higher levels of absolute poverty under most conditions. When the size of the local jurisdiction is larger and in federal countries, tax and spending decentralization is positively associated with absolute poverty. Furthermore, during periods of higher growth and when government spending is lower, decentralization increases absolute poverty.
4. Fiscal decentralization appears to have contrasting effects depending on the size of the local jurisdiction. Where there is statistical significance, tax and spending decentralization often helps reduce income inequality when the average size of the local jurisdiction is smaller. On the other hand, if the size of local government is larger, then fiscal decentralization can be harmful for the poor and poorest. This result runs counter to certain arguments in the literature. Oates (1972) and Boadway and Shah (2009) caution against fiscal decentralization with respect to redistribution, due to the disincentives for local governments to raise taxes on the wealthiest who can simply move to another region (Prud'homme, 1995). Furthermore, models that explain the effects of fiscal competition also demonstrate that when governments are smaller and there are more of them, competition on tax and expenditure is more intense (see section 1.3.1). Yet, the results here suggest that fiscal decentralization can actually help the poor when local government size is smaller. One explanation for this result may be that in a world where capital and the wealthy are already very mobile, by reducing the size of local government the poorest can also migrate to areas of the country that best

suit their needs. Smaller government size could also improve local government accountability and enhance 'yardstick competition' (see 1.2.5, page 26).

5. Fiscal decentralization can help the poorest when the local government executive is elected locally, and accountable to local citizens. This result is the only evidence that tax and spending decentralization can result in lower absolute poverty.

Overall, the results suggest that fiscal decentralization can help reduce income inequality, particularly in high income countries, and increase absolute poverty in low and middle income countries. The effects of decentralization also depend on other factors such as local jurisdiction size, federal constitution and local government accountability.

This research, the first in this area, provides a useful foundation for further work. I would make two recommendations for further work in this area. First, better instruments are required to examine cross-sectional variations in poverty and the effects of decentralization. The instruments I used in this research, though valid and good predictors of variations in decentralization in income distribution estimations, were very weak for the low and middle income sample. Specifically, ethnolinguistic fractionalisation did not explain variations in decentralization as much as expected.

Second, future research should examine the long-term effects of fiscal decentralization. Due to data limitations, my research focused on the instantaneous effects of fiscal decentralization on income based poverty (absolute and relative). In the next chapter I will examine a related area – the impact of fiscal decentralization on the provision of public services. As part of my thesis on fiscal decentralization and the poor, this chapter raised important questions about the effect that fiscal decentralization can have on incomes of the poor. However, poverty is a multi-dimensional concept, and by improving access to basic public services, such as vaccinations and primary education, the issue of absolute poverty may be tackled in the long run.

4. Public Healthcare, Public Education and Fiscal Decentralization

In this chapter I investigate whether there is an association between fiscal decentralization and public healthcare and public education. By public healthcare and public education, I refer to the availability of essential public healthcare services, such as vaccinations, and general healthcare, and of primary education and the quality of the education provided. The aim of this research is to establish whether fiscal decentralization improves the delivery of and consumption of these public services.

Though the relationship between fiscal decentralization and public services has received attention recently (see Treisman, 2000; Khaleghian, 2004; Falch and Fischer, 2012), my empirical research focuses on the different concepts of decentralization and under what conditions fiscal decentralization can improve access to and delivery of public healthcare and public education services, if at all. My research contributes to this area of research in a number of ways:

i) I use the extensive dataset outlined in chapter 2 to establish whether expenditure share (SCG Expenditure) and autonomous subnational government spending (SCG Autonomous Expenditure) observe different effects on public healthcare and public education. I also incorporate measures of other aspects of decentralization, such as electoral decentralization, legislative decentralization and federal constitution to identify whether local government autonomy and accountability have a bearing on the relationship between spending decentralization and public healthcare and public education.

ii) I examine whether fiscal decentralization has different effects on public healthcare and public education depending on the degree of heterogeneity in demands for public goods and services[36], which is often assumed to strengthen the case for greater decentralization (Oates, 1972)

iii) Finally, I examine whether fiscal decentralization has different effects according to the level of total government spending. The interaction between decentralization of spending and the level of total government spending could indicate whether low or high income countries should pursue decentralization policy in order to improve public healthcare and public education

[36] The measure used to represent heterogeneity contains information on income inequality, ethnolinguistic fractionalization, urbanization and so on that could explain variations in the demand for public goods and services. Index is from Ivanyna and Shah (2014), available here: http://dx.doi.org/10.5018/economics-ejournal.ja.2014-3

Using a dataset containing 40 low, middle and high income countries over a period of 20 years, between 1990 and 2009, I produce several estimations for the relationship between fiscal decentralization and public healthcare and education. My final results suggest that fiscal decentralization is neither universally good nor bad for the provision and consumption of public services. My results show that the relationship between fiscal decentralization and public healthcare and public education is sensitive to the degree of fiscal autonomy; to other aspects of decentralization; the degree of heterogeneity of need and the level of total expenditure on healthcare and education.

The structure of this chapter is as follows. In section 3.1 I bring together the public healthcare and education literature and fiscal decentralization literature, and establish how fiscal decentralization may be associated with public services. In section 3.2 I outline the data used in this empirical research. In section 3.3 I provide descriptive statistics for the dataset used in this empirical research. In section 3.4 I outline the methodology and decisions that I have made to improve the credibility of my conclusions. In section 3.5 I provide a selection of estimates for the cross-sectional and panel data, and provide an analysis of the results. Finally, in section 3.6 I provide a conclusion for this research and my closing remarks.

4.1. Related Literature

In this literature survey I establish links between fiscal decentralization and public healthcare and public education. I provide a brief introduction on public provision, including a summary of arguments in favour of publicly funded healthcare and education. I consider the various demand and supply side factors. I consider whether increasing expenditure on public services is the best policy for improving outcomes, and consider what constraints exist that reduce access, particularly for the poorest. I then explain how fiscal decentralization could improve the delivery of public services and remove barriers to access. I also consider how fiscal decentralization could harm nationwide delivery of public services and lead to inter-regional inequality in the availability and quality of public healthcare and education.

4.1.1. Public Healthcare and Public Education

According to recent statistics, the large majority of healthcare and education services available are publicly funded. In 2011 public sector expenditure on healthcare accounted for 59% of total expenditure, up from 56% in 2000[37]. In OECD member countries, public sector expenditure accounted for 84% of total expenditure on education in 2010[38]. Supporters of public healthcare and education cite the need for equitable service and how best to provide services that are available to everyone (Demery, 2000). Banerjee and Duflo (2011) argue that universal healthcare and education are essential for tackling chronic poverty. Sen (1985) argues that barriers to primary education, and poor healthcare, are significant causes of poverty. Consequently, global initiatives aimed at tackling chronic absolute poverty focus on the need for greater access to basic healthcare, particularly for the poorest, and access to primary education[39]

The recent literature has focused on the various determinants of provision and access to public services. Specifically, there has been a debate about the relative benefits of increasing expenditure to increase provision of public services, both in scale and scope,

[37] The figures for average public expenditure on healthcare are calculated using data from the World Bank (World Development Indicators), for a sample of 186 countries
[38] Average from 34 OECD members in 2010. Education at a Glance, 2013 report, page 205, available here: http://www.oecd.org/edu/eag2013%20(eng)--FINAL%2020%20June%202013.pdf
[39] The Millennium Development Goals included targets for universal primary education, reducing infant mortality rates and reducing absolute poverty

and whether governments should focus instead on removing barriers to access and ensuring that people are able to access the services that are already available.

Makinen et al. (2000) argue that even in the poorest countries, basic healthcare services are provided, but few use them. Ensor and Cooper (2004) explain that the poor are not aware of the services that are intended for them and at what cost. In their research they rank the different reasons why people did use available healthcare services in Bangladesh, and found that 40% of respondents were not aware of the services available to them. Where there is limited knowledge of services and barriers to access, demand (uptake) is lower (Gauri and Khaleghian, 2004), and it is the poor that lose out the most (Ensor and Cooper, 2004).

If demand side barriers exist, then increasing expenditure to increase provision may not necessarily benefit those who are missing out on public services. Where there is evidence that increasing expenditure does not benefit the poorest (see Makinen et al., 2000), Castro-Leal et al. (1999) argue that problems of targeting; the quality of the services available and the barriers to access, are the reasons why. McGuire (2006) and Pal (2010) argue that increases in expenditure should be focused on improving access, by improving infrastructure for example, rather than simply increasing the outputs of healthcare and education.

The empirical evidence supports the view that expenditure is positively associated with the consumption of the services of public healthcare and public education. However, the strength of the relationship between expenditure and access to public services is sensitive to a range of socioeconomic factors. There is also disagreement on the distributional effects of increasing expenditure, and whether increases in expenditure disproportionately benefit the poorest.

Bidani and Ravallion (1997), Gupta et al. (2003) and Wagstaff (2003) provide evidence that increases in public expenditure on healthcare is positively associated with health outcomes (infant mortality and life expectancy) for the poorest. They identify a link between poverty and lower life expectancy and higher infant mortality and contrast the effects of higher expenditure on healthcare on the poor and non-poor. They provide evidence that higher levels of expenditure increase life expectancy and reduce infant mortality rates, and this effect is stronger for the poorest.

There is also evidence that public expenditure on education improves outcomes. Blatchford et al., (2003) and Blatchford et al., (2011) provide evidence that higher

expenditure leads to small class sizes (pupil to teacher ratio), and consequently higher literacy rates. This effect is stronger in early years (primary school) and for lower attainment. Deke (2003) and Yang et al. (2014) provide evidence of a link between public expenditure on education (i.e. free, compulsory education) and access to further education. Deke (2003) also identifies a correlation between further education and higher earnings, and they conclude that further expenditure is positively linked to future earnings.

However, there is some evidence that contradicts the narrative that higher expenditure on public services improves availability of public services, particularly for the poorest. Filmer and Pratchett (1999) argue that when socioeconomic variables (income, income inequality and ethnic fragmentation) are accounted for, healthcare expenditure explains only 1% of the variation in healthcare outcomes. McGuire (2006) also finds evidence that increasing expenditure is ineffective in improving healthcare (infant mortality). He cites various reasons: misallocation of funds, corruption and weak administrative capacity. He concludes that instead of focusing on increasing expenditure, a better approach would be to improve the efficiency and effectiveness of current expenditure.

4.1.2. Decentralization and Public Healthcare and Education: Basic Arguments

In practice the relationship between fiscal decentralization and public healthcare and education could go either way. Oates (1972) and Tiebout (1956) provide two critical arguments in favour of decentralization of provision, namely that local governments are better able to address local needs (Oates) and that citizens are able to pick and choose a set of local policies that best matches their preferences (Tiebout). On the other hand, local governments may be unable to raise sufficient revenues to tend to those needs, due to fiscal competition leading to lower tax rates and expenditure (Hoyt, 1991), or they may free-ride on the provision of public services in a neighbouring jurisdiction when those services exhibit positive spillovers (Besley and Coate, 2003). I provide the case for and against decentralization below.

4.1.2.1. The Case for Decentralization

On the supply side, supporters of decentralization often focus on the efficiency and effectiveness of government spending at the local level. One such argument is that local governments will tailor expenditure to local demand (Khaleghian, 2004), and consequently, decentralization will improve allocative efficiency (Oates, 1972). The provision of public services from a central government may be inefficient, where the central government provides public services that are more regionally uniform (Oates, 1972). For this reason, when there is a greater range of preferences between subsets of the population, the case for decentralization is stronger. Oates also argues that if there are no cost-savings to be had from centralized provision, and there are no external economies, then the case for decentralization trumps the case for centralization whenever demand for public services is not homogeneous.

Decentralized provision of public services may also lead to policy differentiation between jurisdictions. As Tiebout (1956) explains, decentralization can bring about diversity in the provision of public goods and services between local areas and citizens can simply move to the area that best matches their preferences. Local governments effectively compete for citizens, and aim to provide the optimal set of public goods and services at minimum cost to their constituents. Fiscal decentralization essentially empowers citizens to hold local governments to account for local decision making, and if they are not satisfied, voters could choose to move to areas where the provision of public services best matches their needs (Tiebout 1956; Epple et al., 2012).

Fiscal decentralization can also empower citizens to hold local governments to account through local elections. As Seabright (1996) demonstrates, local governments have an incentive to provide a set of public policies, including the provision of essential public services, to satisfy the preference of the local population. Central government on the other hand may simply supply a uniform set of public goods and services that satisfies the median voter (Seabright). Therefore, central governments may indeed provide goods according to a one-size-fits-all dictum (Oates, 1972), as that may be sufficient for the central government to be re-elected. Ultimately, central government may not address local issues regarding supply of and access to public services.

4.1.2.2. The Case for Centralization

Whilst fiscal decentralization may improve the allocation of public expenditure, there are a number of risks involved in further fiscal decentralization.

First, subnational governments may be unable to raise sufficient revenues to finance expenditure to match local demands (Khaleghian, 2004). If the responsibility to raise taxes is devolved to local governments then this could lead to lower taxes on capital and mobile citizens, and reduce expenditure on public goods and services (Hoyt, 1991). Prud'homme (1995) cautions against decentralization for this reason, as local governments may not be able to extract the necessary resources to finance local expenditure on public healthcare and education.

Second, if local governments are responsible for raising their own revenues, then inter-regional inequalities may arise. Boadway and Shah (2009) argue that some areas of the country will be wealthier than others, and if local governments are tasked with raising tax revenue and setting own budgets, then there will be inequality in taxation and expenditure between local governments. Cai and Treisman (2005) demonstrate how inter-regional inequality in endowments (productive capacity through natural resources, human capital etc.) could lead to greater welfare of local citizens and higher spending on public goods (and services). Inequalities may arise in investment in infrastructure and other productivity enhancing goods and services, in capital located in each jurisdiction, in productivity and growth, and consequently in tax revenue, expenditure and the provision of public services.

Pal (2010) and Yang et al. (2014) provide evidence of inter-regional inequality in public education. Pal (2010) observe large inequalities in the distribution of resources in India resulting from concentrations of poor and wealthy households in certain areas. Yang et al. (2014) observe a similar gap in education attainment between rural and urban areas. The gap has narrowed following a policy on providing free and compulsory primary education, supported through local government expenditure. In the event of inter-regional externalities, central governments will need to harmonise expenditures and maintain minimum standards of the public services provided (Garcia-Valinas, 2005).

Third, the central government could retain control over tax revenues, and devolve expenditure functions to subnational governments, but doing so would restrict the

autonomy of subnational government. Subnational governments would be reliant on transfers from the central government, and they would not be able to control the size of their budgets (Brueckner, 2009). Furthermore, transfers from the central government may strings attached (Boadway and Shah, 2009), which would mandate local governments to spend on certain public goods and services (Treisman, 2007). Consequently, local governments may not be able to respond to local demands as they are mandated to spend elsewhere.

Fourth, even if local governments cannot compete through taxation (Hoyt, 1991), they may still compete through expenditure (Keen and Marchand, 1997). This could lead to lower spending on public healthcare and public education. Local governments may allocate too much expenditure to infrastructure and airports, and less on public services in an attempt to attract capital to their jurisdiction (Keen and Marchand, 1997).

Fifth, local governments may spend less on goods that exhibit positive externalities. Besley and Coate (2003) raise the problem of free-riding, whereby the provision of public services in a neighbouring jurisdiction may improve the welfare of local citizens. An example of a service that would exhibit spillovers would be immunization, whereby the health of citizens living in one jurisdiction will also affect the health of jurisdictions in the neighbouring jurisdiction. Without control to increase budgets, local governments may prioritise expenditure on goods and services that do not exhibit positive spillovers. If every local government ignores essential public services for this reason, then those public services will be underprovided nationally.

Oates (1972) and Khaleghian (2004) argue that local governments should only be responsible for providing public goods and services when local governments can fully internalize the costs and benefits of those services. Otherwise, local governments may simply under-provide such services to their local area, which will mean lower provision of public services that exhibit externalities nationally. Essentially, for services that exhibit larger externalities, the case for fiscal decentralization is weaker (Chu and Yang, 2012)

4.1.2.3. Empirical Evidence

The theory suggests that fiscal decentralization could help or hinder national delivery of public healthcare and public education, and the empirical evidence that is available is by

no means conclusive. Mostly, the empirical evidence suggests that fiscal decentralization can improve the provision of public services, however the results are sensitive to the choice of controls and how decentralization is measured.

Treisman (2000) investigates the relationship between several forms of decentralization and the provision of public healthcare (vaccinations and infant mortality) and education (primary enrolment and literacy rates). The cross-sectional evidence suggests that the nature of the relationship between fiscal decentralization and provision is dependent on how decentralization is captured. Specifically, how decisions are arranged between different tiers of government and local government autonomy are negatively associated with provision.

Khaleghian (2004) examines the relationship between fiscal decentralization and vaccination coverage (DPT and measles). Further decentralization is positively associated with coverage in low-income countries, but the opposite is observed in middle-income countries. Jimenez-Rubio (2011) examines the relationship between revenue decentralization, fiscal decentralization and infant mortality. They conclude that fiscal decentralization is negatively associated with infant mortality, and hence positively associated with healthcare. An increase in total expenditure is also positively associated with healthcare, and the effect is stronger than that of decentralization.

Falch and Fischer (2012) investigate the relationship between fiscal decentralization and public education (attainment). They find a positive association between test scores and expenditure decentralization. Accounting for higher levels of total expenditure (general consumption spending) appears to mitigate the effects of expenditure decentralization. Falch and Fischer propose further work on transmission effects on public services.

4.1.3. Summary of Related Literature

Fiscal decentralization could improve the provision of public healthcare and public education, but there are also risks associated with greater fiscal autonomy of local governments. The case for decentralization argues that decentralized government can more effectively provide healthcare and education to local needs, which are often different between one locality and the next (Oates, 1972). Fiscal decentralization also empowers citizens to move to the jurisdiction that best matches their preference for

healthcare and education services (Tiebout 1956). Finally, fiscal decentralization can empower citizens to elect local governments that will deliver the public goods and services that the local citizens want (and need).

On the other hand, by allowing local governments to set own tax rates and decide own expenditure, essential public healthcare and public education services may be under-provided. Local governments may be pressured to reduce taxes on capital and on the wealthy, and reduce government spending on public services (Hoyt, 1991). Local governments may also allocate a higher proportion of public spending to infrastructure, and less to public services (Keen and Marchand, 1997). Fiscal decentralization may also result in unequal access to and quality of public services across the country, which could hurt national outcomes.

It is no surprise then that the results in the related empirical research suggest that the effects of fiscal decentralization are mixed. Some of the studies provide evidence that decentralization improves provision and consumption of public services (Khaleghian, 2004; Falch and Fischer, 2012; Jimenez-Rubio, 2012). However, these studies have used indicators for tax and spending share (SCG Revenue and SCG Expenditure), and their results may not capture the effects of fiscal autonomy and fiscal decentralization on public healthcare and public education. When other forms of decentralization are examined, different results may be realised. Treisman (2000) identifies slightly different effects for local government autonomy (legislative). Furthermore, work should be done to establish transmission effects, i.e. decentralization interacting with other factors, such as expenditure (Falch and Fischer, 2012).

In this research, I build on the suggestions above and my own ideas established in the earlier chapters on different aspects of decentralization.

First, I consider whether fiscal decentralization performs differently when local governments are directly elected or appointed by the central government. On the one hand, local governments that are elected have an incentive to respond to local demands, which may improve the communication of citizen needs to local governments (Khaleghian, 2004). Khaleghian refers to the knowledge issue, whereby either local governments are not knowledgeable about the needs of local citizens, or the citizens are not knowledgeable about the local goods and services available to them. The latter may refer to demand side barriers that exist that reduce consumption of public services that are readily available (Ensor and Cooper, 2004). On the other hand, local governments may under-provide certain goods due to either externalities or competition. Central

governments may seek to control local government decision making through appointments.

Second, autonomy could have an effect on the relationship between tax and spending decentralization and public healthcare and public education. The question is whether simply by increasing the share of subnational government activity will improve provision, as Treisman (2007) and others have argued. Or, whether fiscal autonomy and accountability of local governments provides added incentives that ensure decentralized governments provide public services more efficiently.

Third, Khaleghian (2004) and Besley and Coate (2003) raise the point that fiscal decentralization performs better when there is a greater heterogeneity of need. If there are no cost-savings, fiscal decentralization may be more rewarding if the degree of heterogeneity is higher. In this research I test this theory by interacting an indicator for heterogeneity with fiscal decentralization. The indicator for heterogeneity from Ivanyna and Shah (2014) contains information on income inequality, ethnic fractionalization and geographical differences within the country, which could explain variations in demand for public goods and services. The greater the heterogeneity of demands, the more decentralization is expected to improve allocation of public services.

Fourth, if cost-savings do exist, perhaps due to the administrative costs of providing public goods and services (Boadway and Shah, 2009), fiscal decentralization may perform better when there is greater fiscal capacity (i.e. greater total government spending). If fiscal capacity is higher, then decentralization may be more rewarding as there is more money to spend on providing public services, and the administration costs of decentralized provision will take up a smaller percentage of total expenditures. For this reason, I examine whether fiscal decentralization is more or less rewarding (better for provision) when total expenditures are higher.

If there is a relationship between decentralization and the provision of public services, it is unlikely that the relationship will be strictly positive or negative, and there are other mitigating factors to consider. The nature of the relationship between decentralization and provision could be sensitive to the degree of subnational government autonomy; the accountability of local policymakers, the current degree of decentralization. Fiscal decentralization may also perform differently depending on the degree of heterogeneity and the level of total spending on healthcare and education. Therefore, it is important that we account for these factors when conducting

investigations of the relationship between fiscal decentralization and the provision of public services. In this empirical research, I examine these effects.

4.2. Data Definitions

In this section I outline the indicators used to capture provision of healthcare and education. I provide a brief recap of the decentralization indicators that are available and the reasons why I have selected the decentralization indicators for this research. I outline the control variables used in my models and explain why I have chosen them.

4.2.1. Public Healthcare and Public Education Indicators

I use a total of four indicators to capture the provision of public healthcare and public education. I adopt measures that have been in previous research in this area and where there is a reasonable quantity of data available for a wide range of countries.

To capture the provision of public healthcare I use vaccination coverage: the percentage of children (12-23 months) who received vaccinations for Measles and Diphtheria. Treisman (2000) and Khaleghian (2004) previously used vaccinations as a representation of public healthcare provision. Khaleghian argues that vaccination coverage is an effective proxy for public healthcare provision because the availability of vaccines for measles and DPT are a core part of public health programs and the availability of and access to vaccinations and captures many of the important aspects of public provision (access, knowledge and supply). The second variable is infant mortality rates: the number of infants dying before reaching one year of age, per 1000 births. Treisman (2002) uses this indicator alongside vaccinations to represent changes in healthcare outcomes[40]. Jimenez et al., (2011) also used infant mortality to examine the relationship between fiscal decentralization and healthcare outcomes. By using these two measures I can examine the relationship between fiscal decentralization and the provision of an essential healthcare service and the quality of basic healthcare.

[40] Treisman (2002) distinguishes between outputs and outcomes of provision in his empirical research. Outputs examine a specific aim of provision, such as access to vaccinations and primary education. Outcomes measure the general aim of provision – to improve standards of healthcare and education.

To capture the provision of public education I use two indicators: one for access to public education and one for the quality of public education. For access to public education, I use the primary school enrolment rate. I have chosen to focus on access to primary school enrolment for several reasons. First, this measure has been used in previous research in this area (see Treisman, 2000). One of the aims of this research is to build on previous work by examining the effects of many forms of decentralization. Therefore, I can compare my results with similar studies. Second, the data available for primary school enrolment is greater in scope and scale than other measures for secondary school, further education, or pre-primary school (UNESCO). Third, the chosen measure of public education in this research should reflect availability and accessibility, according to the supply and demand side factors addressed in the literature review in section 4.1. The focus of this empirical research is to see whether decentralization explains variations in access to primary education. An alternative measure, for example, average years of schooling, would not capture access and availability, but would provide information on the availability of education to those who access it, and perhaps the quality of that education. Fourth, universal access to primary education is one of the one of the Millennium Development Goals[41].

Finding a second measure for public education presented a single issue: the availability of data. Falch and Fischer (2012) use test scores to measure attainment; however, the data they used is unavailable for this research. Treisman (2000) uses youth literacy to capture the quality of public education. However, data on youth literacy is very scarce. Instead I opt for classroom size: the ratio of pupils to teacher at primary school level. I use this measure as a proxy for quality of education and for educational attainment[42].

The panel dataset for the public healthcare and education indicators contains a maximum of 360 observations covering 40 countries over 20 years, between 1990 and 2009. There is complete data for the public healthcare indicators; however, the public education literature is available for only half the dataset. The total number of observations for classroom size and primary enrolment is 240 and 256, covering 37 and 36 countries respectively. All data is transformed into logarithms.

[41] The Millennium Development Goals for year 2015, included universal primary education as one of several targets for governments to achieve

[42] Blatchford et al., (2003) and Blatchford et al., (2011) identify a link between classroom size and attainment (youth literacy)

I examine cross-sectional variations in the same way as the previous chapter. I take the averages of each of the indicators for public healthcare and public education; fiscal decentralization (panel) and the selection of control variables (2.3).

A summary of the measures used to represent public services is available in table 29.

Table 29: Indicators for Public Services

Public Service	**Indicators (Source)**
Healthcare	1. Vaccinations (World Bank, World Development Indicators) 2. Infant Mortality (UNICEF, World Health Organisation and World Bank, World Development Indicators)
Education	1. Classroom Size (World Bank, World Development Indicators) 2. Primary School Enrolment (UNESCO Education Statistics)

4.2.2. Indicators for High Income Countries

One of the potential problems with using these indicators in empirical research, is the limited variability in the indicators for high income countries. The dataset that I use in this research contains a range of low, middle and high income countries. However, whereas measures of basic education and healthcare are expected to vary between developing countries, and in those countries over time, high income countries are expected to be clustered, and observe limited variability over time. There are several important points to consider.

The variability in these indicators for high income countries is not as limited as one might expect. Though low and middle income observe greater variability, high income countries observe deviation in vaccination coverage, enrolment and classroom size. Even in infant mortality, where cross-sectional variation is limited for high income countries[43], the variability over time is close between the two income groups. Annual change in infant mortality is -3.5% for high income, and -4.5% for low and middle income countries. Therefore, panel estimations will still provide an opportunity to examine links between decentralization and public healthcare.

[43] Standard deviation in cross-sectional observations for high income countries is 1.25, in contrast to 23.5 for deviation in low and middle income countries.

There are also intuitive reasons for why these indicators are suitable for high income countries. The arguments addressed in the literature focus on availability of, and access to, essential public services. The gap between universal coverage (vaccinations, enrolment) and actual coverage, will reflect accessibility issues for the poorest. For example, if primary enrolment is 95%, then the 5% who do not access enrolment will likely come from the poorest backgrounds. Therefore, any changes in provision resulting from government decentralization should be investigated. Finally, these indicators have been used in previous research in this area, and one of the aims of my research is to contrast my own results with previous results in the conclusions. Particularly as I build on previous work to develop new arguments and new results through interactions between decentralization and other aspects of decentralization, heterogeneity and expenditure (see section 4.4)

4.2.3. Decentralization Indicators

I use a selection of the decentralization indicators outlined in chapter 2. First, I use two panel indicators in this empirical research. I use SCG Expenditure to capture share of government activity, and SCG Autonomous Expenditure to capture SCG autonomy over expenditures. I initially tested SCG Revenue; however, the results were very similar to those for SCG Expenditure and consequently I dropped SCG Revenue and focused on the results for SCG Expenditure and Autonomous Expenditure. In addition to the expenditure indicators, I also examined the effect of SCG Healthcare Expenditure and SCG Education Expenditure on public healthcare and public education. These indicators were primarily used for robustness checks for the results of SCG Expenditure. In the end the results were very similar to SCG Expenditure and did not provide further insight into the effects of spending decentralization on public healthcare and public education. Therefore, I focus on SCG Expenditure and SCG Autonomous Expenditure in the results in section 4.5.

In addition to the panel indicators for fiscal decentralization, I include three indicators for electoral decentralization, legislative decentralization and federal constitution. As in chapter 3, I interact these three variables to establish whether fiscal decentralization performs differently for subnational governments that have legislative powers, are more decentralized (federal) or when the subnational government executive

is directly elected. I also tested the effects of local government area size after observing strong significance in the previous chapter; however, the results were largely insignificant in this study.

The decentralization data used in this chapter covers 40 countries over 20 years, from 1990 to 2009. There is a total of 360 observations in the panel dataset. 360 observations are available for each of the panel indicators of decentralization[44]SCG Expenditure and SCG Autonomous Expenditure. Of the 40 countries covered, 27 of them observe electoral decentralization, whilst 13 observe appointments by the central government. Legislative decentralization applies to 10 countries, but in 29 countries subnational governments do not have the power to legislate. 9 countries have a Federal constitution, whilst 31 are classed as unitary

4.2.4. Control Variables

In previous studies of the relationship between fiscal decentralization and provision the selection of control variables is broadly the same. Treisman (2002) includes baseline controls for income, population size, land area, and ethnic fragmentation in his research on public services. Khaleghian (2004) investigates the relationship between decentralization and vaccination coverage, and includes controls for income, population size, population density, literacy rate and foreign aid. Falch and Fischer (2012) investigate the relationship between decentralization and education attainment includes controls for income, population size and public sector size.

In my research I adopt a similar set of control variables. I include baseline controls in all of the regressions, they are: income (logarithm of real GDP per capita), population size (logarithm of total population), heterogeneity index (Ivanyna and Shah, 2014), public healthcare expenditure (logarithm of real healthcare expenditure per capita) in regressions featuring healthcare indicators and public education expenditure (logarithm of public education expenditure per primary school student) in regressions featuring education indicators. In regressions for infant mortality I provide an extra set of control variables in certain specifications. Treisman (2000) argues that outcomes and outputs of

[44] Though only results for SCG Expenditure and SCG Autonomous Expenditure are present in this chapter, when creating the dataset for this research I ensured that the data used was consistent for each of the decentralization indicators. Some countries and years were lost due to this process, but this enabled a consistent comparison between the effects of different decentralization indicators.

healthcare are not the same thing, and that healthcare outcomes (infant mortality) should include other variables to capture the wide range of factors that determine general health standards. The additional variables are improved sanitation (logarithm of the proportion of the population with access to improved sanitation facilities), personnel (the number of physicians per 1,000 people) and beds (the number of beds per 1,000 people). In infant mortality regressions I also include immunization, the same data as the dependent variable, to capture availability of/access to vaccinations, which are expected to be strongly associated with infant mortality.

All but one of the baseline controls has been used in previous research. The only exception is the variable I have chosen to represent heterogeneity. Ethnic fractionalization is often used to represent heterogeneity (see Treisman, 2000; Khaleghian, 2004). However, the two indicators for ethnic fractionalization: language and religion, are not complete for this dataset, and do not cover all types of heterogeneity. Recently, Ivanyna and Shah (2014) have constructed their own indicator for heterogeneity. The heterogeneity index they provide covers ethno-linguistic fractionalization, demographics and income distribution[45]. Like the ethnolinguistic indicators, the data for heterogeneity is cross-sectional, and covers a period between 2000 and 2005 (see Ivanyna and Shah, 2014).

In table 30 I provide the complete list of the control variables and I include expected coefficient sign for each variable. My expectations are based on the related literature covered in section 4.1. I expect income to be positively associated with provision of healthcare and education. McGuire (2006) argues that higher incomes generate more money for individuals and households to spend on food, healthcare and basic needs. Population size is expected to be negatively associated with provision, where smaller populations are associated with effective government and civic virtue (Treisman, 2000). Heterogeneity is expected to be negatively associated with provision. Treisman (2000) argues that heterogeneity increases the rationale for electoral decentralization. Ivanyna and Shah (2014) explain that heterogeneity increase disutility, where there is a larger difference between an individual's preference and the policy of government. All expenditure is expected to be positively associated with provision. Infant mortality

[45] In recent empirical research on public healthcare, the Gini coefficient has been included in models (see Macinko et al., 2004). Unfortunately, the data I used in the previous chapter is not complete for this dataset, and including the panel Gini coefficient would further reduce the scope of this research. Hence I have opted to include income distribution through the heterogeneity index instead.

controls are all expected to be negatively associated with infant mortality rates. Lin (2005) and Farahani (2009) include health infrastructure in their empirical research on infant mortality and healthcare provision.

The final dataset covers a maximum of 40 low, middle and high income countries (full list in the appendix), over a period of 20 years, from 1990 to 2009.

Table 30: List of Control Variables

Control Variable	Expected Coefficient Sign
Baseline Controls	
Income *(logarithm of real GDP per capita)*	Positive
Population *(logarithm of total population)*	Negative
Heterogeneity *(heterogeneity index containing information on ethno-linguistic fractionalization, income distribution, age dependency and geographical characteristics)*	Negative
Public Healthcare Expenditure *(logarithm of public healthcare expenditure per capita)*	Positive
Public Education Expenditure (logarithm of *public education expenditure per primary school student)*	Positive
Additional Controls (Infant Mortality)	
Quality of Sanitation *(logarithm of the proportion of the population with access to improved sanitation facilities)*	Negative
Healthcare Personnel *(the number of physicians per 1,000 people)*	Negative
Healthcare Resources *(the number of beds per 1,000 people)*	Negative
Healthcare Provision *(logarithm of the proportion of infants receiving vaccinations for measles and DPT)*	Negative

4.3. Descriptive Statistics and Correlations

In this section I provide descriptive statistics and correlation coefficients for the dataset used in this research. The descriptive statistics cover the average, variation and range of observations in the cross-sectional dataset, whilst the correlation coefficients cover the entire panel dataset.

4.3.1. Descriptive Statistics

The descriptive statistics in table 31 are based on the cross-sectional dataset. As part of the descriptive statistics I include the average level of the indicators for public healthcare and public education, and the growth in those indicators to see whether this is any interesting changes in the indicators over the 20-year period.

4.3.1.1. Public Healthcare and Public Education

The descriptive demonstrate variation between public healthcare and public education indicators.

First, average vaccination coverage is just in 90 (in 100). Most countries in the sample observe higher levels of vaccination coverage than the average level (28 of 40). Of those countries that observed lower than the average level of vaccination coverage, India had the lowest coverage of 61.45. Other countries that observed below the average level of vaccinations include South Africa (67.86) and Bolivia (69.25). The data for infant mortality observes a similar distribution. The mean infant mortality rate, 19.55, is higher than the median, due to some countries observing much higher rates of infant mortality. 28 countries have lower IMR than the mean. However, despite the negative skew in the distribution, there is only one statistical outlier: Tajikistan, with 74.54. Other countries with high levels of infant mortality include, again Bolivia (61.32) and Indonesia (52.96), South Africa observes (50.68).

Over the period, growth in vaccination coverage and a fall in infant mortality rates indicate an improvement in public healthcare provision. On average, vaccination coverage has increased by 0.6% per year, and infant mortality rates have fallen by 4.1% per year. Most countries in the sample have seen improvements in healthcare, however

there are exceptions. In South Africa vaccination coverage has fallen by just under 1% per year, whilst infant mortality has increased by over 1% per year (between 1995 and 2005). Vaccination coverage has declined for one third of the sample, however infant mortality rates have risen in only two countries (South Africa and Belarus).

With respect to the indicators for public education, the distribution of countries in the dataset is more even. Across the 30 countries for which there is data, the average classroom size (pupils to teacher) is 17.62. The smallest classroom sizes are in more economically developed countries in Europe – Italy with the lowest size of just under 11 pupils per teacher. 18 of the 30 countries observe smaller classroom size than the mean. South Africa is the only outlier, with the largest classroom size of 33 pupils per teacher. Primary enrolment data is much the same. 17 of 30 countries observe higher primary enrolment than the mean of 94.64. There are no outliers in the sample of 30 countries, with a fairly tight range of observations included in this research. European countries observe the highest primary enrolment rates, with near to full enrolment (Spain, Norway and Netherland above 99). The lowest rate is in Mongolia (86.37)

Countries have observed mixed fortunes with respect to improvements in education provision over the time period. Overall, access to primary enrolment and classroom sizes have declined. There is a greater spread of change in classroom size across the sample. There is one outlier (El Salvador, -12.3% per year). Removing the outlier does not change the overall result, the mean change falls from -1.73% per year, to -1.27% per year.

Enrolment in primary school has also increased, however the result is marginal. When I removed a statistical outlier (Azerbaijan, 2.5% increase per year) the overall change is 0.07%. Contrasting education provision with healthcare provision, the evidence that education provision has improved between 1990 and 2009 is weaker than for healthcare provision. There is evidence that classroom sizes and enrolment has increased, though in the case of primary school enrolment the change is very close to 0

Across all the indicators, public healthcare and public education has improved.

Table 31: Descriptive Statistics (cross-sectional dataset)

Panel A: Provision Statistics

	Obs.	Mean	Std. Dev	Min	Max
Immunization	40	89.168	10.153	61.452	98.995
Infant Mortality	40	19.551	21.887	2.375	74.543
Classroom Size	30	17.622	5.038	10.782	33.286
Primary Education Enrolment	30	94.643	3.673	86.371	99.777
Growth in Immunization	40	0.735	1.247	-0.919	5.298
Growth in Infant Mortality	40	-4.125	1.894	-8.214	1.154
Growth in Classroom Size	23	-1.267	1.857	-4.940	2.928
Growth in Primary Education Enrolment	21	0.194	0.654	-0.586	2.484

Panel B: Decentralization Statistics

	Obs.	Mean	Std. Dev	Min	Max
SCG Expenditure	40	28.176	11.698	9.59	58.19
SCG Autonomous Expenditure	40	18.518	9.911	0.95	42.75

Panel C: Baseline Controls (excl. Heterogeneity) Statistics

	Obs.	Mean	Std. Dev	Min	Max
Income	40	17049.53	13749.72	880.7731	54973.14
Population Size	40	53.823	164.627	0.3007	1011.814
Public Health Expenditure (per capita)	39	1499.121	1370.701	38.535	4515.269
Public Education Expenditure (per student)	23	5662.716	3431.564	239.140	12143.39

4.3.1.2. Decentralization

Decentralization across the sample exhibits similar characteristics to the larger sample of countries covered in the previous chapter. Subnational government expenditure decentralization estimates a higher level of fiscal decentralization than the alternate measure, subnational government autonomous expenditure decentralization. Canada is the most decentralized country in both measures, with 58% of total expenditure accruing to subnational governments, and 43% of total expenditure financed by own tax revenue. The median for the sample is lower than the mean in both of the decentralization indicators. There is a positive skew in the distribution of the data, where the majority of countries observe lower levels of decentralization than the mean values in panel B (i.e. a positive skew in the distribution).

4.3.1.3. Controls

The important information in panel C is the range of the observations for each of the control variables. The dataset contains a wide range of countries with different economic backgrounds (in Income), different population size, and different levels of spending on healthcare and education. The variations in the decentralization and baseline control variables could explain the different changes in the dependent variables over the time period in this dataset.

4.3.2. Correlations

In table 32 I provide the pairwise correlations for all public healthcare and education indicators, fiscal decentralization indicators and baseline controls. Most of the variables share some correlation with one another and there are some interesting findings. First, there is a positive correlation between the indicators of public healthcare and education provision. Higher vaccination coverage is correlated with lower infant mortality rates, smaller classroom sizes and higher primary school enrolment. This could mean that these variables are interconnected – good healthcare leads to good education, and visa-versa. It could also mean that the same variables that explain the provision of one public service, also explain the provision of other public services.

Second, there is limited correlation between the indicators for decentralization and the provision of public services. Only subnational government expenditure decentralization (SCG Expenditure) is found to be significantly correlated with vaccination coverage. The negative coefficient shows that higher vaccination coverage is correlated with lower degrees of decentralization.

Third, many of the controls exhibit the expected correlation with provision. Income and expenditure are positively correlated with provision, whilst population and heterogeneity are negatively associated with provision. Fourth, higher healthcare and education expenditure is positively associated with decentralization. This may suggest that in countries where there is larger total expenditure, there is a stronger case for distributing that expenditure to lower tiers of government.

Table 32: Pairwise Correlation Coefficients (Public Services, Fiscal Decentralization and Baseline Controls)

	Vaccine	Mortality	Class Size	Primary Enrolment	SCG Expenditure	SCG Autonomous Expenditure	Income	Population	Heterogen-eity	Healthcare Expenditure	Education Expenditure
Vaccine	1.0000										
Mortality	-0.5996***	1.0000									
Class Size	-0.5067***	0.7644***	1.0000								
Primary Enrolment	0.4397***	-0.6568***	-0.6467***	1.0000							
SCG Expenditure	-0.1481***	-0.0286	0.1177	-0.0526	1.0000						
SCG Autonomous Expenditure	0.0244	-0.0314	-0.0347	-0.0226	0.8182***	1.0000					
Income	0.5197***	-0.9473***	-0.6905***	0.6136***	0.1230**	0.0865	1.0000				
Population	-0.4502***	0.3229***	0.1572**	-0.0944	0.3887***	0.2418***	-0.2281***	1.0000			
Heterogeneity	-0.4096***	0.5260***	0.4996***	-0.2987***	0.4445***	0.4489***	-0.3799***	0.6307***	1.0000		
Healthcare Expenditure	0.4141***	-0.9371***	-0.6808***	0.7080***	0.1674***	0.1127**	0.9855***	-0.1662***	-0.3789***	1.0000	
Education Expenditure	0.4883***	-0.9257***	-0.8171***	0.7610***	0.1387*	0.3281***	0.9613***	-0.2672***	-0.5042***	0.9496***	1.0000

***, ** and * represent significance at the 1, 5 and 10% levels respectively

4.4. Methodology

The methods I use to estimate the relationship between fiscal decentralization and public healthcare and public education are similar to those used in chapter 3. The first estimates are produced using a cross-sectional OLS estimator and the second estimates are produced using a cross-sectional instrument variable model. The IV estimator is expected to mitigate against potential endogeneity bias in the ordinary least squares estimations. Finally, I produce estimates for the effects of decentralization on public healthcare and public education over time, using a random effects panel estimator.

4.4.1. Cross-sectional Estimates

In the first set of regressions I examine the relationship between the average levels for the dependent and independent variables in the cross-sectional dataset (function 4.1). The dependent variable (Y_i) is the average level for each of the indicators for public healthcare and education. The independent variables include the averages for the two spending decentralization indicators over the time period (D_i) and the vector of control variables (X_i). In additional specifications, I estimate the coefficients for up to five interactions between the average level of spending decentralization: SCG Expenditure and SCG Autonomous Expenditure, captured in 4.1. as $D_i.INT_i$. These interactions are: i) legislative decentralization; ii) electoral decentralization, and iii) federal constitution, iv) heterogeneity and iv) total public healthcare or education spending. The cross-sectional estimation is outlined in function 4.1:

$$Y_i = \alpha + \beta_1 D_i + \beta_2 D_i.INT_i + \gamma X_i + \varepsilon_i \qquad 4.1$$

4.4.2. Endogeneity Bias: Brief Summary of Previous Research

In the second set of estimations I instrument the decentralization variable in the cross-sectional specification in 4.1. As in the previous chapter I consider the possibility that decentralization (D_{it}) is endogenous in function 4.1. In previous studies of the effects of decentralization on public services, reverse causality and omitted variable bias have been cited as potential causes of endogeneity in the OLS estimations.

Khaleghian (2004) raises the potential problem of omitted variable bias, where unobserved factors of vaccination coverage: various public health reforms, unspecific social or political variables, may be correlated with a country's decision to centralize or decentralize fiscal functions. Jimenez-Rubio (2011) examines the relationship between decentralization and infant mortality and also raises the possibility of omitted variable bias in the estimations. Endogeneity may also be caused by reverse causality, where the dependent variable explains variations in decentralization. Khaleghian (2004) also considers this with respect to vaccination coverage, where important public healthcare outputs may influence decentralization policy.

Treisman (2000) argues that reverse causality may not be an issue for the selection of public healthcare and public education indicators (vaccination coverage, infant mortality, primary enrolment). However, omitted variable bias could affect estimations of the relationship between decentralization and those indicators. The problem of omitted variable bias, whereby some underlying variables causes changes in both decentralization and the dependent variable, can be mitigated against using covariates, and using random or fixed effects. Falch and Fischer (2012) also suggest that fixed or random effects can mitigate against potential endogeneity bias resulting from omitted variable bias.

To counter potential endogeneity bias resulting from either reverse causality, or omitted variable bias, I produce further estimates using a cross-sectional IV estimator (4.4.3), and a random effects panel estimator (4.4.4)

4.4.3. Cross-sectional Instrument Variable Estimates

The second set of estimates are produced using a cross-sectional instrument variable model. The instruments used in this model must satisfy the two criteria explained in the previous chapter. The instruments must explain variations in the endogenous variable, decentralization. The instruments must also be exogenous – uncorrelated with the error term. Therefore, the chosen instruments should explain variations in the dependent variable(s), only indirectly, through the endogenous variables, decentralization.

In this research, I have selected the legal origin dummies (La Porta et al., 2008) as instruments of decentralization. There are two reasons why I have chosen these instruments. First, legal origins are expected to explain variations in fiscal decentralization. Fisman and Gatti (2002) explain that civil legal systems are associated

with greater government centralization, due to the constraints of statutes laid down by federal legislators (page 337). Therefore, countries with civil legal codes (French legal origins) are expected to be more centralized, than countries with common legal code (UK legal origins). The empirical evidence confirms this expectation. Furthermore, where legal origins have been used to instrument decentralization previously, the evidence suggests that legal origins explain variations in decentralization in the first stage (see Altunbas and Thornton, 2011).

Secondly, legal origins are not expected to be directly linked to the selection of dependent variables in this research. Instead, legal origins are expected to share an association with public healthcare and public education indicators indirectly, through the degree of government decentralization, based on the rationale above. There is also no prospect of reverse causality between the public healthcare and public education indicators, and a country's legal origin.

The first stage estimation is outlined in function 4.2:

$$D_i = \alpha + \delta_1 LEGAL\ ORIGINS_i + \theta X_i + u_i \qquad 4.2$$

The first stage estimations are presented alongside the second stage results in section 4.5. I provide an analysis of the individual significance of each of the legal origins dummy variables. I also discuss the effect that each legal origin has on decentralization. As Fisman and Gatti (2002) explain, countries with certain legal origins tend to be more decentralized than others[46]. I confirm in my results whether the sign and coefficient for the legal origins dummy variables are as expected. Furthermore, I include p-values for the f-test of collective significance of the legal origins dummy variables. If the null hypothesis is rejected (p-value less than 0.05), then the legal origins dummy variables are suitable instrument variables for predicting cross-sectional variations in decentralization.

I also provide two diagnostic tests in the corresponding second stage estimations. I provide the p-value for the Durbin-Wu-Hausman test statistic, that can be used to identify potential endogeneity of the decentralization variable in the original ordinary least squares. Finally, I provide the p-value for Hansen j-statistic of instrument

[46] Fisman and Gatti (2002) find that countries with French Legal Origins are more decentralized than countries with UK Legal Origins, where local government expenditure accounts for a smaller percentage of total government spending (0.12 to 0.21 respectively)

exogeneity. If the null hypothesis is not rejected at the 5% significance level, then there is evidence that the instruments are exogenous, and suitable for the cross-sectional instrument variable regressions. The evidence suggests that legal origins is suitable for instrumenting decentralization, both in terms of validity (exogeneity) and explanatory power in the first stage estimations.

4.4.4. Random Effects Panel Estimator

To exploit the richer panel dataset available for this research and to investigate the relationship between fiscal decentralization and public healthcare and public education over time, I opt for a random effects panel estimator for several reasons. As explained in the poverty chapter (see 3.4.3), the choice between a fixed effects estimator and a random effects estimator depends on several considerations. Ideally, the random effects estimator would be used due to the large number of countries, relative to the short time period for this panel dataset. Furthermore, by using random effects, time-invariant explanatory variables can be included in the model. Therefore, the heterogeneity index, which forms an important part of this empirical analysis, can still be used if random effects are used. If the fixed effects estimator is used, then heterogeneity cannot be included in the model, due to correlation with the country intercept terms in the fixed effects estimator.

However, despite the advantages of using a random effects estimator, it is essential that decentralization is not associated with the unobserved country effects. Therefore, I perform the Hausman specification test to compare the fixed effects and random effects estimator, and to determine which estimator is either more efficient (random effects) or more consistent (fixed effects). I produced several tests for each of the different dependent variables, and for the two decentralization indicators, and produced fairly conclusive evidence that the random effects estimator was more suitable for this research. The null hypothesis was not rejected in all but one comparison[47]

Therefore, I produce final estimations using the random effects panel estimator, outlined in function 4.3.

$$P_{it} = \alpha + \beta_1 D_{it} + \beta_2 D_{it} . INT_i + \gamma X_{it} + (v_i + u_{it}) \qquad 4.3$$

[47] The null hypothesis was rejected at the 10% level when comparing fixed effects and random effects estimator for Primary School Enrolment, and with SCG Expenditure as the decentralization indicator.

4.5. Results

In this section I provide an analysis of the results for each of the indicators for public healthcare and public education. For each indicator, there is one set of cross-sectional estimates, one set of cross-sectional IV estimates, including the first stage estimations, and one set of random effects panel estimations. Within each set of results, I provide specifications for the relationship between provision and i) fiscal decentralization, ii) fiscal decentralization interacting with each of the aspects of decentralization (electoral, legislative and federal constitution), and iii) fiscal decentralization interacting with heterogeneity indicator and total spending on healthcare and education. All specifications contain the baseline controls outlined in section 4.2, with the exception of classroom size, where education expenditure data is not included in the cross-sectional dataset.

4.5.1. Public Healthcare

I estimate the relationship between fiscal decentralization and public healthcare in 8 tables (33-40). Estimates for vaccination coverage are in tables 33-36 and estimates for infant mortality rates are in tables 37-40.

4.5.1.1. Vaccination Coverage

The first set of estimates is for the OLS cross-sectional regressions, in table 33. There is very limited evidence of an association between fiscal decentralization is associated with vaccination coverage. First, greater SCG Autonomous Expenditure is positively associated with vaccination coverage (7). The coefficient indicates that a one percentage point increase in subnational government autonomous expenditure results in a 0.38% increase in vaccination coverage. Second, legislative decentralization reverses the positive effect of SCG Autonomous Expenditure. In specification 8, further SCG Autonomous Expenditure continues to improve vaccination coverage when the subnational government does not have the autonomy to legislate. However, when subnational governments do have autonomy to legislate, the relationship is reversed. SCG Expenditure also has a negative effective on immunization coverage when subnational governments have some legislative autonomy (2). No other results are

significant, neither the type of government (unitary or federal) or electoral decentralization have any effect on vaccination coverage.

Finally, fiscal decentralization observes contrasting effects depending on the degree of heterogeneity and the degree of total healthcare expenditure. SCG Autonomous Expenditure is positively associated with vaccination coverage as the degree of heterogeneity rises (11), though there is no effect for SCG Expenditure. This is an expected result, which shows that countries which feature higher degrees of heterogeneity, observe improvements in vaccination coverage through greater decentralization, in this case, SCG Autonomous Expenditure. Finally, SCG Expenditure has a positive effect on vaccination coverage when total government expenditure is sufficiently high (5).

The next set of estimates are produced using the cross-sectional instrument variable model. The first stage estimations in table 34 indicate that legal origins explain variations in tax and spending decentralization. The sample of countries is split into four groups: Scandinavia, UK, Germany and French legal origins, hence there are three legal origins dummies in the first stage estimates. Countries in the omitted group, Scandinavia legal origins, observe the highest level of tax and spending decentralization. This is reflected in the negative coefficients for each of the legal origins groups in the first stage estimates. Countries in the French legal origins group are the most centralized in terms of spending (panel A), whilst countries in the UK legal origins group are the most centralized in terms of autonomous spending (panel B). In most specifications, all of the legal origins dummies are statistically significant. This is evident in the low p-values for the f-test of collective significance. There is a notable exception however. When interacting decentralization with total healthcare spending, in specification 6 and 12, the instruments are no longer collectively significant. Of the control variables assumed to be exogenous in the second stage, heterogeneity is consistently positively associated with decentralization, which supports previous research in this area (Wallis and Oates, 1988; Panizza, 1998).

The second stage results are presented in table 35. Fiscal decentralization is often statistically insignificant in the cross-sectional IV estimates. However, SCG expenditure is associated with vaccination coverage when subnational government has legislative autonomy. The negative coefficient indicates that greater decentralization reduces vaccination coverage.

Table 33: Cross Sectional OLS Estimates, Dependent Variable: Vaccinations, with Additional Interactions

	PANEL A: Vaccinations and Subnational Government Expenditure						**PANEL B: Vaccinations and Subnational Government Autonomous Expenditure**					
	1	2	3	4	5	6	7	8	9	10	11	12
Decentralization	-0.047	0.075	-0.079	-0.215	-0.418	-1.948*	0.376*	0.504**	0.432	0.107	-0.652	-0.281
	(0.142)	(0.156)	(0.140)	(0.236)	(0.477)	(0.999)	(0.205)	(0.244)	(0.275)	(0.296)	(0.622)	(0.832)
Income	0.151	0.135	0.153	0.148	0.150	0.189*	0.199*	0.193*	0.198*	0.197*	0.169*	0.208**
	(0.110)	(0.111)	(0.112)	(0.118)	(0.113)	(0.103)	(0.102)	(0.104)	(0.103)	(0.111)	(0.095)	(0.100)
Population	-0.005	-0.001	-0.006	-0.007	-0.004	-0.003	-0.005	-0.002	-0.004	-0.010	-0.006	-0.005
	(0.016)	(0.013)	(0.015)	(0.015)	(0.017)	(0.012)	(0.016)	(0.014)	(0.015)	(0.015)	(0.015)	(0.016)
Heterogeneity	-0.203	-0.033	-0.229	-0.197	-0.683	-0.194	-0.439*	-0.306	-0.406	-0.424	-1.098**	-0.457*
	(0.300)	(0.317)	(0.366)	(0.324)	(0.928)	(0.288)	(0.244)	(0.270)	(0.298)	(0.267)	(0.402)	(0.247)
Healthcare Expenditure	-0.096	-0.071	-0.100	-0.109	-0.100	-0.208**	-0.141*	-0.124	-0.137	-0.158*	-0.123	-0.169**
	(0.089)	(0.090)	(0.094)	(0.093)	(0.093)	(0.089)	(0.081)	(0.084)	(0.084)	(0.087)	(0.074)	(0.081)
Decentralization x Legislative		-0.250**						-0.302*				
		(0.121)						(0.172)				
Decentralization x Federal Const.			0.051						-0.093			
			(0.210)						(0.267)			
Decentralization x Elected Bottom Tier				0.225						0.368		
				(0.205)						(0.267)		
Decentralization x Heterogeneity					1.161						2.782*	
					(1.735)						(1.425)	
Decentralization x Expenditure						0.267*						0.095
						(0.133)						(0.122)
Constant	3.820***	3.720***	3.845***	3.936***	4.003***	4.231***	3.679***	3.557***	3.640***	3.813***	4.064***	3.788***
	(0.469)	(0.462)	(0.493)	(0.515)	(0.552)	(0.531)	(0.446)	(0.454)	(0.477)	(0.505)	(0.473)	(0.505)
Observations	39	38	39	39	39	39	39	38	39	39	39	39
R-squared	0.261	0.363	0.263	0.298	0.271	0.339	0.321	0.396	0.324	0.363	0.374	0.329

****, ** and * represent significance at the 1, 5 and 10% levels respectively. Robust standard errors are in parenthesis*

Table 34: Cross Sectional IV Estimates (1st Stage), Dependent Decentralization, with Additional Interactions

	PANEL A: Vaccinations and Subnational Government Expenditure						PANEL B: Vaccinations and Subnational Government Autonomous Expenditure					
	1	2	3	4	5	6	7	8	9	10	11	12
Instrument Variables												
UK Legal Origins	-0.163**	-0.182**	-0.178***	-0.119**	-0.063**	-0.009	-0.176***	-0.195***	-0.190***	-0.098**	-0.069***	-0.002
	(0.067)	(0.067)	(0.062)	(0.050)	(0.024)	(0.008)	(0.047)	(0.033)	(0.032)	(0.043)	(0.021)	(0.004)
Germany Legal Origins	-0.134**	-0.151**	-0.160***	-0.104**	-0.031	-0.012	-0.097**	-0.124***	-0.132***	-0.059*	-0.039***	-0.010**
	(0.061)	(0.058)	(0.057)	(0.046)	(0.021)	(0.009)	(0.041)	(0.032)	(0.028)	(0.031)	(0.014)	(0.004)
French Legal Origins	-0.169***	-0.187***	-0.178***	-0.125**	-0.042*	-0.017	-0.132***	-0.161***	-0.147***	-0.074**	-0.055***	-0.003
	(0.060)	(0.060)	(0.057)	(0.046)	(0.022)	(0.012)	(0.038)	(0.030)	(0.028)	(0.034)	(0.015)	(0.005)
Second Stage Controls												
Income	-0.054	-0.020	-0.028	-0.052	-0.006	0.018	-0.072	-0.033	-0.034	-0.056	-0.026	-0.005
	(0.052)	(0.051)	(0.053)	(0.054)	(0.022)	(0.020)	(0.053)	(0.045)	(0.044)	(0.052)	(0.016)	(0.011)
Population	0.021***	0.012	0.008	0.013*	0.005	0.002	0.005	-0.005	-0.007	-0.003	0.002	0.002
	(0.007)	(0.009)	(0.008)	(0.008)	(0.004)	(0.004)	(0.007)	(0.006)	(0.007)	(0.006)	(0.003)	(0.001)
Heterogeneity	0.727***	0.529***	0.435**	0.571***	-0.893***	0.042	0.767***	0.526**	0.378**	0.501**	-0.349***	0.004
	(0.206)	(0.188)	(0.177)	(0.177)	(0.163)	(0.040)	(0.203)	(0.199)	(0.177)	(0.208)	(0.102)	(0.029)
Healthcare Expenditure	0.057	0.015	0.014	0.034	-0.001	-0.054***	0.069	0.020	0.010	0.029	0.017	-0.015
	(0.047)	(0.047)	(0.049)	(0.051)	(0.020)	(0.018)	(0.046)	(0.038)	(0.040)	(0.045)	(0.015)	(0.009)
Decentralization x Interaction		0.259***	0.347***	0.279**	2.602***	0.131***		0.445***	0.567***	0.464***	2.227***	0.113***
		(0.093)	(0.076)	(0.113)	(0.297)	(0.005)		(0.122)	(0.119)	(0.135)	(0.203)	(0.003)
Constant	0.252	0.281	0.399*	0.362*	0.416***	0.223***	0.232	0.296	0.412**	0.347	0.324***	0.166***
	(0.198)	(0.205)	(0.205)	(0.202)	(0.094)	(0.068)	(0.209)	(0.211)	(0.198)	(0.217)	(0.055)	(0.050)
F-test (p-value) for instruments	0.056	0.032	0.034	0.081	0.038	0.558	0.004	0.000	0.000	0.140	0.006	0.894
Observations	39	38	39	39	39	39	39	38	39	39	39	39
R-squared	0.619	0.692	0.739	0.690	0.951	0.979	0.544	0.712	0.763	0.679	0.957	0.997

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 35: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Vaccinations, with Additional Interactions

	PANEL A: Vaccinations and Subnational Government Expenditure						PANEL B: Vaccinations and Subnational Government Autonomous Expenditure					
	1	2	3	4	5	6	7	8	9	10	11	12
Decentralization	-0.098	-0.176	-0.089	-0.406	1.244	-5.796*	0.300	0.133	0.212	-0.318	-0.219	-0.281
	(0.277)	(0.238)	(0.259)	(0.442)	(1.286)	(3.079)	(0.327)	(0.284)	(0.290)	(0.726)	(0.891)	(0.832)
Income	0.146	0.117	0.152	0.134	0.175*	0.247**	0.190*	0.162	0.182*	0.169	0.185*	0.208**
	(0.104)	(0.100)	(0.105)	(0.114)	(0.105)	(0.120)	(0.101)	(0.105)	(0.098)	(0.129)	(0.095)	(0.100)
Population	-0.004	0.001	-0.006	-0.005	-0.009	0.002	-0.005	-0.006	-0.006	-0.013	-0.006	-0.005
	(0.014)	(0.012)	(0.013)	(0.013)	(0.015)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.014)	(0.016)
Heterogeneity	-0.173	0.071	-0.226	-0.113	1.081	-0.079	-0.397*	-0.177	-0.364	-0.279	-0.876	-0.457*
	(0.268)	(0.284)	(0.350)	(0.265)	(1.655)	(0.290)	(0.235)	(0.282)	(0.292)	(0.257)	(0.548)	(0.247)
Healthcare Expenditure	-0.091	-0.052	-0.099	-0.099	-0.108	-0.407**	-0.133	-0.098	-0.126	-0.144	-0.135*	-0.169**
	(0.087)	(0.082)	(0.089)	(0.089)	(0.087)	(0.182)	(0.083)	(0.086)	(0.080)	(0.095)	(0.074)	(0.081)
Decentralization x Legislative		-0.200*						-0.161				
		(0.118)						(0.182)				
Decentralization x Federal Const.			0.054						0.023			
			(0.174)						(0.250)			
Decentralization x Elected Bottom Tier				0.295						0.614		
				(0.257)						(0.511)		
Decentralization x Heterogeneity					-3.400						1.736	
					(3.931)						(2.154)	
Decentralization x Expenditure						0.784*						0.095
						(0.412)						(0.122)
Constant	3.834***	3.796***	3.848***	4.012***	3.225***	5.076***	3.705***	3.697***	3.739***	3.985***	3.903***	3.788***
	(0.442)	(0.424)	(0.449)	(0.523)	(0.741)	(0.872)	(0.433)	(0.450)	(0.441)	(0.640)	(0.538)	(0.505)
DWH Test (p-value)	0.860	0.357	0.975	0.660	0.131	0.154	0.785	0.114	0.380	0.493	0.468	0.295
Hansen J-statistic (p-value)	0.232	0.175	0.253	0.235	0.199	0.340	0.215	0.155	0.251	0.197	0.221	0.513
Observations	39	38	39	39	39	39	39	38	39	39	39	39
R-squared	0.260	0.335	0.263	0.285	0.106	0.033	0.318	0.348	0.309	0.318	0.366	0.329

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Expenditure and SCG Autonomous Expenditure are instrumented using legal origin dummies, from the first stage. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

Spending decentralization is also negatively associated with vaccination coverage when spending is lower, and positively associated with vaccination coverage when spending is higher. This suggests that decentralization is a policy better undertaken when there is sufficient spending resources to distribute to subnational and local governments. Hence, centralization is a better policy for low and middle income countries. These results support the ordinary least squares results in table 33. In panel B, autonomous spending has no effect on vaccination coverage in any of the specifications.

` There is some change in significance between the OLS estimates in table 33 and the IV estimates in table 35. In particular, autonomous spending has no effect on vaccination coverage in the IV estimates, though it did have an effect in the OLS estimates. This may indicate that decentralization was endogenous in the ordinary least squares results, and the instrumentation has fixed the potential bias in the OLS estimations. However, fiscal decentralization could be treated as exogenous, based on the p-values for the Durbin-Wu-Hausman test, which are all comfortably above 0.10 significance level. There is also a noticeably difference in the magnitude of the effect in specification 6 between IV and OLS estimations. In the first stage, the legal origins instruments were not associated with decentralization in that specification. Therefore, the difference between the estimates may indicate weak instruments, at least with respect to specifications featuring interactions between decentralization and public healthcare spending.

The final set of estimations are produced using a random effects panel estimator. In these results, subnational government expenditure decentralization, in panel A, observes no significance in all but one interaction. Greater spending decentralization, combined with greater public healthcare spending, can increase vaccination coverage. This result is consistent with previous estimates.

Autonomous spending decentralization is often statistically associated with vaccination coverage. All of the statistically significant results are positive. Greater spending decentralization increases vaccination coverage over time generally (specification 7), a result that is consistent with the OLS cross-sectional estimates in table 33. Furthermore, greater tax and spending decentralization improves vaccination coverage when subnational governments do not have autonomy to legislate; in unitary countries and when the local government executive is appointed. The reverse in these interactions observes no statistical significance, though the coefficients are negative.

Table 36: Random Effects Panel Estimates, Dependent Variable: Vaccinations, with Additional Interactions

	PANEL A: Vaccinations and Subnational Government Expenditure						**PANEL B: Vaccinations and Subnational Government Autonomous Expenditure**					
	1	2	3	4	5	6	7	8	9	10	11	12
Decentralization	0.068	0.109	0.108	-0.001	0.643	-0.513	0.297***	0.310***	0.360**	0.307***	0.424	0.191
	(0.139)	(0.127)	(0.193)	(0.191)	(0.425)	(0.325)	(0.088)	(0.104)	(0.164)	(0.067)	(0.404)	(0.312)
Income	0.025	0.027	0.025	0.025	0.025	0.021	0.025	0.029	0.027	0.025	0.027	0.025
	(0.076)	(0.075)	(0.076)	(0.076)	(0.075)	(0.077)	(0.071)	(0.070)	(0.070)	(0.071)	(0.070)	(0.072)
Population	-0.010	-0.011	-0.007	-0.011	-0.013	-0.012	-0.010	-0.013	-0.008	-0.010	-0.010	-0.010
	(0.014)	(0.013)	(0.012)	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)
Heterogeneity	-0.214	-0.141	-0.168	-0.195	0.396	-0.224	-0.319	-0.289	-0.282	-0.321	-0.250	-0.328
	(0.234)	(0.234)	(0.308)	(0.246)	(0.423)	(0.232)	(0.221)	(0.226)	(0.258)	(0.222)	(0.343)	(0.224)
Healthcare Expenditure	0.022	0.023	0.023	0.019	0.023	-0.001	0.021	0.020	0.023	0.021	0.020	0.019
	(0.065)	(0.064)	(0.067)	(0.065)	(0.065)	(0.064)	(0.062)	(0.061)	(0.062)	(0.061)	(0.061)	(0.060)
Decentralization x Legislative		-0.098						-0.029				
		(0.108)						(0.126)				
Decentralization x Federal Const.			-0.094						-0.113			
			(0.188)						(0.197)			
Decentralization x Elected Bottom Tier				0.094						-0.019		
				(0.140)						(0.097)		
Decentralization x Heterogeneity					-1.620						-0.320	
					(1.044)						(0.909)	
Decentralization x Expenditure						0.085*						0.018
						(0.045)						(0.055)
Constant	4.198***	4.144***	4.160***	4.213***	3.985***	4.392***	4.198***	4.167***	4.151***	4.198***	4.165***	4.222***
	(0.306)	(0.304)	(0.321)	(0.311)	(0.333)	(0.346)	(0.278)	(0.283)	(0.289)	(0.278)	(0.292)	(0.305)
Observations	321	318	321	321	321	321	321	318	321	321	321	321
Groups	40	39	40	40	40	40	40	39	40	40	40	40

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

This indicates that greater spending decentralization can improve vaccination coverage, and is unlikely to harm it, under certain circumstances. The results in the random effects panel estimator are some of the strongest, though despite the lack of statistical evidence in the cross-sectional estimates, the results are consistent.

Overall, there is some evidence of an association between fiscal decentralization and vaccination coverage. However, the results differ between spending and autonomous spending indicators, and are not robust to estimation technique. Spending decentralization is found to be negatively associated with vaccination coverage when subnational government has legislative autonomy. This result is exclusive to cross-sectional variations. Spending decentralization is negatively associated with vaccination coverage when public spending on healthcare is lower, and positively associated with vaccination coverage when public spending is higher. This result may be evidence that centralization is a better policy with respect to vaccination coverage in low and middle income countries, where tax resources are limited. Finally, autonomous spending explains variations in vaccination coverage over time, as shown by the random effects panel estimations

4.5.1.2. Infant Mortality

The cross-sectional estimates in table 37 are statistically insignificant in all but two estimations. SCG Autonomous Expenditure is negatively associated with infant mortality (8). The coefficient indicates that a one percentage point increase in fiscal decentralization would reduce infant mortality rates between countries by 1.4%. Fiscal decentralization also reduces infant mortality in federal countries, however this result is restricted to the first indicator for decentralization (4), and there is no effect in unitary countries. SCG Expenditure reduces infant mortality when the degree of heterogeneity is greater (6).

The next set of estimates are for the cross-sectional IV model. The first stage estimates are presented in table 38, and the corresponding second stage estimates in table 39.

Table 37: Cross Sectional OLS Estimates, Dependent Variable: Infant Mortality, with Additional Interactions

	PANEL A: Infant Mortality and Subnational Government Expenditure							**PANEL B: Infant Mortality and Subnational Government Autonomous Expenditure**						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Decentralization	-0.372	-0.612	-0.382	0.011	-0.438	1.927	-4.172	-1.389*	-0.715	-0.756	-0.482	-0.731	0.806	-3.092
	(0.691)	(0.690)	(0.636)	(0.571)	(0.738)	(1.315)	(2.521)	(0.736)	(0.723)	(0.654)	(0.637)	(0.704)	(1.579)	(2.130)
Income	-0.161	0.139	0.056	0.065	0.095	0.091	0.200	-0.281	0.086	-0.009	0.015	0.012	0.040	0.058
	(0.277)	(0.313)	(0.258)	(0.254)	(0.267)	(0.264)	(0.245)	(0.285)	(0.330)	(0.282)	(0.273)	(0.284)	(0.295)	(0.276)
Population	0.003	0.043	0.011	0.014	-0.005	-0.007	-0.003	-0.003	0.036	0.000	0.000	-0.009	-0.009	-0.011
	(0.033)	(0.034)	(0.039)	(0.039)	(0.041)	(0.036)	(0.035)	(0.030)	(0.032)	(0.039)	(0.039)	(0.039)	(0.036)	(0.036)
Heterogeneity	2.961**	2.128**	2.697***	3.000***	2.617***	5.698***	2.594***	3.512***	2.226**	2.823***	3.036***	2.859***	3.988***	2.772***
	(1.150)	(0.846)	(0.880)	(0.664)	(0.889)	(1.738)	(0.850)	(1.069)	(0.851)	(0.890)	(0.785)	(0.889)	(1.250)	(0.883)
Healthcare Expenditure	-0.494**	-0.655**	-0.627***	-0.600**	-0.655***	-0.628**	-0.894***	-0.384	-0.618**	-0.585**	-0.574**	-0.586**	-0.608**	-0.700***
	(0.224)	(0.278)	(0.224)	(0.222)	(0.232)	(0.231)	(0.227)	(0.233)	(0.290)	(0.238)	(0.238)	(0.249)	(0.251)	(0.248)
Vaccinations		-1.879***	-1.604***	-1.652***	-1.689***	-1.612***	-1.899***		-1.709***	-1.365**	-1.525***	-1.476***	-1.371***	-1.542***
		(0.349)	(0.514)	(0.431)	(0.515)	(0.458)	(0.430)		(0.381)	(0.513)	(0.472)	(0.496)	(0.494)	(0.470)
Sanitation		-0.010**							-0.010*					
		(0.005)							(0.005)					
Beds		-0.017							-0.009					
		(0.017)							(0.020)					
Physicians		-0.016							-0.009					
		(0.047)							(0.046)					
Decentralization x Legislative			-0.214							-0.089				
			(0.375)							(0.538)				
Decentralization x Federal Const.				-0.736*							-0.551			
				(0.392)							(0.605)			
Decentralization x Elected Bottom Tier					-0.017							-0.141		
					(0.496)							(0.627)		
Decentralization x Heterogeneity						-7.423**							-4.545	
						(3.569)							(4.349)	
Decentralization x Expenditure							0.521							0.330
							(0.345)							(0.313)
Constant	6.212***	14.310***	12.399***	12.165***	12.655***	11.196***	14.270***	6.578***	13.627***	11.643***	11.958***	11.958***	10.992***	12.630***
	(1.192)	(1.614)	(2.242)	(1.913)	(2.349)	(2.217)	(2.168)	(1.217)	(1.655)	(2.205)	(2.113)	(2.253)	(2.467)	(2.188)
Observations	39	33	38	39	39	39	39	39	33	38	39	39	39	39
R-squared	0.917	0.957	0.950	0.952	0.946	0.951	0.950	0.928	0.957	0.951	0.950	0.948	0.950	0.950

****, ** and * represent significance at the 1, 5 and 10% levels respectively. Robust standard errors are in parenthesis*

Table 38: Cross Sectional IV Estimates (1st Stage), Dependent Variable: Decentralization, with Additional Interactions

	PANEL A: Infant Mortality and Subnational Government Expenditure							PANEL B: Infant Mortality and Subnational Government Autonomous Expenditure						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Instrument Variables														
UK Legal Origins	-0.163**	-0.173*	-0.177**	-0.180***	-0.122**	-0.067***	-0.011	-0.176***	-0.171***	-0.183***	-0.180***	-0.099**	-0.069***	-0.005
	(0.067)	(0.087)	(0.070)	(0.062)	(0.049)	(0.023)	(0.008)	(0.047)	(0.047)	(0.032)	(0.032)	(0.043)	(0.021)	(0.008)
Germany Legal Origins	-0.134**	-0.177**	-0.158**	-0.159***	-0.100**	-0.028	-0.010	-0.097**	-0.160***	-0.137***	-0.136***	-0.064*	-0.036**	-0.001
	(0.061)	(0.065)	(0.059)	(0.057)	(0.044)	(0.020)	(0.008)	(0.041)	(0.043)	(0.029)	(0.027)	(0.032)	(0.014)	(0.007)
French Legal Origins	-0.169***	-0.157**	-0.193***	-0.177***	-0.119**	-0.039*	-0.015	-0.132***	-0.140***	-0.173***	-0.153***	-0.080**	-0.052***	-0.000
	(0.060)	(0.068)	(0.061)	(0.058)	(0.046)	(0.021)	(0.011)	(0.038)	(0.044)	(0.027)	(0.027)	(0.036)	(0.015)	(0.008)
Second Stage Controls														
Income	-0.054	-0.026	-0.034	-0.024	-0.040	0.004	0.025	-0.072	-0.096**	-0.071*	-0.058	-0.066	-0.018	0.010
	(0.052)	(0.068)	(0.055)	(0.056)	(0.055)	(0.024)	(0.019)	(0.053)	(0.042)	(0.037)	(0.044)	(0.049)	(0.018)	(0.015)
Population	0.021***	0.032**	0.012	0.008	0.012	0.005	0.002	0.005	0.017**	-0.003	-0.005	-0.002	0.002	-0.000
	(0.007)	(0.012)	(0.009)	(0.008)	(0.008)	(0.004)	(0.003)	(0.007)	(0.008)	(0.004)	(0.006)	(0.007)	(0.003)	(0.002)
Heterogeneity	0.727***	0.618**	0.512**	0.433**	0.558***	-0.907***	0.037	0.767***	0.700***	0.514***	0.398**	0.521**	-0.379***	0.004
	(0.206)	(0.260)	(0.186)	(0.181)	(0.180)	(0.150)	(0.040)	(0.203)	(0.177)	(0.165)	(0.153)	(0.191)	(0.106)	(0.038)
Healthcare Expenditure	0.057	0.032	0.021	0.012	0.026	-0.008	-0.059***	0.069	0.080*	0.038	0.025	0.037	0.012	-0.037***
	(0.047)	(0.062)	(0.050)	(0.051)	(0.051)	(0.021)	(0.017)	(0.046)	(0.040)	(0.030)	(0.037)	(0.042)	(0.015)	(0.012)
Decentralization x Interaction			0.286***	0.348***	0.293**	2.619***	0.132***			0.484***	0.551***	0.435***	2.282***	0.138***
			(0.098)	(0.077)	(0.123)	(0.274)	(0.005)			(0.109)	(0.109)	(0.145)	(0.201)	(0.006)
Vaccinations		-0.238	0.112	-0.028	-0.082	-0.065	-0.050		0.008	0.256**	0.153*	0.063	-0.046	-0.011
		(0.161)	(0.104)	(0.093)	(0.118)	(0.040)	(0.034)		(0.144)	(0.104)	(0.076)	(0.116)	(0.032)	(0.030)
Sanitation		0.002							0.002					
		(0.002)							(0.002)					
Beds		0.007							0.018***					
		(0.008)							(0.006)					
Physicians		-0.004							0.003					
		(0.021)							(0.016)					
Constant	0.252	1.020	-0.122	0.500	0.668	0.657***	0.408**	0.232	0.012	-0.626	-0.155	0.108	0.496***	0.213*
	(0.198)	(0.643)	(0.431)	(0.422)	(0.524)	(0.192)	(0.150)	(0.209)	(0.638)	(0.400)	(0.304)	(0.498)	(0.126)	(0.119)
F-test (p-value) for instruments	0.056	0.081	0.031	0.038	0.086	0.024	0.491	0.004	0.008	0.000	0.000	0.132	0.009	0.868
Observations	39	33	38	39	39	39	39	39	33	38	39	39	39	39
R-squared	0.619	0.686	0.699	0.740	0.695	0.954	0.981	0.544	0.759	0.769	0.785	0.682	0.959	0.973

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using federal constitution dummy and ethnic fractionalisation, from the first stage. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided

Table 39: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Infant Mortality, with Additional Interactions

	PANEL A: Infant Mortality and Subnational Government Expenditure							PANEL B: Infant Mortality and Subnational Government Autonomous Expenditure						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Decentralization	-0.342	-0.188	-0.638	-0.530	-0.342	2.073	-8.255	-0.502	-0.095	-0.478	-0.298	0.879	1.737	-0.502
	(1.004)	(0.719)	(0.854)	(0.868)	(1.257)	(1.866)	(9.360)	(0.940)	(0.768)	(0.792)	(0.842)	(1.678)	(2.180)	(0.940)
Income	-0.158	0.164	0.035	0.030	0.100	0.092	0.297	-0.181	0.163	0.025	0.034	0.133	0.067	-0.447
	(0.267)	(0.274)	(0.237)	(0.232)	(0.254)	(0.242)	(0.316)	(0.284)	(0.301)	(0.265)	(0.267)	(0.282)	(0.285)	(0.816)
Population	0.002	0.034	0.013	0.016	-0.005	-0.008	0.002	-0.003	0.030	0.002	0.002	0.001	-0.009	-0.005
	(0.032)	(0.029)	(0.034)	(0.035)	(0.036)	(0.032)	(0.033)	(0.029)	(0.028)	(0.035)	(0.035)	(0.040)	(0.032)	(0.079)
Heterogeneity	2.943***	1.913***	2.804***	3.165***	2.578***	5.853***	2.659***	3.021***	1.873**	2.718***	2.990***	2.281**	4.500***	3.079*
	(1.128)	(0.720)	(0.879)	(0.732)	(0.972)	(1.933)	(0.775)	(1.132)	(0.757)	(0.843)	(0.739)	(1.032)	(1.281)	(1.580)
Healthcare	-0.497**	-0.686***	-0.607***	-0.570***	-0.659***	-0.628***	-1.130**	-0.479**	-0.689**	-0.610***	-0.587**	-0.652***	-0.627***	1.107
Expenditure	(0.220)	(0.248)	(0.207)	(0.204)	(0.218)	(0.207)	(0.565)	(0.236)	(0.268)	(0.223)	(0.228)	(0.237)	(0.239)	(2.120)
Vaccinations		-1.817***	-1.591***	-1.675***	-1.679***	-1.607***	-2.122***		-1.779***	-1.435***	-1.557***	-1.543***	-1.328***	-1.176
		(0.308)	(0.459)	(0.380)	(0.444)	(0.397)	(0.562)		(0.333)	(0.525)	(0.461)	(0.523)	(0.432)	(1.262)
Sanitation		-0.010***							-0.011***					
		(0.004)							(0.004)					
Beds		-0.018							-0.017					
		(0.013)							(0.015)					
Physicians		-0.018							-0.018					
		(0.038)							(0.039)					
Decentralization x Legislative			-0.159							-0.202				
			(0.343)							(0.517)				
Decentralization x Federal Const.				-0.568							-0.643			
				(0.384)							(0.586)			
Decentralization x Elected Bottom Tier					-0.054							-1.041		
					(0.589)							(1.077)		
Decentralization x Heterogeneity						-7.824							-6.849	
						(4.930)							(5.376)	
Decentralization x Expenditure							1.071							-6.363
							(1.255)							(8.020)
Constant	6.204***	14.03***	12.43***	12.46***	12.58***	11.11***	16.01***	6.277***	13.87***	11.80***	12.00***	11.56***	10.49***	15..91***
	(1.130)	(1.478)	(1.939)	(1.715)	(2.050)	(2.026)	(4.002)	(1.150)	(1.409)	(2.100)	(1.897)	(1.960)	(2.287)	(4.348)
DWH Test (p-value)	0.9710	0.418	0.651	0.372	0.924	0.934	0.655	0.281	0.287	0.593	0.742	0.288	0.540	0.045
Hansen J-statistic (p-value)	0.537	0.213	0.163	0.270	0.248	0.452	0.314	0.816	0.199	0.147	0.225	0.320	0.292	0.9971
Observations	39	33	38	39	39	39	39	39	33	38	39	39	39	39
R-squared	0.917	0.956	0.949	0.950	0.946	0.951	0.945	0.923	0.955	0.951	0.950	0.940	0.950	0.937

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

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The first stage estimates are similar to those observed in the vaccination coverage regressions. Scandinavia legal origin group observes the highest level of decentralization, so each of the coefficients for the other groups in table 38 are negative. Each dummy variable is statistically significant individually, in most specifications. The f-test also confirms the collective significance of the dummy variables in all but a few of the specifications. As was the case in the vaccination coverage first stage estimates, in table 34, legal origins are not as effective in capturing variations in decentralization, in the final specifications for decentralization and total healthcare spending.

The second stage estimates in table 39 provide no evidence in any specification of a relationship between fiscal decentralization and infant mortality. The control variables observe some interesting effects on infant mortality. As expected, public healthcare is negatively associated with infant mortality. Vaccination coverage is also negatively associated with infant mortality, which is also expected. However, heterogeneity is positively associated with infant mortality, which suggests that when voters have heterogenous demands, healthcare outcomes are affected negatively. All of these results are robust to IV estimation.

The final set of estimates for the random effects panel model provides almost no evidence of any effect of decentralization on infant mortality over time. The only result that is statistically significant is in specification 12. When the local government executive is appointed, greater autonomous spending decentralization increases infant mortality. However, when the local executive is elected, the effect is now negative. This suggests that when local governments are accountable to local citizens, they may use spending resources to tackle health issues at the local issue, which in turn would reduce infant mortality rates. Essentially, in this result at least, local governments are more responsive when dealing with local health issues, than the central government.

Most of the control variables share a relationship with infant mortality rates that is consistent with the theory. Income is negatively associated with infant mortality rates in each of the four tables, and frequently statistically significant. Healthcare expenditure and vaccination coverage are negatively associated with infant mortality. Heterogeneity is positively associated with infant mortality, which is consistent with the cross-sectional estimations.

Table 40: Random Effects Panel Estimates, Dependent Variable: Infant Mortality, with Additional Interactions

	PANEL A: Infant Mortality and Subnational Government Expenditure							**PANEL B: Infant Mortality and Subnational Government Autonomous Expenditure**						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Decentralization	0.141	0.294	0.199	0.293	0.456	0.169	-1.508	-0.058	-0.298	-0.148	-0.130	0.293***	-0.400	0.003
	(0.276)	(0.268)	(0.303)	(0.340)	(0.302)	(1.337)	(1.511)	(0.166)	(0.204)	(0.267)	(0.277)	(0.100)	(0.720)	(0.705)
Income	-0.425***	-0.458***	-0.420***	-0.415***	-0.417***	-0.416***	-0.427***	-0.428***	-0.485***	-0.425***	-0.427***	-0.426***	-0.423***	-0.421***
	(0.155)	(0.125)	(0.141)	(0.140)	(0.142)	(0.140)	(0.133)	(0.156)	(0.126)	(0.136)	(0.136)	(0.139)	(0.140)	(0.143)
Population	-0.012	-0.036	-0.005	-0.005	-0.009	-0.016	-0.027	-0.009	-0.028	-0.016	-0.022	-0.007	-0.013	-0.014
	(0.042)	(0.044)	(0.042)	(0.043)	(0.035)	(0.037)	(0.040)	(0.040)	(0.044)	(0.038)	(0.039)	(0.035)	(0.037)	(0.038)
Heterogeneity	2.783***	1.625*	2.674***	2.860***	2.582***	2.686**	2.706***	2.872***	1.987**	2.618***	2.641***	2.683***	2.488***	2.742***
	(0.988)	(0.941)	(0.931)	(0.881)	(0.930)	(1.327)	(0.962)	(0.958)	(0.851)	(0.954)	(0.986)	(0.878)	(0.958)	(0.939)
Healthcare	-0.220*	-0.133	-0.207*	-0.207*	-0.201*	-0.209*	-0.273*	-0.216*	-0.113	-0.209*	-0.204*	-0.195	-0.203*	-0.204
Expenditure	(0.125)	(0.090)	(0.122)	(0.121)	(0.120)	(0.119)	(0.148)	(0.128)	(0.093)	(0.120)	(0.120)	(0.121)	(0.121)	(0.125)
Vaccinations		-0.105	-0.420**	-0.437**	-0.423**	-0.429**	-0.450**		-0.025	-0.438**	-0.436**	-0.444**	-0.435**	-0.443**
		(0.192)	(0.203)	(0.206)	(0.208)	(0.203)	(0.206)		(0.184)	(0.201)	(0.192)	(0.196)	(0.194)	(0.198)
Sanitation		-0.852**							-0.843**					
		(0.346)							(0.347)					
Beds		0.010							0.009					
		(0.010)							(0.010)					
Physicians		-0.049							-0.048					
		(0.039)							(0.042)					
Decentralization			-0.080							0.386				
x Legislative			(0.494)							(0.346)				
Decentralization				-0.357							0.366			
x Federal Const.				(0.524)							(0.366)			
Decentralization					-0.391							-0.419*		
x Elected Bottom														
Tier					(0.316)							(0.246)		
Decentralization						0.008							1.177	
x Heterogeneity						(3.595)							(1.604)	
Decentralization							0.247							0.012
x Expenditure							(0.210)							(0.116)
Constant	6.775***	11.17***	8.557***	8.499***	8.535***	8.580***	9.217***	6.791***	10.89***	8.781***	8.759***	8.675***	8.738***	8.665***
	(0.806)	(1.623)	(1.214)	(1.237)	(1.236)	(1.305)	(1.315)	(0.793)	(1.611)	(1.176)	(1.174)	(1.150)	(1.200)	(1.221)
Observations	321	181	318	321	321	321	321	321	181	318	321	321	321	321
Groups	40	33	39	40	40	40	40	40	33	39	40	40	40	40

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Overall, there is very limited evidence that fiscal decentralization is associated with infant mortality. The initial significance in the cross-sectional OLS estimates, is not robust to IV estimation. The random effects estimations provide only one statistical effect of autonomous spending decentralization on infant mortality, through interactions with the electoral decentralization dummy variable.

4.5.2. Public Education

I estimate the relationship between fiscal decentralization and public education in 8 tables (41-48). Estimates for primary enrolment are in tables 41-44 and estimates for classroom size are in tables 45-48.

4.5.2.1. Primary Enrolment

The cross-sectional estimates provide no evidence of an association between spending and autonomous spending and primary school enrolments. Education expenditure is omitted due to data limitations[48]. Fiscal decentralization has no effect in any of the specifications. The next set of estimates are produced using the cross-sectional instrument variable model. The first stage estimates are presented in table 42 and the second stage in table 43.

In the first stage estimates, legal origins remain effective as instruments of decentralization, though perhaps not as strong as they were in the vaccination and infant mortality regressions (34 and 38). The legal origins are often statistically significant individually. However, in specifications 4 and 9, when decentralization is interacting with electoral decentralization in the corresponding second stages, legal origins are neither individually, nor collectively significant, according to the f-test p-value.

[48] Including education expenditure as a control in the cross-sectional estimations, OLS or IV, would reduce observation count from 30 to 18.

Table 41: Cross Sectional OLS Estimates, Dependent Variable: Primary Enrolment, with Additional Interactions

	PANEL A: Primary Enrolment and Subnational Government Expenditure					PANEL B: Primary Enrolment and Subnational Government Autonomous Expenditure				
	1	2	3	4	5	6	7	8	9	10
Decentralization	-0.044	-0.025	-0.021	-0.043	0.083	-0.032	0.019	0.066	-0.019	0.143
	(0.065)	(0.061)	(0.065)	(0.090)	(0.230)	(0.080)	(0.080)	(0.105)	(0.119)	(0.272)
Income	0.021***	0.023***	0.024**	0.021**	0.024**	0.020**	0.023***	0.026***	0.021**	0.022**
	(0.007)	(0.007)	(0.009)	(0.008)	(0.009)	(0.008)	(0.007)	(0.009)	(0.009)	(0.008)
Population	0.005	0.006	0.006	0.005	0.004	0.005	0.006	0.007*	0.005	0.005
	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Heterogeneity	-0.077	-0.058	-0.057	-0.077	0.069	-0.085	-0.066	-0.044	-0.087	0.015
	(0.066)	(0.078)	(0.088)	(0.066)	(0.271)	(0.067)	(0.078)	(0.100)	(0.068)	(0.168)
Decentralization x Legislative		-0.032					-0.074			
		(0.045)					(0.071)			
Decentralization x Federal Constitution			-0.034					-0.125		
			(0.058)					(0.109)		
Decentralization x Elected Bottom Tier				-0.000					-0.015	
				(0.060)					(0.104)	
Decentralization x Heterogeneity					-0.356					-0.437
					(0.630)					(0.643)
Constant	4.374***	4.351***	4.342***	4.374***	4.306***	4.381***	4.344***	4.297***	4.373***	4.329***
	(0.083)	(0.085)	(0.106)	(0.094)	(0.158)	(0.085)	(0.084)	(0.113)	(0.098)	(0.122)
Observations	30	30	30	30	30	30	30	30	30	30
R-squared	0.429	0.441	0.438	0.429	0.441	0.422	0.448	0.464	0.422	0.437

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 42: Cross Sectional IV Estimates (1st Stage), Dependent Variable: Decentralization, with Additional Interactions

	PANEL A: Primary Enrolment and Subnational Government Expenditure					**PANEL B: Primary Enrolment and Subnational Government Autonomous Expenditure**				
	1	2	3	4	5	6	7	8	9	10
Instrument Variables										
UK Legal Origins	-0.138*	-0.160**	-0.150**	-0.058	-0.067***	-0.149***	-0.173***	-0.158***	-0.031	-0.070***
	(0.072)	(0.070)	(0.063)	(0.048)	(0.022)	(0.047)	(0.034)	(0.030)	(0.047)	(0.018)
Germany Legal Origins	-0.096	-0.132*	-0.150**	-0.041	-0.043*	-0.077	-0.127***	-0.142***	-0.024	-0.042**
	(0.078)	(0.068)	(0.065)	(0.050)	(0.024)	(0.057)	(0.037)	(0.029)	(0.036)	(0.017)
French Legal Origins	-0.159**	-0.183**	-0.172**	-0.026	-0.049**	-0.122**	-0.153***	-0.131***	0.008	-0.055***
	(0.070)	(0.069)	(0.062)	(0.055)	(0.021)	(0.048)	(0.036)	(0.025)	(0.044)	(0.014)
Second Stage Controls										
Income	0.029	0.004	-0.016	-0.016	-0.010*	0.022	-0.010	-0.031*	-0.027	-0.006
	(0.026)	(0.022)	(0.020)	(0.025)	(0.005)	(0.023)	(0.021)	(0.015)	(0.018)	(0.004)
Population	0.013	0.006	0.003	-0.010	0.010**	-0.001	-0.008	-0.013	-0.019*	0.002
	(0.014)	(0.013)	(0.012)	(0.014)	(0.004)	(0.012)	(0.009)	(0.008)	(0.009)	(0.003)
Heterogeneity	0.715***	0.422*	0.244	0.451**	-0.835***	0.733***	0.396*	0.137	0.335	-0.326***
	(0.239)	(0.240)	(0.261)	(0.210)	(0.142)	(0.214)	(0.214)	(0.199)	(0.224)	(0.080)
Decentralization x Interaction		0.333***	0.456***	0.550***	2.429***		0.541***	0.749***	0.755***	2.145***
		(0.115)	(0.116)	(0.177)	(0.208)		(0.137)	(0.115)	(0.171)	(0.144)
Constant	-0.155	0.190	0.437	0.222	0.441***	-0.181	0.248	0.533**	0.276	0.249***
	(0.297)	(0.271)	(0.258)	(0.258)	(0.081)	(0.256)	(0.247)	(0.192)	(0.204)	(0.048)
F-test (p-value) for instruments	0.138	0.086	0.076	0.516	0.043	0.022	0.000	0.000	0.532	0.004
Observations	30	30	30	30	30	30	30	30	30	30
R-squared	0.468	0.606	0.668	0.675	0.952	0.412	0.701	0.831	0.736	0.963

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

The corresponding second stage estimates in table 43 provide some evidence of an association between decentralization and primary school enrolment. This is in contrast to the OLS estimates in table 41, where spending decentralization had no effect on enrolment. Spending and autonomous spending decentralization are found to be positively associated with primary school enrolment in unitary countries (specifications 3 and 8), and negatively associated with primary school enrolment in specification 8. This could reflect one of two things. Either that countries that are less decentralized, unitary countries, can benefit from greater decentralization with respect to primary enrolment. This result could also signify that other aspects of decentralization reflected in the constitution, could have a bearing on the relationship between spending decentralization and enrolment. The strength of the effect depends on the indicator of spending decentralization. A 1% increase in spending decentralization, increases primary school enrolment by 0.15% and 0.17% (spending and autonomous spending respectively).

The second significant result is observed in interactions with heterogeneity. Spending decentralization is negatively associated with enrolment when the degree of heterogeneity is greater (5 and 10), and autonomous spending decentralization is positively associated with primary school enrolment (10). This result is counter-intuitive – Oates (1972) among others argue that greater heterogeneity strengthens the case for decentralization. However, what this indicates is that it is better to centralize when the degree of heterogeneity across the national population is greater. One interpretation of this result may be that central government prioritises primary enrolment and basic education when the demands of the population are heterogenous.

Of the control variables, only income and heterogeneity have some effect on primary school enrolment in the cross-sectional estimations. Income has a positive effect in all specifications and is robust to IV estimation. Heterogeneity observes a negative effect on primary school enrolment in specifications 1 and 6 only, and only appears in IV estimations. The negative coefficient suggests that when citizen preferences are heterogeneous, primary school enrolment is lower.

Table 43: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Primary Enrolment, with Additional Interactions

	PANEL A: Primary Enrolment and Subnational Government Expenditure					PANEL B: Primary Enrolment and Subnational Government Autonomous Expenditure				
	1	2	3	4	5	6	7	8	9	10
Decentralization	0.107	0.111	0.151*	0.379	0.440	0.101	0.122	0.166**	0.232	0.380*
	(0.108)	(0.090)	(0.092)	(0.417)	(0.269)	(0.117)	(0.084)	(0.074)	(0.340)	(0.216)
Income	0.015*	0.020***	0.023***	0.029**	0.028***	0.017**	0.023***	0.028***	0.029**	0.024***
	(0.009)	(0.007)	(0.008)	(0.015)	(0.008)	(0.007)	(0.006)	(0.007)	(0.014)	(0.007)
Population	0.004	0.006	0.006	0.009	0.001	0.005	0.007*	0.009**	0.009	0.004
	(0.005)	(0.005)	(0.005)	(0.008)	(0.004)	(0.004)	(0.004)	(0.004)	(0.008)	(0.003)
Heterogeneity	-0.164**	-0.101	-0.085	-0.232	0.420	-0.156**	-0.090	-0.046	-0.159	0.128
	(0.072)	(0.080)	(0.097)	(0.152)	(0.292)	(0.061)	(0.076)	(0.096)	(0.110)	(0.160)
Decentralization x Legislative		-0.072					-0.123*			
		(0.053)					(0.073)			
Decentralization x Federal Constitution			-0.105					-0.193**		
			(0.072)					(0.093)		
Decentralization x Elected Bottom Tier				-0.235					-0.199	
				(0.267)					(0.279)	
Decentralization x Heterogeneity					-1.258*					-0.976*
					(0.744)					(0.590)
Constant	4.423***	4.360***	4.315***	4.273***	4.145***	4.412***	4.335***	4.261***	4.296***	4.269***
	(0.087)	(0.075)	(0.098)	(0.172)	(0.155)	(0.076)	(0.073)	(0.093)	(0.150)	(0.111)
DWH Test (p-value)	0.127	0.080	0.037	0.138	0.179	0.240	0.215	0.240	0.459	0.335
Hansen J-statistic (p-value)	0.502	0.532	0.748	0.459	0.492	0.454	0.534	0.777	0.239	0.497
Observations	30	30	30	30	30	30	30	30	30	30
R-squared	0.277	0.337	0.296		0.356	0.331	0.411	0.441	0.296	0.412

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Expenditure and SCG Autonomous Expenditure are instrumented using federal constitution dummy and ethnic fractionalisation, from the first stage. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

The final estimates are produced using the random effects panel estimator. The use of the panel dataset allows for the inclusion of education expenditure as a control and as an interaction. The results in table 44 indicate that autonomous spending decentralization can increase primary school enrolment over time.

First, autonomous spending decentralization is positively associated with primary school enrolment (specification 7). A 1% increase in autonomous spending decentralization can increase primary school enrolment by 10%. Decentralization remains positively associated with decentralization when subnational governments do not have legislative autonomy (8), in unitary countries (9) and when the local government executive is appointed by the central government (10). However, when the local government executive is elected, greater spending decentralization reduces primary enrolment. This result suggests that for spending decentralization to produce positive effects on primary school enrolment, central governments should maintain control over local government through appointed local government executives.

Second, spending decentralization leads to higher primary school enrolment when total education spending is lower (12), and reduces primary school enrolment as education spending increases. One explanation for this result could be that when total education spending is lower, primary school enrolment and universal basic education are a top priority of government. By devolving spending to subnational governments, when the total level of spending is low, subnational governments allocate resources specifically to boost primary school enrolment. This would also suggest that decentralization could increase primary school enrolment in low and middle income countries.

Table 44: Random Effects Panel Estimates, Dependent Variable: Primary Enrolment, with Additional Interactions

	PANEL A: Primary Enrolment and Subnational Government Expenditure						**PANEL B: Primary Enrolment and Subnational Government Autonomous Expenditure**					
	1	2	3	4	5	6	7	8	9	10	11	12
Decentralization	-0.028	-0.010	-0.016	-0.149	0.156	-0.675	0.109*	0.126***	0.140***	0.247***	-0.011	0.738***
	(0.042)	(0.040)	(0.040)	(0.105)	(0.182)	(0.483)	(0.060)	(0.039)	(0.038)	(0.053)	(0.173)	(0.100)
Income	-0.022	-0.022	-0.022	-0.021	-0.021	-0.022	-0.026**	-0.025**	-0.024**	-0.032***	-0.030***	-0.034***
	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.011)	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)
Population	-0.001	-0.000	-0.000	0.001	0.000	0.001	-0.002	-0.001	-0.001	-0.001	-0.002	-0.001
	(0.005)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Heterogeneity	-0.108*	-0.079	-0.094	-0.113*	0.135	-0.077*	-0.166***	-0.157**	-0.148*	-0.160**	-0.229*	-0.136**
	(0.061)	(0.070)	(0.076)	(0.066)	(0.233)	(0.045)	(0.063)	(0.069)	(0.077)	(0.065)	(0.128)	(0.057)
Education Expenditure	0.035***	0.036***	0.035***	0.030*	0.038***	0.017	0.033***	0.033***	0.033***	0.042***	0.036***	0.055***
	(0.012)	(0.012)	(0.012)	(0.015)	(0.010)	(0.027)	(0.010)	(0.009)	(0.009)	(0.012)	(0.010)	(0.012)
Decentralization x Legislative		-0.035						-0.027				
		(0.040)						(0.055)				
Decentralization x Federal Const.			-0.020						-0.045			
			(0.045)						(0.060)			
Decentralization x Elected Bottom Tier				0.120						-0.171***		
				(0.093)						(0.055)		
Decentralization x Heterogeneity					-0.602						0.338	
					(0.599)						(0.525)	
Decentralization x Expenditure						0.072						-0.077***
						(0.054)						(0.015)
Constant	4.529***	4.506***	4.518***	4.566***	4.419***	4.674***	4.578***	4.562***	4.552***	4.556***	4.618***	4.470***
	(0.100)	(0.104)	(0.112)	(0.089)	(0.165)	(0.136)	(0.082)	(0.084)	(0.094)	(0.098)	(0.094)	(0.092)
Observations	139	139	139	139	139	139	139	139	139	139	139	139
Groups	23	23	23	23	23	23	23	23	23	23	23	23

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Overall, the results for fiscal decentralization and primary enrolment are mixed and often statistically insignificant. The initial cross-sectional OLS estimates provide no evidence of a link between decentralization and primary school enrolment. The cross-sectional IV estimates however provide some evidence. Spending decentralization boosts primary school enrolment in unitary countries, but reduces enrolment in federal countries. Spending decentralization also reduces enrolment when there is a greater degree of heterogeneity, and boosts enrolment when the demands of citizens are more homogenous.

Finally, the random effects estimations provide evidence that autonomous spending is associated with primary school enrolment. The effects are often positive. When subnational governments do not have legislative autonomy, in unitary countries, and when the local government executive is appointed, increases in autonomous spending decentralization can boost primary school enrolment over time. Greater spending decentralization can also increase primary school enrolment when total education spending is lower. This result may suggest that autonomous spending decentralization could be beneficial in low and middle income countries.

4.5.2.2. Classroom Size

In the first set of estimates for the cross-sectional regressions there is no evidence that fiscal decentralization has any effect on classroom size. Public expenditure is excluded from these regressions due to data limitations, which may have had an effect on role of decentralization; however, I include this control for the remaining estimations.

The second set of estimates are produced using the cross-sectional instrument variable model. The first stage estimates are presented in table 46. Similar to the primary enrolment first stage results (table 42), legal origins are a suitable instrument in all specifications, apart from the specification featuring interactions between decentralization and elected bottom tier, in the second stage. All legal origins dummies are individually statistically significant, and collectively significant at the 1% level, with the exception of specifications 4 and 9.

Table 45: Cross Sectional OLS Estimates, Dependent Variable: Classroom Size, with Additional Interactions

	PANEL A: Classroom Size and Subnational Government Expenditure					**PANEL B: Classroom Size and Subnational Government Autonomous Expenditure**				
	1	2	3	4	5	6	7	8	9	10When
Decentralization	0.091	0.161	0.538	-0.174	1.100	-0.689	-0.845	-0.804	-0.889	0.307
	(0.336)	(0.543)	(0.530)	(0.559)	(1.199)	(0.499)	(0.689)	(0.760)	(0.660)	(2.121)
Income	-0.125***	-0.116***	-0.095**	-0.148***	-0.107***	-0.115***	-0.120***	-0.122***	-0.128***	-0.103***
	(0.028)	(0.033)	(0.043)	(0.036)	(0.035)	(0.028)	(0.036)	(0.044)	(0.041)	(0.033)
Population	-0.036	-0.036	-0.025	-0.049	-0.045	-0.035	-0.042	-0.038	-0.043	-0.039
	(0.026)	(0.030)	(0.032)	(0.038)	(0.032)	(0.028)	(0.032)	(0.031)	(0.036)	(0.030)
Heterogeneity	1.266*	1.324*	1.320*	1.348*	2.212*	1.754**	1.775**	1.736**	1.798**	2.230*
	(0.723)	(0.688)	(0.679)	(0.771)	(1.222)	(0.630)	(0.633)	(0.655)	(0.651)	(1.226)
Decentralization x Legislative		-0.098					0.179			
		(0.367)					(0.456)			
Decentralization x Federal Constitution			-0.520					0.144		
			(0.471)					(0.613)		
Decentralization x Elected Bottom Tier				0.329					0.267	
				(0.510)					(0.569)	
Decentralization x Heterogeneity					-2.586					-2.331
					(2.716)					(4.501)
Constant	3.577***	3.470***	3.179***	3.795***	3.093***	3.453***	3.513***	3.544***	3.583***	3.167***
	(0.359)	(0.358)	(0.536)	(0.352)	(0.641)	(0.310)	(0.387)	(0.525)	(0.386)	(0.661)
Observations	30	29	30	30	30	30	29	30	30	30
R-squared	0.569	0.566	0.602	0.577	0.579	0.608	0.610	0.609	0.611	0.616

****, ** and * represent significance at the 1, 5 and 10% levels respectively. Robust standard errors are in parenthesis*

Table 46: Cross Sectional IV Estimates (1st Stage), Dependent Variable: Decentralization, with Additional Interactions

	PANEL A: Classroom Size and Subnational Government Expenditure					PANEL B: Classroom Size and Subnational Government Autonomous Expenditure				
	1	2	3	4	5	6	7	8	9	10
Instrument Variables										
UK Legal Origins	-0.103**	-0.174***	-0.135***	-0.047	-0.065***	-0.140***	-0.207***	-0.176***	-0.042	-0.072***
	(0.043)	(0.052)	(0.040)	(0.034)	(0.015)	(0.036)	(0.025)	(0.019)	(0.039)	(0.014)
Germany Legal Origins	-0.096**	-0.150***	-0.157***	-0.038	-0.041***	-0.090***	-0.144***	-0.152***	-0.025	-0.045***
	(0.037)	(0.032)	(0.028)	(0.038)	(0.012)	(0.030)	(0.026)	(0.020)	(0.033)	(0.010)
French Legal Origins	-0.134***	-0.191***	-0.172***	-0.033	-0.050***	-0.115***	-0.173***	-0.151***	-0.012	-0.056***
	(0.030)	(0.034)	(0.025)	(0.035)	(0.012)	(0.024)	(0.026)	(0.019)	(0.035)	(0.009)
Second Stage Controls										
Income	0.019	-0.016	-0.022	-0.024	-0.012***	0.013	-0.022	-0.030**	-0.025	-0.008**
	(0.021)	(0.020)	(0.015)	(0.018)	(0.004)	(0.018)	(0.020)	(0.014)	(0.015)	(0.003)
Population	0.011	-0.002	-0.003	-0.019	0.008**	0.001	-0.012	-0.014	-0.023*	0.003
	(0.015)	(0.015)	(0.014)	(0.015)	(0.004)	(0.013)	(0.011)	(0.011)	(0.011)	(0.003)
Heterogeneity	0.760***	0.390	0.363	0.585***	-0.720***	0.702***	0.363	0.248	0.460**	-0.310***
	(0.219)	(0.254)	(0.212)	(0.192)	(0.103)	(0.219)	(0.240)	(0.187)	(0.201)	(0.075)
Decentralization x Interaction		0.450***	0.475***	0.570***	2.307***		0.636***	0.709***	0.686***	2.092***
		(0.139)	(0.114)	(0.160)	(0.159)		(0.174)	(0.134)	(0.183)	(0.124)
Constant	-0.100	0.383	0.455**	0.247	0.423***	-0.088	0.388	0.511***	0.233	0.263***
	(0.226)	(0.247)	(0.190)	(0.187)	(0.049)	(0.197)	(0.261)	(0.180)	(0.172)	(0.041)
F-test (p-value) for instruments	0.001	0.000	0.000	0.539	0.001	0.000	0.000	0.000	0.655	0.000
Observations	30	29	30	30	30	30	29	30	30	30
R-squared	0.511	0.711	0.733	0.716	0.961	0.422	0.741	0.789	0.701	0.966

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 47: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Classroom Size, with Additional Interactions

	PANEL A: Classroom Size and Subnational Government Expenditure					PANEL B: Classroom Size and Subnational Government Autonomous Expenditure				
	1	2	3	4	5	6	7	8	9	10
Decentralization	1.489*	0.747	1.697**	-1.839	-1.813	-0.597	-0.434	0.039	-4.349	-0.844
	(0.767)	(0.547)	(0.785)	(5.115)	(4.121)	(1.630)	(1.148)	(1.032)	(4.156)	(3.293)
Income	-0.162***	-0.113***	-0.084**	-0.190	-0.147***	-0.116***	-0.111***	-0.098**	-0.229*	-0.115***
	(0.039)	(0.026)	(0.035)	(0.139)	(0.057)	(0.033)	(0.034)	(0.040)	(0.130)	(0.038)
Population	-0.046	-0.034	-0.018	-0.079	-0.020	-0.035	-0.037	-0.027	-0.115	-0.035
	(0.033)	(0.029)	(0.035)	(0.106)	(0.043)	(0.025)	(0.029)	(0.029)	(0.104)	(0.029)
Heterogeneity	0.192	1.089*	0.823	2.275	-0.072	1.698	1.660***	1.567**	3.211*	1.779
	(0.733)	(0.571)	(0.681)	(2.799)	(3.424)	(1.045)	(0.630)	(0.676)	(1.716)	(1.428)
Decentralization x Legislative		-0.332					-0.049			
		(0.255)					(0.659)			
Decentralization x Federal Constitution			-1.035***					-0.420		
			(0.379)					(0.707)		
Decentralization x Elected Bottom Tier				1.282					2.650	
				(3.027)					(2.958)	
Decentralization x Heterogeneity					4.207					0.150
					(9.755)					(6.880)
Constant	3.960***	3.394***	2.982***	4.184***	4.292**	3.466***	3.416***	3.243***	4.502***	3.458***
	(0.458)	(0.329)	(0.424)	(1.332)	(1.719)	(0.368)	(0.422)	(0.546)	(1.255)	(0.850)
DWH Test (p-value)	0.090	0.534	0.162	0.763	0.458	0.954	0.646	0.328	0.361	0.620
Hansen J-statistic (p-value)	0.208	0.163	0.197	0.131	0.143	0.102	0.104	0.142	0.388	0.104
Observations	30	29	30	30	30	30	29	30	30	30
R-squared	0.367	0.541	0.516	0.423	0.500	0.608	0.601	0.581	0.118	0.607

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Expenditure and SCG Autonomous Expenditure are instrumented using federal constitution dummy and ethnic fractionalisation, from the first stage. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

In the second stage results, spending decentralization is found to be statistically associated with classroom size (panel A). Greater spending increase the size of classrooms between countries. An increase of 1% in spending decentralization, results in a 1.5% increase in classroom size. Spending decentralization is also found to be statistically associated classroom size through interactions with federal constitution in specification 3. Spending decentralization increases classroom size in unitary countries, and reduces them in federal countries. This result is harder to explain intuitively. As unitary countries are generally less decentralized (Altunbas and Thornton, 2011), this result does not suggest that greater decentralization in countries that are typically more centralized, will lead to smaller classroom sizes. It is also hard to explain when considering the effect of federal constitution on classroom size, or rather, the mechanisms by which decentralization affect classroom size. This result may indicate correlation between federal constitution and another determinant of cross-sectional variations in classroom size.

Of the control variables, once again income and heterogeneity explain cross-sectional variations in provision. Income is, as expected, negatively associated with classroom size. Heterogeneity is consistently, positively associated with classroom size in the OLS estimations. The IV estimations remove most significance, though in some specifications heterogeneity continues to be positively associated with classroom size.

The final estimates for the random effects panel estimates observe greater statistical significance of spending decentralization on classroom size. There are also differences in the effects of decentralization between the cross-sectional IV estimates and the random effects panel estimations. First, when accounting for cross-sectional variation in the random effects, greater spending decentralization over time helps to reduce the size of classrooms. A 1% increase in spending decentralization reduces classroom size by 0.32% (1). Spending decentralization continues to be negatively associated with classroom size when local governments have no legislative autonomy (2), and in unitary countries (3). On the other hand, when subnational governments do have legislative autonomy, greater spending decentralization increases classroom size.

Second, autonomous spending decentralization is also associated with classroom size in specification 10. When the local government executive is appointed, greater decentralization increases the size of classrooms. However, when the local government executive is elected, the opposite is true.

Table 48: Random Effects Panel Estimates, Dependent Variable: Classroom Size, with Additional Interactions

	PANEL A: Classroom Size and Subnational Government Expenditure						**PANEL B: Classroom Size and Subnational Government Autonomous Expenditure**					
	1	2	3	4	5	6	7	8	9	10	11	12
Decentralization	-0.323*	-0.571*	-0.530*	-0.144	-2.952**	1.102	0.050	-0.566	-0.392	0.333**	-1.095*	0.944*
	(0.168)	(0.293)	(0.283)	(0.344)	(1.401)	(1.800)	(0.149)	(0.490)	(0.459)	(0.169)	(0.577)	(0.497)
Income	-0.104**	-0.091*	-0.104**	-0.095*	-0.107**	-0.096*	-0.140***	-0.142***	-0.147***	-0.147***	-0.148***	-0.139***
	(0.047)	(0.055)	(0.045)	(0.054)	(0.044)	(0.052)	(0.050)	(0.048)	(0.046)	(0.053)	(0.048)	(0.053)
Population	-0.020	-0.038	-0.030	-0.022	-0.037	-0.025	-0.036	-0.041*	-0.044*	-0.028	-0.033	-0.031
	(0.032)	(0.028)	(0.031)	(0.030)	(0.032)	(0.031)	(0.027)	(0.023)	(0.026)	(0.027)	(0.028)	(0.028)
Heterogeneity	1.373**	0.843	1.322*	1.350**	-1.757	1.294*	1.285**	1.113*	1.260*	1.270*	0.833	1.309**
	(0.648)	(0.706)	(0.738)	(0.663)	(1.933)	(0.670)	(0.647)	(0.648)	(0.649)	(0.676)	(0.798)	(0.652)
Education Expenditure	-0.181***	-0.209***	-0.184***	-0.182**	-0.193***	-0.145**	-0.167**	-0.168**	-0.162***	-0.148**	-0.155**	-0.145*
	(0.064)	(0.072)	(0.062)	(0.075)	(0.062)	(0.073)	(0.066)	(0.065)	(0.063)	(0.075)	(0.062)	(0.079)
Decentralization x Legislative		0.619**						0.686				
		(0.306)						(0.492)				
Decentralization x Federal Const.			0.311						0.495			
			(0.290)						(0.466)			
Decentralization x Elected Bottom Tier				-0.134						-0.450**		
				(0.381)						(0.216)		
Decentralization x Heterogeneity					8.364*						2.773**	
					(4.323)						(1.303)	
Decentralization x Expenditure						-0.157						-0.120*
						(0.202)						(0.062)
Constant	4.914***	5.228***	5.015***	4.832***	6.049***	4.547***	5.130***	5.265***	5.216***	5.034***	5.276***	4.930***
	(0.403)	(0.438)	(0.454)	(0.435)	(0.813)	(0.525)	(0.427)	(0.472)	(0.468)	(0.445)	(0.459)	(0.471)
Observations	116	116	116	116	116	116	116	116	116	116	116	116
Groups	20	20	20	20	20	20	20	20	20	20	20	20

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

This result suggests a difference in government priorities between central and local government. Therefore, local citizens may put a greater weight on classroom sizes and the quality of education. On the other hand, the central government may prioritise universal access to education. This theory is supported in the primary school enrolment estimations, in table 44, specification 10.

Third, fiscal decentralization reduces classroom size when the degree of heterogeneity is lower, as observed in specifications 5 and 11. However, increases in the degree of heterogeneity reverse the effects of decentralization, particularly when subnational governments do not have autonomy over that expenditure (5). Finally, autonomous spending decentralization leads to larger classroom sizes when education spending is lower (12)

When controlling for random effects, income and education expenditure are negatively associated with classroom size over time. The effect of income on classroom size is consistent with cross-sectional estimates also. Heterogeneity is also positively associated with classroom size, which confirms cross-sectional results that greater heterogeneity of citizen demands leads to higher classroom sizes.

Overall the results for the relationship between fiscal decentralization and classroom are mixed. There is no evidence in the cross-sectional OLS estimations, though IV estimation produces some significance. Spending decentralization is positively associated with classroom size between countries, and in unitary countries especially. Federal countries observe the opposite effect. The strongest evidence is in the random effects panel estimates. Spending decentralization is negatively associated with classroom size, which is in contrast to the cross-sectional IV estimates. Greater spending decentralization is also negatively associated with classroom size when heterogeneity is lower, and when spending is higher. This suggests that decentralization will not lead to smaller class sizes in countries where public spending on education is lower. Combined with results in the primary school enrolment estimations, greater spending decentralization when education spending is lower, will produce mixed results – leading to higher primary school enrolment, but bigger classroom sizes.

4.5.3. Results Summary

After producing estimates for each of the indicators for public healthcare and public education, there are several key findings:

1. Fiscal decentralization does not share a robust positive or negative association with any of the indicators for public healthcare or education. Also, the results are not robust to estimation technique. Furthermore, there is very little evidence that decentralization has an effect on infant mortality. Instead, decentralization shares stronger links with health and education outputs, such as vaccination coverage and primary school enrolment.
2. Fiscal decentralization has different effects depending on the degree of autonomy subnational governments have over expenditure. This effect is noticeable in random effects estimations for vaccination coverage (table 36) and primary enrolment (table 44). When controlling for random effects, greater autonomous spending decentralization increases vaccination coverage and primary enrolment.
3. The effects of spending decentralization are sensitive to other forms of decentralization. The strongest example of this is in interactions between decentralization and local government accountability. Depending on whether the local government executive is elected, the effects of spending decentralization differ. This is particularly relevant to education indicators. In random effects estimations (tables 44 and 48), greater autonomous spending decentralization leads to higher primary school enrolment, but higher class sizes, when the executive is appointed. However, if the executive is elected, the opposite is true for the two education indicators.
4. Fiscal decentralization performs differently depending on the level of total spending on healthcare and education. In estimations for decentralization and education, Spending decentralization improves vaccination coverage when total government spending is higher, but leads to lower vaccination coverage when total government spending is more limited. This may suggest that centralized administration can improve public service provision in developing countries.

4.6. Conclusion and Closing Remarks

In this chapter I have examined the effects of fiscal decentralization on public healthcare and public education. Using the decentralization dataset outlined in chapter 2 and indicators for vaccination coverage, infant mortality rates, primary enrolment and classroom size that have been used in similar research previously, I investigated whether tax and spending decentralization had a positive or negative effect on the provision of public healthcare and public education. I included in my estimations interactions between tax and spending decentralization and other aspects of decentralization. Finally, I examined whether fiscal decentralization had different effects depending on the degree of heterogeneity (of need between citizens) and total public spending on healthcare and public education. The main findings of my empirical research are as follows:

1. Generally, there is limited evidence that spending decentralization provides consistent benefits or risks to public healthcare and public education at the national level. Instead, the effects of decentralization are sensitive to the degree of autonomy of subnational governments; other types of decentralization, and the level of total public spending on healthcare and education.
2. There is evidence that decentralization of autonomous spending can improve healthcare outputs, such as vaccination. In the random effects estimations, autonomous spending is positively associated with vaccination coverage, and this effect is consistent for when subnational governments do not have legislative powers, in unitary countries, and when the local government executive is appointed. However, there is very little evidence that fiscal decentralization improves healthcare outcomes. This result may be expected due to the large number of factors that determine general healthcare of the population (mortality, expectancy). However, as vaccination coverage is negatively associated with mortality, decentralization would benefit healthcare generally indirectly through improvements to essential services.
3. Whether the local government executive is elected (accountable to local citizens) or appointed (answering to central government), has a bearing on the relationship between decentralization and public services, particularly public education. The contrast in effects of spending decentralization on education

suggest that local governments will make different decisions, with respect to the allocation of government expenditure, depending on who they are accountable to. The strongest evidence of this is in random effects estimations, where greater spending decentralization increases enrolment, with larger classroom sizes, when the executive is appointed. The opposite is true when the executive is elected.

4. Fiscal decentralization observes different effects depending on the level of total public expenditure on education. This is evident in vaccination, primary enrolment and classroom size estimations. For example, spending decentralization is positively associated with vaccination coverage when total healthcare spending is higher, but negatively associated with vaccination coverage when total healthcare spending is limited. This may indicate that different effects will be observed between developing and developed countries.

Though my results are inconclusive, this reflects previous studies in this area. Previous research has produced qualified conclusions on the relationship between decentralization and the provision of public services. Khaleghian (2004) finds that the relationship between decentralization and vaccination coverage is sensitive to the selection of countries studied (i.e. low, middle or high income countries). Falch and Fischer (2012) provide evidence that decentralization is conducive to school performance, but argue that more work must be done to investigate transmission effects, for example, total government spending and decentralization. Finally, Treisman (2000) finds that the relationship between decentralization and the provision of public services is sensitive to the chosen indicator of decentralization, or rather, the aspect of decentralization being measured.

To conclude, fiscal decentralization is neither universally good, nor universally bad for the provision of public healthcare and public education. Instead, the relationship between fiscal decentralization and public services depends on: i) the public service in question, ii) other aspects of decentralization, iii) the degree of heterogeneity, and iv) the total level of public spending on healthcare and education.

Further work is needed to establish what effect fiscal autonomy has on the relationship between decentralization and the provision of public services as my results were largely mixed between the two indicators. Future research should consider

expanding the dataset, particularly in the country dimension. In this research, I was unable to compare the effects of decentralization on provision according to different income groups (low, middle and high) due to limited data. Finally, the interactions between the panel decentralization indicators and other aspects of decentralization produced some interesting results. However, I chose only three of the available qualitative indicators for different concepts of decentralization, and the Treisman dataset (2002), and a new local government dataset from Ivanyna and Shah (2014) provide a broader range of qualitative indicators. Further examination of the effects of interactions between decentralization and qualitative indicators for electoral, administrative and fiscal decentralization available in these datasets could produce more conclusive results on the role of autonomy and administrative decentralization.

5. Trust in Government and Fiscal Decentralization

In this chapter I investigate whether citizens trust governments more the greater the degree of subnational government responsibility. We may think of trust in government as depending on the 'integrity' of government to do what is right (Keele, 2007) and the 'capability' of government to deliver an efficient public sector and a stable economy (Porumbescu, 2016). Essentially, citizens will trust government more when government is motivated to serve citizens, and when government is competent to deliver. In this chapter I consider how fiscal decentralization might affect citizen trust in government overall, specifically through these two channels.

The literature on interpersonal trust and trust in government includes research on the effect of trust. Knack and Keefer (1997) and Zak and Knack (2001) find that higher trust is conducive to stronger economic development. One such argument is that trust helps to reduce transactions costs, therefore reducing overall cost and enhancing economic development (Dincer, 2010). Higher trust in government can also promote long term investments in infrastructure, as citizens are more willing to pay for such investments (Oh and Hong, 2012).

In the most related piece of research, Ligthart and Oudheusen (2015) explain that the fiscal decentralization literature often focuses on the relationship between decentralization and economic growth, public sector efficiency, the quality of government, but there is little investigation of the more direct effects of fiscal decentralization, such as citizen satisfaction in government performance and citizen trust in government. Indeed, only two pieces of empirical research examine the effects of government decentralization on trust in government. Ligthart and Oudheusen examine the effects of revenue and expenditure decentralization[49] on trust in government in a selection of countries between 1994 and 2007. The relationship is positive between decentralization and trust in government, but there is no effect on trust in other institutions[50]. Similar work by Dincer (2010) investigates the relationship between fiscal decentralization and interpersonal trust in the US. The relationship between SCG Revenue and SCG Expenditure is positive and robust.

I contribute to this new area of research by expanding on the empirical work of Ligthart and Oudheusen (2015). My contributions are several:

i) I explain the link between fiscal decentralization and trust in government through specific channels, such as government capability at the local and

[49] Equivalent of SCG Revenue and SCG Expenditure
[50] Parliament, political parties and civil services

national level, and the integrity of local government decision making. I raise specific arguments regarding electoral decentralization and government structure that may explain how fiscal and other forms of decentralization could have an effect on trust.

ii) I use the extensive dataset for fiscal and other aspects of decentralization outlined in chapter 2 to examine specific effects of government decentralization on trust. In previous research in this area, indicators for SCG Revenue and SCG Expenditure were used by Ligthart and Oudheusen (2015)[51]. I include in my research additional measures of electoral decentralization, government structure, and a measure of the proximity of local government to citizens (average local population size). Through interactions between these indicators and the panel decentralization indicators, I may establish specific effects of decentralization

iii) I use two sources of data for citizen trust in government: The World Values Survey and the Eurobarometer dataset. Ligthart and Oudheusen (2015) used the World Values Survey only. However, as Keele (2007) explains, the determinants of trust over a longer period of time may not be the same as year on year changes. The World Values Survey data is measured in blocks of years; however, the Eurobarometer dataset is available year on year.

The results produced in this research demonstrate that fiscal decentralization often has a negative effect on trust, though the initial negative effects are sensitive to electoral decentralization and the number of tiers of government. I also provide additional evidence that fiscal decentralization has a positive effect on trust when government spending is lower, perhaps benefiting poorer countries more. Furthermore, further decentralization can improve citizen trust in when local governments are responsible for a smaller number of people. Hence any positive effects of fiscal decentralization appear to be driven by the specific effect of bringing governments closer to people. However, fiscal decentralization can damage trust in government through other channels, such as the efficiency of government, particularly in public spending.

[51] Ligthart and Oudheusen (2015) explain data limitations restrict their research on fiscal autonomy and trust in government

This research is organised as follows. In section 5.1 I provide a literature discussion on the determinants of trust, and how fiscal decentralization fits into this discussion. After the key arguments are established, I outline the data that I will use in this research to investigate the relationship between fiscal decentralization and other concepts of decentralization, and trust in government. In section 5.3, I provide a brief overview of this data, including differences in measurements of trust between two sources, and correlations between the key variables. In section 5.4, I explain the various methods used in this empirical research to identify the strength of any relationship between decentralization and trust in government. I split results into two sections. In section 5.5, I provide the main body of results, concerning the relationship between fiscal decentralization and trust in government. In section 5.6, I provide further estimations for additional interactions between decentralization and: i) the quality of government, ii) total government expenditure (government size) and iii) the proximity of government to citizens. Finally, in section 5.7 I provide a conclusion to this research and include suggestions for future work in this area.

5.1. Related Literature

In this literature survey, I establish how fiscal decentralization could impact on citizen trust in government. I focus on two aspects of the trust literature. One, trust in government depends on the integrity of government decision making (Keele, 2007). Two, trust in government is a matter of confidence in the competence of government decision making (Porumbescu, 2016). Various arguments in the decentralization literature, addressed in chapter 1, may provide some idea of how fiscal decentralization could affect the integrity of government decision making and how fiscal decentralization may affect the administrative effectiveness of government decision making at the central and local government level. Despite a potential link between government decentralization and citizen trust in government, there has been only one study to my knowledge that has studied this (Ligthart and Oudheusen, 2015).

This literature survey is organised into two halves. In the first half I provide a brief overview of the trust literature, where I refer to commonly used definitions of trust (in government); I summarise the benefits of higher trust on economic development and public sector performance; and finally, what are the determinants of trust. In the second half I connect themes in the decentralization and trust literature that could explain a relationship between decentralization and trust, in practice.

5.1.1. Trust Literature: An Overview

I begin this overview by briefly defining citizen trust in government for the purposes of this research. The trust literature is a sub-section of the social capital literature, which encompasses civic engagement, citizen participation in democratic governance and trust: interpersonal trust and trust in government (Putnam, 1993; Keele, 2007). In my research I focus on citizen trust in government.

Citizen trust in government is defined in two ways. First, citizens must trust that government is motivated to serve. This argument focuses on the integrity of government decision making (Keele, 2007). Simply put, do citizens have trust that government will do the right thing? [52] Second, citizens must have confidence that government is competent

[52] This is the exact wording of several surveys, including the Edelman Trust Barometer, and surveys cited in Nye's analysis of trust data (1997)

and effective (Porumbescu, 2016). Government is seen as capable (competent) when they deliver on key policies, such as the efficiency of public sector spending and taxation; ensure economic stability and economic development (Barnes and Gill, 2000). The measures of trust are often closely linked to citizen confidence (Alesina and Ferrara, 2002), which focuses more on the degree of competence of government, rather than simply whether governments are motivated by a desire to serve their citizens.

Citizens base their trust in government on a range of representatives at the national and local level, and in related institutions, such as parliament and the civil service (Mishler and Rose, 2001). Bannister and Connolly (2011) explain that "government" encompasses individuals (executives) and agencies of government at the local and national level. Hence the trust that citizens have in government will depend on the performance of local government and national government, and the decisions made by local and national executives.

5.1.1.1. The Benefits of Trust

Most of the work carried out in the trust literature has focused on the practical implications of trust, specifically on economic development. Studies in this area (see Knack and Keefer, 1997 and Zak and Knack, 2001) find that higher trust is conducive to stronger economic development. One such argument is that trust helps to reduce transactions costs, therefore reducing overall cost and enhancing economic development (Dincer, 2010). Knack and Keefer (1997) also argue that trust helps to reduce costs, but for a different reason. They explain that distrust acts as a tax on innovation, where businesses (entrepreneurs) allocate more of their time to monitoring (employees), and consequently, less time on innovation.

Another area of study, albeit smaller, focuses on the relationship between trust in government and public sector performance. Porumbescu (2016) explains that the relevant literature tends to find that lower levels of trust have a negative effect on the efficiency and effectiveness of the public sector. One such argument is that low trust reduces citizen compliance with taxation and expenditure decision making of government. Oh and Hong (2012) provide theoretical evidence for a positive association between citizen trust in government and willingness to pay (WTP). They explain that lower trust leads citizens to underestimate the economic value of government expenditure, which in turn reduces

their willingness to contribute, in taxes, to finance public expenditure. Governments may seek to improve citizen trust (or reduce distrust) by focusing on short-term expenditure to produce immediate benefits, rather than long term investment projects (i.e. infrastructure). Lower investment in infrastructure and productivity enhancing goods and services may lead to weaker economic development

The empirical research provides robust support in favour of the view that trust is good for growth. Knack and Keefer (1997) identify a positive relationship between trust and economic growth for a selection of 29 market economies. Dincer and Uslaner (2010) investigate the relationship between trust and economic and manufacturing sector growth in the US. Regions where trust is higher exhibit faster economic growth. Ahlerup et al. (2009) show that trust is positively associated with economic growth across a range of countries and that the effect is even stronger in low income countries.

5.1.1.2. The Determinants of Trust

Some of the arguments regarding the benefits of trust appear to be compelling, so much so that new research has focused on how trust may be strengthened in places where it is low (Warner, 2001). Many studies have attempted to analyse the changes in trust over time and between countries, particularly when statistical evidence shows a consistent decline in trust leading up to the 21st century. Nye (1997) provides a summary of statistical evidence for the decline in trust. In the US, trust in government[53] between the 1960s and 1990s fell from 75% to 25%. Similar declines in trust were also observed in Canada, Japan and most of the European continent. Nye also identifies cross-sectional variations in trust, where low income countries exhibit higher levels of trust than high income countries. He explains that trust is higher in low income societies because citizens are more willing to accept governmental authority. Finally, Nye explains that whilst there has been a decline in trust over a long period of time, around this trend there have been fluctuations, which suggests that there are factors which can improve trust year on year.

Keele (2007) seeks to explain the decline and trust, over shorter and longer periods of time. Keele considers the factors that may explain short term (intra-year and year on year) fluctuations in trust, and the factors which help build trust over a longer period of

[53] Question: do you trust the government to do the right thing? (Nye, 1997). Government includes federal, state and local definitions. The responses were consistent between the different tiers of government

time. Factors which are expected to explain short term fluctuations include economic performance: development and stability, political corruption and quality of public services (Kim, 2010). Factors which explain changes in trust over a longer period of time include the degree of civic engagement and the quality of institutions that enable citizen participation in democratic governance (Yang and Holzer, 2006; Keele, 2007). In this brief overview I consider a selection of these factors that have been covered in the literature.

First of all, economic outcomes such as growth, unemployment and inflation, are expected to have an effect on citizen trust in government. Brehm and Rahn (1997) find that changes in trust over time typically follow economic upturns and downturns. Citrin and Green (1986) observe the close link between other economic outcomes, such as inflation and unemployment (measured collectively in the Misery Index) and citizen's confidence in the government. Trust will also depend on the distribution of income (individual circumstance). Zak and Knack (2003) explain why income distribution may explain some of the variations in trust, alongside the macroeconomic variables above. They explain that those earning lower wages are more sensitive to income changes, and therefore more sensitive to economic instability. Gustavsson and Jordahl (2008) provide empirical evidence that individual earnings and inequality have a significant effect on trust. Income distribution (Gini coefficient) has also been used as a control in various studies on trust (interpersonal and government) (see Knack and Keefer, 1997; Zak and Knack, 2001; Alesina and Ferrara, 2002).

Second, citizen trust in government may also depend on the efficiency and effectiveness of government spending. Citizens could perceive higher taxation and spending as a sign of inefficient government, which would lead to lower trust. Alternatively, higher taxes may indicate that the government is seeking to maximise rents[54]. There is some evidence that higher taxes are associated with lower trust and greater dissatisfaction. Nye (1997) observes a strong link between survey responses on government spending and taxation, and trust in government. When respondents were asked why they do not trust their government, 80% responded saying they believe government is wasteful and inefficient, spending on the wrong things. Keele (2007) constructs a trust indicator and identifies a strong positive correlation between citizens' view of wasteful expenditure and trust in government. Bjørnskov et al. (2007) examine

[54] The 'Leviathan' hypothesis (Brennan and Buchanan, 1980), see Chapter 1, sub-section 1.2.3 (page 17)

the effects of government spending on citizen satisfaction (in life), and provide evidence to support the theory that government spending is negatively associated with satisfaction. I expect their arguments to be relevant to citizen trust, as there is a strong link between trust and satisfaction in their empirics. Whatever the cause of higher taxes, there is good reason to expect that higher taxes might be negatively associated with citizen trust in government.

Third, citizens' view of the quality of their government is expected to have a strong effect on citizen trust in government. The perception that public funds are being used for private ends is expected to have a strong negative effect on citizen trust in government (Jang et al., 2015). Corruption will matter to the public on how they assess the functioning of government in general (Easton, 1965). Corruption also means there are obstacles to accountable government and citizen participation in government decision making (Dahl, 1971; Sun and Wang, 2012). The empirical evidence on corruption and trust in government appears to justify the expectations in the literature of a negative effect of corruption on trust. Chang and Chu (2006) provide empirical evidence that the perception of corruption has a negative effect on trust in a selection of Asian countries. Della Porta (2000) using Eurobarometer data, find a negative relationship between the perception of corruption and trust in Italy, France and Germany. Seligson (2002) observe the same relationship in Latin America countries. Anderson and Tverdova (2003), using ISSP (International Social Survey Program) data, showed that corruption had a negative effect on trust in civil servants. Clausen et al. (2011), using Gallop World Poll data, show that confidence in military, judicial system and national government is negatively affected by corruption.

5.1.2. Fiscal Decentralization and Trust in Government

The connection between the decentralization of governments and citizen trust in government has received only limited attention in the literature. Warner (2001) and Bannister and Connolly (2011) consider fiscal decentralization as a way to build trust at the local level, specifically through increased citizen participation in government decision making. Citizen participation in democratic governance is increasingly important as the role of subnational governments is expanding to cover the delivery of basic and essential public services, in education and healthcare, and social welfare (Weitz-Shapiro, 2008).

Walker and Andrews (2015) observe that local governments are considered to be the public face of the state, and therefore by strengthening ties between local government and local citizens, this could potentially improve citizen trust in government overall.

In this literature review I consider how fiscal decentralization could affect trust in government according to the definition of trust provided at the beginning of this literature survey. Specifically, I consider how fiscal decentralization could improve the integrity of government decision making (1.2.1) and why fiscal decentralization may improve or reduce the capability of governments to deliver an efficiency and effective public sector (1.2.2)

5.1.2.1. Fiscal Decentralization, Government Capability and Trust in Government

On the one hand, local governments may be more effective at providing goods and services to the local area (Oates, 1972). Local government may possess an advantage over central governments that they can focus on local demands and are better placed to know what those demands are (Tanzi, 1996). On the other hand, local governments may lack the resources (human, financial and technical) to provide for local demands (see Evans, 1996; Boadway and Shah, 2009).

Supporters argue that fiscal decentralization brings governments closer to citizens enabling governments to better address local needs (Musgrave, 1983; Faguet, 2014). Local governments are better able to address local needs because they know what they are (Tanzi, 1996). Therefore, if the demands for public goods and services differ from one subset of the population to the next, local governments will be better able to allocate expenditure according to demands, compared with a centralized administration that may tend towards a more regionally-uniform public policy (Oates, 1972). By increasing the role of local governments, local citizens are encouraged to participate in democratic governance at the local level, and in doing so, express their demands to government more effectively (Bratton, 2012).

Fiscal decentralization could also lead to lower taxes. Bjørnskov et al. (2008) find that satisfaction is negatively associated with government size (taxes). If fiscal decentralization reduces taxes, then this could also boost citizen trust in government. Oates (1972) and Tiebout (1956) explain that fiscal decentralization reduces the cost of

providing public goods and services to the minimum point along the cost curve. Citizens may observe a fall in taxes, or an increase in government output for the taxes they pay.

On the other hand, detractors argue that local governments may simply be unable to address local need due to resource constraints (fiscal, human, technical), or local governments may face incentives to address some local needs, but not others.

First, local governments may lack the capability to address local demands. Faguet (2004) points out that in order for government to be responsive, there needs to be sufficient resources to provide for citizen demands in the local area. Rodden and Rose-Ackerman (1997) argue that the benefits of centralization, such as economies of scale and scope, may outweigh the benefits of decentralization in poorer countries, where tax resources are more limited. Fiscal decentralization could also risk reducing minimum standards of public services (Garcia-Valinas, 2005). Citizens may feel that despite the advantages of local government, ultimately they are not getting value for their taxes from local government that they would get from a robust central government (Evans, 1996).

Second, fiscal decentralization may actually change the composition of expenditure in a way that is undesirable to citizens, who may then have a negative view of the capability of government. Keen and Marchand (1997) provide evidence that shift from parks, recreational facilities and social services, to infrastructure and productivity-enhancing investments. As a consequence, fewer resources may go to essential non-productive public goods, which could reduce trust in government for two reasons. The allocation of spending to public goods and services may be inefficient, thereby reducing the capability of government at the local level, and reducing trust in government overall.

Third, fiscal decentralization could lead to inequality in local government performance. For example, in wealthier areas of the country, local governments will have greater resources (Boadway and Shah, 2009). Hence, some local governments may be better able to respond to local citizens than national government, but for other local governments, the opposite may be true. On a similar point, Cai and Treisman (2005) show how areas that have better quality infrastructure, more human capital, and other advantages, could observe higher levels of growth. If economic performance has an effect on trust in government, then a decentralized government may lead to inter-regional differences in trust.

All of these arguments suggest that fiscal decentralization could be bad for the poor (Prud'homme, 1995). This is particularly important if the poorest have a lower

degree of trust in government[55]. If fiscal decentralization leads to lower spending on welfare (Hoyt, 1991; Keen and Kotsogiannis, 2004) and if fiscal decentralization leads to inter-regional inequality then the poorest may be negatively affected by the decentralization of governments. The most effective way to increase trust may be to help the poorest. Fiscal decentralization could reduce citizen trust in government for the poorest, or at least fail to improve trust. However, it is important to note that my own evidence in chapter 3 suggests that fiscal decentralization does not necessarily harm the poorest in society. Chu and Yang (2012) also note that fiscal decentralization can enhance economic growth because of the arguments above, which could ultimately improve the public's opinion of government.

Overall, fiscal decentralization could increase the responsiveness of government to citizen needs, thereby improving links between citizens and government and increase trust. However, there is also the risk that fiscal decentralization could reduce the efficiency of the public sector, reduce the quality of public services, and lead to inter-regional inequality – all of which will reduce the ability of governments to help the poorest, who in turn have the lowest degree of trust in government.

5.1.2.2. Fiscal Decentralization, Government Integrity and Trust in Government

Fiscal decentralization could also improve citizen trust in government by making government more accountable to local citizens, thereby improving government integrity.

Supporters argue that decentralization can improve the accountability of local government decision making. Tabellini (2000) argues that fiscal decentralization empowers citizens to hold local politicians to account, specifically by enabling citizens to compare and contrast the performance of local government. Besley and Case (1995) demonstrates how yardstick competition between local governments forces government officials to serve their citizens, rather than themselves. Boadway and Shah (2009) explain that local citizens are better able to monitor the activities of local governments, which makes it harder for local governments to pursue their own interests at the cost of their citizens.

[55] See Gustavsson and Jordahl (2008) for empirical evidence that income distribution has an effect on trust.

Fiscal decentralization also strengthens the accountability of government through local government decision making. Local politicians have a specific remit to attend to local issues, hence can be judged and held to account for the decisions they make concerning one area of the country (Kyriacou and Roca-Sagales, 2011). As Seabright (1996) demonstrates, local governments must satisfy local citizens, but central governments must satisfy only a sufficient number of local regions. Essentially, fiscal decentralization can improve the integrity of government decision making as citizens are empowered to hold local autonomous governments to account better than they would be able to a central government.

There is evidence that local governments do address local needs more effectively than the central government. Bratton (2012) provides evidence that in practice, local governments (local leaders) are more responsive than national government and national leaders. First, Bratton identifies a more positive view of local councillors in African countries. In a survey, citizens were asked whether local representatives (councillors) or national representatives were more responsive[56], and almost all responses were more favourable with regards to the local representatives. Faguet (2004) examines the effects of decentralization reform in Bolivia in 1994 on expenditure decision making of government. After the reforms in 1994, government allocated more expenditure according to need. In areas of the country where literacy rates are lower, decentralization led to an increase in education spending in those areas. Similar effects were observed for spending on sanitation, urban development and water management. Faguet's evidence may indicate greater local government capability, or greater responsiveness. Either way, local governments appear to satisfy local needs more.

Another reason why fiscal decentralization may improve trust in government is that it may simply generate a perception of improved government responsiveness. Faguet (2014) argues that the decentralization of fiscal powers and decision making is intended to improve civic participation, by moving from a "hierarchical, bureaucratic mechanism of top-down management to a system of nested self-governments characterized by participation and cooperation" (page 2). In contrast, further centralization could be perceived as self-serving: taking power from more accountable, local governments, and instead increase the powers and control of a distant, centralized administration (Weitz-Shapiro, 2008).

[56] Responsive defined as the length of time that government representatives at different tiers of governments listen to their citizens (page 518, table 2)

Detractors argue that fiscal decentralization does not necessarily improve local government integrity, and presents certain risks and challenges, specifically in implementation of fiscal decentralization.

First, for fiscal decentralization to improve accountability, local executives must be directly elected by. When explaining the link between fiscal decentralization and the accountability of local government, Faguet (2014) assumes that fiscal decentralization means locally elected governments. As explained above, if local governments and representatives are elected directly by the local constituency, they then face incentives to improve local government performance (increasing likelihood of re-election). However, if local executives are appointed by central government, then they are accountable to central government. However, the central appointments of local executives create a principal-agent problem. Central government would need to monitor the performance of local executives, whilst citizens can only hold the central government to account. Bratton (2012) states this point specifically, saying that the lack of political accountability of local officials leads to dissatisfaction with service delivery, which in turn would lead to lower citizen trust in government.

Second, in order for citizens to hold government to account they must be clear about the responsibilities that are assigned to different tiers of government. However, Treisman (2002, 2008) shows that some government structures are more complicated than others, containing more tiers of government, and that the clear assignment of decision making between the different tiers of government becomes increasingly important. Bratton (2012) explains that citizens are often uncertain about the roles of central, subnational and local government, citing an example where citizens in African countries over-estimated the role of local governments, specifically regarding income tax. In the decentralization literature, a few academics have raised the issue of complex government structures on the relationship between decentralization and government accountability. Shleifer and Vishny (1993) explain that more complex government structures also make it harder to hold government officials to account, as citizens are simply unsure who is responsible. Fukasaku and de Mello (1999) explain that decentralization could lead to more corruption if expenditure and revenue functions are not clearly assigned between the different tiers of government. Treisman (2002) also examines the effect of complicated government structures on various dependent variables for the quality of

government, and concludes that governments with more tiers lead to increased levels of corruption.

Third, even if local government executives are elected at the local level and are clearly assigned, there is still the risk that local governments may not serve the local citizens. Seabright (1996) shows that when the welfare of the local politician depends on being re-elected they will seek to maximise their own welfare by serving local citizens and increasing the probability of being re-elected to office. However, local governments are closer to citizens, which also include wealthy elites, who may seek to capture governments at the local level (Prud'homme, 1995; Tanzi, 1996). Elites may provide incentives for local politicians to serve a small group of people in the local area.

The empirical research in the area of fiscal decentralization and government accountability often examines the effects of fiscal decentralization on corruption. Fisman and Gatti (2002) and Altunbas and Thornton (2011) both provide positive relationship between fiscal decentralization and the perception of corruption, though in the case of the latter, local government autonomy and vertical administration appear to mitigate against the initial positive effects. Treisman (2000) observes mixed results between decentralization and corruption, depending on the chosen indicator of decentralization. Specifically, the number of tiers in a government structure has a negative effect on the quality of government (i.e. increasing corruption).

5.2. Data Definitions

In this section I outline the indicators for citizen trust in government and institutions, the quantitative and qualitative indicators of fiscal decentralization, and the selection of control variables. At the end of this section I provide a full list of the variables used in this research.

5.2.1. Citizen Trust in Government Indicators

In order to measure citizen trust in government I use measures of trust in government and institutions from two datasets. The first set of data is from the World Values Survey. The World Values Survey data is the most commonly used dataset for research on the trust in government (Ligthart and Oudheusden, 2015), but also interpersonal trust as well (see

Knack and Keefer, 1997). The original data is available per individual response to the survey. Each participant is asked how much confidence they have in government and other institutions[57]. I interpret citizen confidence in organizations as a representation of citizen trust in institutions (see Alesina and Ferrara, 2002; Ligthart and Oudheusen, 2015). After excluding all "don't know" responses from the survey, I produced a simple scale from 0-3, where 0 represents no confidence, and 3 represents a great deal of confidence. I constructed aggregated data (national level) as an average of all responses[58] for each period of time that data is available. The World Values Survey data comes in waves of between 4 and 6 years. Between 1990 and 2009 there are four waves: 1990-1994 (wave 1), 1995-1998 (wave 2), 1999-2004 (wave 3) and 2005-2009 (wave 4).

The country level data from the World Values Survey contains three indicators covering a maximum a 45 countries between 1990 and 2009. The three indicators are: i) trust in national government, ii) trust in national government, parliament, civil service and political parties (averaged across the four indicators)[59], and iii) public mood (average trust in church, armed forces, press and television)

The main limitation of the World Values Survey is that data is not available annually. Instead, the data which is available in waves of 4-6 years reflects longer term changes in trust in government, in related institutions, and public mood. Therefore, data in waves is not suitable for examining short term changes in trust (i.e. year on year) and consequently, the factors that explain year on year changes in trust. For this reason, I include an additional dataset from the Eurobarometer trust survey. The Eurobarometer dataset has been used previously by Zak and Knack's (2001) in their empirical research on trust and economic growth.

The question in the Eurobarometer survey is slightly different to that of the World Values Survey. Participants were asked whether they trust government and other institutions[60]. There were three possible responses: yes, no or don't know. After removing the "don't know" responses, I produced aggregated data calculated as the percentage of the population who gave a positive (yes) response to the question. Hence

[57] For the exact wording of the questions in each survey, see Appendix A data definitions

[58] The average number of responses per single observation is 1479, with a minimum of 650 and a maximum of 3025.

[59] Mishler and Rose (2001) define trust as the average of trust in political parties, parliament, military and other institutions. My average is for national government, parliament, civil service and political parties. Data is not always complete for each country, each wave. The average is from at least 2 variables.

[60] Respondents could also reply "don't know", as in the World Values Survey. I removed these responses from the individual level data, and construct aggregated (national) data based on trust and do not trust responses

the data does not measure the degree of trust people have in government, but the proportion of the population who trust their government.

Data is available yearly[61] from 2003 and 2009 (7 years in total). I use two indicators: i) trust in government and ii) public mood (average trust in television, armed forces, religion and business). The dataset covers 26 countries. For some countries data is not available for the entire time period – the total number of observations in the panel data is 168 (roughly 6.22 observations per country). Trust in government is complete for the entire dataset, but there are some gaps in the public mood data.

I also examined a third dataset from the Edelman Trust Barometer publications. The data is similar to the Eurobarometer Survey, measuring positive responses to a typical question of trust in government decision making[62]. However, the quantity of data available before 2010 is rather limited and the two datasets provided very contrasting views of the level and changes in trust over time. For example, according to the Eurobarometer dataset, trust in France between 2007 and 2008 declined by 30%. However, according to the Edelman dataset, trust actually rose in France over the same period. In Poland, between 2007 and 2008, trust rose by 28% in the Eurobarometer dataset, but declined by 43.5% in the Edelman dataset. There are several reasons why these two sources of trust data, which intend to measure the same thing, produce such contrasting results. One possible reason may be timing, and that within the year a significant event may have occurred that affected citizen trust in government be a substantial amount. A second reason may be that different samples of people asked in these surveys have very different views of government. The World Value Survey and Eurobarometer data is based on samples containing a wide range of people. On the other hand, the Edelman Trust Barometer collected data from a specific group of people: more educated and wealthier[63]. Though it may be worthwhile to examine differences in trust and the factors of trust between different income groups, in this research the limited quantity of data provided no prospect of a valuable analysis. Instead I focus my research

[61] In some cases, it is available bi-annually. I calculate the average across the two observations to produce annual data for the entire dataset

[62] The wording of the question and the possible responses are different to the Eurobarometer dataset (see appendix for full details). However, the publication provides country level data as a percentage of positive responses, which is similar to that of the Eurobarometer dataset

[63] Edelman Trust Barometer state that respondents are what are referred to as 'elites'. Respondents are between 25 and 4 year olds, college educated, with household income in top quartile, and reported significant interest in/engagement in media, business news and policy affairs

on the two more common datasets to examine changes in trust for a wider range of people who participated in those surveys.

A complete list of the countries covered in this research is available in appendix D. Furthermore, cross-sectional data for the trust indicators is available in appendices E (World Values Survey) and F (Eurobarometer and Edelman Barometer).

5.2.2. Decentralization Indicators

In this chapter I include a different selection of decentralization indicators to capture important effects. I include SCG Revenue, SCG Expenditure and SCG Expenditure share to capture share of subnational government activity and subnational government autonomy. In addition to panel decentralization indicators, I also include some of the qualitative indicators of other concepts of decentralization. I include legislative decentralization and electoral decentralization indicators from previous chapters. I also include an indicator for the number of tiers of government (chapter 2, section 2.3.4). The original data in Treisman's (2008) decentralization dataset describes the number of government tiers for a range of countries. In the selection of countries covered in this empirical research, Slovenia has the least complex government, with two tiers of government (central and local). India and China have the most complex government structure, each with five tiers of government. Using Treisman's original data for the number of tiers of government, I construct a dummy variable to split the same between those countries with 3 or fewer tiers of government, and those countries with 4 or more tiers of government. Finally, I include local government population size to capture the degree of local government responsiveness to local citizens.

In initial estimates I examined the effect of federal constitution (used in previous chapters) and local government size (average area size of local government). However, I chose not to include these indicators in the final results after the estimations were found to be largely insignificant.

5.2.3. Control Variables

I include a selection of control variables based on the relevant literature and previous empirical research in this area. The first control is public mood, which captures the degree

of trust the public have in other organisations. Ligthart and Oudheusen (2015) in the most comparable research to my own also control for trust in other organisations from the World Values Dataset. The Eurobarometer dataset also contains information on trust in other organisations.

The remaining controls used in this empirical research are based on the literature themes and previous empirical research on interpersonal trust and trust in government. I control for economic development and stability: income (logarithm of real GDP/capita), growth (annual growth rate of GDP) and unemployment (share of labour force that are unemployed). I initially included a control for inflation to capture economic stability, alongside unemployment (i.e. the Misery index utilised in Citrin and Green, 1986), however results were almost always insignificant across a number of specifications. I control for government size (general government expenditure as a % of GDP) (see Bjørnskov et al., 2007) and the quality of government (Corruption Perception Index), used in previous chapters. Finally, I control for heterogeneity (ethnolinguistic fractionalization, from Alesina, et al., 2003), previously incorporated in research on interpersonal trust (see Alesina and Ferrara, 2002; Gustavsson and Jordahl, 2008). I also included a control for income inequality (GINI coefficient), using the same data from chapter 3. Gustavsson and Jordahl (2008) and Dincer (2010) also included the GINI coefficient in their research. However, the data had many gaps, and despite some significance in a selection of regressions featuring different decentralization indicators, different controls and the different econometrics techniques (section 5.4), the inclusion of inequality did not change the significance of the decentralization indicators in those regressions. The gaps in the data had a significant effect on the power of the results, particularly for World Values Survey. Hence I omitted inequality from the empirics in section 5.5. Finally, I control for institutional democracy. The indicator from the POLITY IV datasets computes the difference between scores applied to countries on the strength of their democracy and autocracy indicators. This variable has been previously used in Ljunge (2014) to examine the relationship between trust and the strength of democracy. This research concluded stronger democratic political institutions were positively associated with trust.

A complete list of the indicators used in this research is provided in table 49 below. I include my expectations of the relationship between trust and the control variables based on the arguments presented in the literature review in chapter 1.

Table 49: List of Control Variables

Determinant of Poverty	Expected Coefficient Sign (for controls and interactions)
Income *(logarithm of real GDP per capita)*	Positive
Economic Growth *(annual growth in nominal GDP per capita)*	Positive
Unemployment *(Percentage of work force currently unemployed)*	Negative
Government Expenditure *(general government expenditure as a % of GDP)*	Negative
Governance *(corruption perception index)*	Positive
Heterogeneity *(ethnolinguistic fractionalization index)*	Negative
Democracy *(institutional democracy score)*	Positive

5.3. Descriptive Statistics and Correlations

In this section I provide a few descriptive statistics for the datasets I use in this research. As in previous chapters, I include statistics for the cross-sectional datasets. In contrast to the previous research I measure the dependent variable with more than one source of data. I provide descriptive statistics for the World Values Survey dataset and the Eurobarometer Trust dataset. The datasets contrast in the measurement of trust and the coverage (country and time period), hence it is important to identify differences in the features of the dataset prior to empirical examination. I also provide pairwise correlation coefficients for the key variables in Eurobarometer dataset

5.3.1. Descriptive Statistics

The descriptive statistics are for the cross-sectional datasets from the World Values Survey (table 50) and the Eurobarometer Survey (table 51).

5.3.1.1. Trust in Government, Government related Institutions and General Trust

World Values Survey:

In table 50, panel A, trust in government is only slightly above "a little bit of confidence", at a value of 1.366. The maximum confidence is 2.426 (Jordan), which represents between a lot and a great deal of confidence. In contrast, South American countries (Argentina and Peru) observe the lowest degree of confidence in government – average confidence is below 1, representing very little confidence overall. Most countries observe lower citizen confidence than the average across the sample.

Public mood is more positive. The confidence that citizens have in the church, armed forces and media is greater than confidence in government. Argentina still observes the lowest degree of confidence, whilst public mood is lower in high income European countries. Netherlands, France, United Kingdom and Sweden all have lower than the average degree of general trust. Public mood is most positive in Asian countries, China and India, and African countries, South Africa and Morocco.

Eurobarometer Survey

The Eurobarometer survey responses also demonstrate the limited trust that citizens have in government. In the majority of countries, fewer participants would trust their government than those that did not – most countries observe an aggregate level value of less than 0.5 in the Eurobarometer dataset. Citizens in Poland have the lowest trust in government across the entire dataset, at 18.5% positive responses. At the other end of the range, the wealthiest country in the sample, Luxembourg ($74132.06 average real income) has the highest positive response rate of 71.2%. As with the World Values Survey data, trust in general is higher than trust in government. The lowest positive response rate is 55% (Slovenia), which is higher than the average trust in government. The range and standard deviation of the public mood indicator is considerably smaller than trust in government. The difference in the summary statistics between the two trust indicators for the Eurobarometer dataset suggest that there is greater variation in citizen trust in government, than trust overall (public mood).

5.3.1.2. Decentralization and Controls

The decentralization data is similar to previous datasets used in this research, though there are some interesting differences between the two cross-sectional samples in table 50 and table 51. First, SCG revenue is greater than SCG expenditure in both datasets. Only 7 of 45 countries observe higher SCG expenditure than SCG revenue in the World Values Survey dataset, and 3 of 27 in the Eurobarometer dataset. Second, there is a significant difference between the measures of SCG revenue and SCG expenditure decentralization, and the measure of fiscal autonomy in SCG autonomous expenditure decentralization. This is a feature of previous studies, with Ebel and Yilmaz (2002) identifying that traditional measures of decentralization (SCG revenue/SCG expenditure) overestimate the degree of fiscal decentralization. When comparing the datasets, it is noticeable that decentralization is higher in the WVS dataset. This is due to the inclusion of federal countries (USA and Canada) in the WVS dataset, which observe some of the highest levels of decentralization.

Table 50: Descriptive Statistics: World Values Survey (cross-sectional dataset)

Panel A: Trust

	Obs.	Mean	Std. Dev	Min	Max
Trust in Government	44	1.366	0.346	0.907	2.426
Trust in Government and Institutions	45	1.237	0.271	0.696	2.235
Public Mood	45	1.531	0.258	0.696	2.279

Panel B: Decentralization

	Obs.	Mean	Std. Dev	Min	Max
SCG Revenue	45	28.24	13.87	6.41	66.05
SCG Expenditure	44	25.17	12.77	3.42	60.68
SCG Autonomous Expenditure	41	17.53	10.74	0.95	46.92
Average Population (Local Government)	45	46.0765	74.914	1.59603	381.986
Average Size (Local Government)	45	0.08001	0.07486	0.01365	0.39416

Panel C: Selection of Covariates

	Obs.	Mean	Std. Dev	Min	Max
Real GDP/capita	44	16728	12862	2123.641	42462
Economic Growth	45	3.387	2.469	-2.825	11.419
Unemployment	41	9.237	4.455	3.600	23.793
Government Expenditure	45	17.764	4.081	10.772	25.176
Governance (Corruption Perception)	36	5.596	2.426	2.359	9.460
Ethnolinguistic Fractionalization	45	0.335	0.193	0.063	0.808

Table 51: Descriptive Statistics: Eurobarometer Survey (cross-sectional dataset)

Panel A: Trust

	Obs.	Mean	Std. Dev	Min	Max
Trust in Government	27	40.485	14.204	18.500	71.200
Public Trust	27	63.148	5.051	55.300	73.800

Panel B: Decentralization

	Obs.	Mean	Std. Dev	Min	Max
SCG Revenue	27	23.575	11.104	1.533	46.947
SCG Expenditure	26	21.425	11.346	1.230	48.844
SCG Autonomous Expenditure	24	11.980	7.828	0.280	29.236
Average Population (Local Government)	27	36.227	73.385	1.596	381.986
Average Size (Local Government)	27	0.048	0.037	0.008	0.144

Panel C: Selection of Covariates

	Obs.	Mean	Std. Dev	Min	Max
Real GDP/capita	27	27879	13505	74132	6477
Economic Growth	27	2.626	1.777	-0.053	7.182
Unemployment	27	8.693	5.691	3.743	34.350
Government Expenditure	27	19.529	2.416	15.913	25.175
Governance (Corruption Perception)	27	6.271	1.989	3.300	9.500
Ethnolinguistic Fractionalization	27	0.22835	0.165568	0.033269	0.587096

In addition to the tax and expenditure decentralization indicators, I include descriptive statistics for the average size of local government, with respect to population (per 1000s) and area size (per 1000 square kilometres). There are large variations in population and area size within this dataset.

First, the average number of people local governments are responsible for is 46,000 (WVS) and 36,000 (Eurobarometer). The average size of the local government area is 0.080 (WVS) and 0.048 (Eurobarometer). Second, the average size of local government is much smaller in the European dataset (Eurobarometer), than in the World dataset (World Values Survey). This is also the case in population size of local governments. Third, there is a large range of local government sizes, in both respect, in the World Values Survey sample. The largest local government size (Australia, 394 square kilometres) is just under 300 times larger than the smallest (India, 13.7 square kilometres), whilst the largest average population count at the local government level is in the United Kingdom (380,000)[64]. In contrast, many countries have a much smaller population size at the local government level – 10 (WVS) and 11 (Eurobarometer) countries observe fewer than 10,000 people on average. Fourth, and unsurprising given the largest sizes above, there is a positive skew in the distribution of countries in both datasets. In the World Values Survey 27 out of the 45 countries observe smaller local government size than the sample average. There are, however, only two outliers in the WVS dataset (Australia and South Africa). In the Eurobarometer dataset the countries are more clustered. 18 out of 27 countries observe smaller local government size than the average, but there are no outliers. In terms of population, there are two outliers in WVS (United Kingdom and South Africa) and one outlier in Eurobarometer (United Kingdom)

Finally, the descriptive statistics for the control variables in panel C demonstrate variations between and within the samples. For example, the Eurobarometer dataset contains European countries, all of which are in the middle to high income category. Within this sample, countries are characterized by economic stability – lower unemployment and steady, lower average growth. In the World Values Survey, countries from South America, such as Argentina and Brazil, observe higher levels of unemployment, which provides a greater range of observations in the World Values

[64] The figure, 381,000 per local government is significantly higher than the next largest (105,000 in Denmark). I verified the figure in the Ivanyna and Shah (2014) dataset and corresponding paper. When producing estimates later on I tested the effect of local government population size with and without the United Kingdom. The results were consistent in sign and significance, though the magnitude of the effects did change.

Survey dataset. Real income also observes large variations within the datasets, and between them, as WVS countries has lower incomes, but faster growth. Similar differences appear in the other control variables. Government expenditure and quality of government is greater in the Eurobarometer dataset. These variations could explain the differences in the trust indicators between the two samples, and the variation within the samples could explain variations in trust between countries.

5.3.2. Correlations

In tables 52 and 53 I provide the pairwise correlation coefficients for the Eurobarometer and World Values Survey dataset. The correlation coefficients are based on the panel datasets. The Eurobarometer data contains a larger number of observations, but covers a narrower range of countries. On the other hand, the World Value Survey data covers fewer observations, but a wider range of countries.

There are several interesting observations. First, public mood is positively correlated with trust in government. The size of the coefficient is fairly similar between the two datasets, just over 0.5. This size of this coefficient suggests that whilst public mood is aligned with trust in government to an extent, trust in government may be driven by other factors than those driving the general mood of the public. Second, in the Eurobarometer data (table 52), each of the decentralization indicators is positively correlated with government trust. SCG expenditure is also positively correlated with public mood. Third, the local government population size is positively associated with trust in the World Values Survey (table 53). This is a rather odd finding, as this suggests the trust in government is higher when the population size of the local jurisdiction is increasing. However, there is no association in the Eurobarometer dataset. Fourth, the correlation between decentralization and local government area and population size provide some interesting observations. In the Eurobarometer data local government area is positively correlated with the decentralization indicators. This means that decentralization of revenue and expenditure is greater when local governments cover a larger area of land. In the World Values Survey data local government population size is negatively correlated with each of the decentralization indicators. Together, this suggests that subnational governments account for more revenue and expenditure (as a proportion

of total government revenue and expenditure) when local governments are responsible for a larger area of land and a smaller number of people (i.e. smaller population density).

Of the control variables, between the two datasets there are some significant correlations with trust in government. Real income has a strong positive correlation with trust in government in both datasets, economic growth also shares a positive correlation in the World Values Survey dataset (table 53), whilst unemployment shares a strong negative correlation in the Eurobarometer dataset (table 52). Government spending also shares no correlation with trust in government, but quality of government does share a positive correlation with trust in government (table 52). Finally, ethnolinguistic fractionalization is positively correlated with trust. This is a surprising result. Though correlation does not indicate causality, it is interesting that countries with higher levels of fractionalization also have higher trust.

Table 52: Pairwise Correlation Coefficients (Eurobarometer Trust Dataset)

	Trust in Gov't	Public Mood	SCG Revenue	SCG Expenditure	SCG Autonomous Expenditure	Real Income	Growth	Unemploy.	Gov't Exp.	Corruption	Ethno-linguistic	LG Area	LG Pop
Trust in Gov't	1.000												
Public Mood	0.3388***	1.000											
SCG Rev.	0.1391*	0.092	1.000										
SCG Exp.	0.188**	0.1788**	0.9851***	1.000									
SCG Aut. Exp.	0.198**	0.103	0.8470***	0.8631***	1.000								
Real Income	0.5468***	0.004	0.240***	0.2083***	0.1496*	1.000							
Growth	0.089	0.061	-0.104	-0.065	-0.017	-0.271***	1.000						
Unempl.	-0.397***	-0.1510*	-0.078	-0.087	0.051	-0.491***	-0.077	1.000					
Gov't Exp.	0.014	-0.066	0.3183***	0.2670***	0.066	0.1935**	-0.3848***	-0.080	1.000				
Corruption	0.5717***	0.1866**	0.4902***	0.4822***	0.3612***	0.7780***	-0.1758**	-0.4586***	0.4245***	1.000			
Ethno-linguistic	0.5113***	0.5132***	-0.013	-0.040	-0.089	-0.427***	0.181	0.245	-0.348***	-0.2426*	1.000		
Local Government Population	-0.085	0.120	0.3357***	0.2742***	0.053	-0.052	0.080	-0.029	0.2033***	0.1985***	0.093	1.000	

Statistical significance of the pairwise correlation coefficients: 0.10 (*), 0.05 (**), 0.01 (***)

Table 53: Pairwise Correlation Coefficients (World Values Survey Trust Dataset)

	Trust in Gov't	Trust in Gov't (+)	Public Mood	SCG Rev.	SCG Exp.	SCG Aut. Exp.	Real Income	Growth	Unemp.	Gov't Exp.	Corrupt.	Ethno-ling.	LG Area	LG Pop
Trust in Gov't	1.0000													
Trust in Gov't (+)	0.879***	1.0000												
Public Mood	0.542***	0.514***	1.0000											
SCG Rev.	-0.014	0.174	-0.069	1.0000										
SCG Exp.	-0.089	0.085	-0.140	0.984***	1.0000									
SCG Aut. Exp.	0.080	0.140	-0.091	0.826***	0.857***	1.0000								
Real Income	0.196*	-0.102	-0.508***	0.166	0.277**	0.354***	1.0000							
Growth	0.392***	0.257**	0.355***	-0.112	-0.203*	-0.090	-0.270**	1.0000						
Unemp.	0.038	-0.040	0.165	-0.037	-0.036	-0.234*	-0.234*	0.054	1.0000					
Gov't Exp.	-0.164	-0.011	-0.145	-0.070	-0.031	-0.148	0.340***	-0.30***	0.222*	1.0000				
Corrupt.	0.050	0.164	-0.42***	0.214*	0.350***	0.382***	0.796***	-0.309**	-0.28**	0.3495***	1.0000			
Ethno- ling.	0.511***	0.467***	0.513***	-0.013	-0.040	-0.089	-0.43***	0.181	0.245*	-0.358***	-0.243*	1.0000		
LG Area	0.140	0.022	-0.023	-0.104	-0.075	-0.024	0.241*	0.005	0.194	0.083	0.241*	0.093	1.0000	
LG Pop	0.269**	0.142	0.218*	-0.385***	-0.388***	-0.413***	-0.034	0.071	0.425***	0.065	-0.050	0.337***	0.771***	1.00

Statistical significance of the pairwise correlation coefficients: 0.10 (*), 0.05 (**), 0.01 (***)

5.4. Methodology

The methods outlined in this section are used to produce estimations for the relationship between fiscal decentralization and trust in government. The methods used are similar to those in the previous two chapters, examining changes in trust between countries and over time. I provide initial estimates for a cross-sectional model. To counter potential endogeneity bias in the initial estimations, I employ a cross-sectional instrument variable model. To examine variations in trust over time, I use a fixed effects panel estimator is used to examine variations in trust and decentralization over time.

5.4.1. Cross-sectional Estimates:

The first estimations are produced using a cross-sectional ordinary least squares model, in function 5.1.

$$T_i = \alpha + \beta_1 D_i + \beta_2 D_i . INT_i + \gamma X_i + \varepsilon_i \qquad 5.1$$

In the cross-sectional estimations, each of the dependent and independent variables are averaged across the period for which data is available. The WVS dataset spans a maximum of 20 years between 1990 and 2009, whilst the Eurobarometer Survey cross-sectional dataset covers 7 years from 2003 to 2009. The averaging of the WVS dataset is weighted according to the length of each wave[65]

The dependent variable is the average level of trust in government and trust in government and related institutions (WVS dataset only). The independent variables include the average level of decentralization (D_i), with interactions[66] ($D_i . INT_i$). I also include a selection of control variables contained in vectorX_i, also averaged for the corresponding time period.

[65] There are four waves in total: 2 cover a period of 5 years, 1 a period of 4 years and 1 a period of 6 years. The averaged value is weighted according to the length of the waves for which data is available.
[66] Interactions include: legislative decentralization, electoral decentralization, tiers of government, local government population size, government size and governance index (CPI).

5.4.2. Endogeneity: de Mello (2004), Dincer (2010) and Ligthart and Oudheusen (2015)

I consider the possibility that decentralization, D_i, is endogenous in 5.1. The potential issue of endogeneity bias in ordinary least squares estimations has been raised in previous research in this area (see de Mello, 2004; Dincer, 2010; Ligthart and Oudheusen, 2015). There are two reasons why decentralization may be endogenous in function 5.1, and why the estimation of the effect of decentralization on trust in government, β_1, may be biased and inconsistent in OLS estimations.

The first reason is possible reverse causality or simultaneity in function 5.1. Ligthart and Oudheusen (2015) explain that it is difficult to establish clear causality between fiscal decentralization and trust in government. They explain how the trust that citizens have in government may influence the political processes that affect decentralization policy. De Mello (2004) also alludes to reverse causality between social capital (confidence in government) and fiscal decentralization. Essentially, decentralization may be affected by changes in trust, which would bias the estimation of the effects of decentralization on trust in government. If this is the case, then the explanatory power of decentralization in function 5.1, β_1, may be overstated and consequently, statistical tests of the significance of β_1 would be invalid.

The second reason why decentralization may be endogenous in function 5.1 is omitted variable bias. Any unobserved factors of trust will be contained in the residuals in function 5.1. If decentralization shares some correlation with those unobserved factors, then this would bias the estimation of the effects of decentralization on trust in government.

Ligthart and Oudheusen (2015) investigate whether decentralization is endogenous in their research using the Durbin Wu-Hausman test, and find sufficient evidence to reject the null hypothesis (exogeneity of decentralization data). To tackle the potential endogeneity problem in function 5.1, I produce two further estimations using a cross-sectional IV model, and a fixed effects panel estimator.

5.4.3. Cross-sectional Instrument Variables Estimates:

The second set of estimations are produced using a cross-sectional instrument variable model. In previous research in this area a selection of instruments has been used. De Mello (2004) uses initial values of the decentralization data and ethnolinguistic fractionalisation. Earlier work by Oates (1972) and Tiebout (1956) cite the benefits of decentralization when there is greater heterogeneity of demands. Furthermore, empirical research by Wallis and Oates (1988) and Panizza (1998) suggests that fractionalisation explain variations in decentralization.

However, ethnolinguistic fractionalisation may not be a suitable instrument for decentralization in this research. Dincer (2010) points out that a correlation exists between ethnic diversity and trust in government. Furthermore, research by Alesina and Ferrera (2002) explains how ethnic diversity can affect interpersonal trust and their empirical research confirms their hypothesis. Interpersonal trust may be strongly correlated with trust in government and for this reason, I have included ethnolinguistic fractionalisation as a control. Therefore, ethnolinguistic fractionalisation is not a suitable instrument variable.

Dincer (2010) proposes alternate instrument variables: land area and population size. Enikolopov and Zhuravskaya (2007) explain that, all other things equal, the larger the country, the stronger the case for decentralization. This is also supported by the arguments discussed in chapter 1 (see Tiebout, 1956; Oates, 1972 and Seabright, 1996). Furthermore, the empirical research conducted by Wallis and Oates (1988) and Panizza (1998) provide some evidence of a link between size (area and population) and decentralization. They also provide evidence that urbanisation and capital population, are associated with the degree of decentralization.

It is also important to discuss the exogeneity of the instruments. Ethnolinguistic fractionalisation is not suitable because it could share a direct link with the dependent variable. It is important that any chosen instruments affect the dependent variable indirectly, through the endogenous explanatory variable. Though Dincer (2010) uses area and population, and provides diagnostic tests that support their use as instruments (strong and valid), he does not provide a discussion on exclusion restriction and instrument exogeneity. Instead. Enikolopov and Zhuravskaya (2007) discuss exogeneity restriction with respect to country size (area and population) in their research. They explain area

size could only be endogenous in the long run. Over time countries can break up or reform based on various political factors, which could be linked to citizen trust in government. However, they argue that their period of study, 25 years, is sufficiently short horizon to treat the instruments as exogenous. In my research, the periods covered at 20 years (WVS) and 7 years (Eurobarometer). An argument could be made that population size, and capital population as a percentage of national population, may affect trust, for example, through interactions of heterogenous groups (Alesina and Ferrara, 2003). However, as ethnolinguistic fractionalisation is included in the model as one of the covariates, there is no plausible explanation how land area, population size of capital population would be associated with trust directly. Instead, land area, population size and the percentage of the population living in the capital are expected to explain variations in trust in government, through variations in decentralization.

Therefore, the first stage estimations are outlined in function 5.2, below.

$$D_i = \alpha + \delta_1 AREA_i + \delta_2 POPULATION_i + \delta_3 CAPITAL_i + \theta X_i + u_i \qquad 5.2$$

As before, the results of the first stages are provided alongside their second stage counterparts in the result sections (5.5 and 5.6). I provide a discussion of instrument strength alongside my results. I discuss the coefficients for each of the instruments in the first stage and consider whether the signs of those coefficients (δ_1, δ_2, δ_3) are what we would expect based on the literature. Area and population are expected to be positively associated with decentralization, whilst capital population is expected to be negatively associated with decentralization. I also provide the p -value for the f-test of collective significance of the instrument variables. In second stage estimations, I also provide the p-value for the Durbin-Wu Hausman test and Hansen J-statistic for each of the estimations.

5.4.4. Fixed Effects Panel Estimator

The final set of estimations are produced using a Fixed Effects Panel model, outlined below in function 5.3.

$$T_{i,t} = \alpha_i + \beta_1 D_{i,t} + \beta_2 D_{i,t} . INT_i + \gamma X_{i,t} + \varepsilon_{i,t} \qquad 5.4$$

In the fixed effects estimator, each country has its own intercept term, which captures any time invariant features that could explain trust between countries (culture, institutional quality etc.). For example, cultural effects may explain variations in trust between countries (Fukuyama, 1995). Fukuyama explains that different cultures may observe lower levels of trust. These time invariant factors could be accounted for using fixed effects. Failure to capture variables that explain cross-sectional variability in trust, could bias estimates of the relationship between decentralization and trust in government in the ordinary least squares estimates. Unfortunately, data does not exist to capture all of these factors. A fixed effects panel estimate captures cross-sectional variability in the individual intercept terms. Consequently, the explanatory variables, including decentralization, could explain variations in trust in government over time.

One of the disadvantages of using the fixed effects estimator is that it does not allow for the inclusion of time invariant independent variables, such as ethnolinguistic fractionalization, due to collinearity with the fixed effects. Another option would be to use a random effects estimator. However, the specification test (see Hausman, 1978) rejects the null hypothesis – the random effects is not a valid estimator[67]. Though the use of the fixed effects panel estimator will generate problems of efficiency, due to the large number of countries and the very short time span[68], by rejecting the null hypothesis in the Hausman specification test, the random effects estimator is unsuitable due to inconsistent estimates of the effects of the explanatory variables. Consequently, fractionalisation is dropped as an explanatory variable in the fixed effects panel estimates.

[67] I compared the estimates for a Fixed Effects and Random Effects panel estimator using the Hausman specification test. For each indicator of tax and spending decentralization, the null hypothesis was rejected for both datasets: at the 5% (SCG revenue), 1% (SCG expenditure) and 10% (SCG autonomous expenditure) level. Therefore, the model is correctly specified using the Fixed Effects estimator, and not the Random Effects estimator.

[68] Though the World Values Survey dataset covers 20 years, there are only 4 waves, hence 4 time periods. The Eurobarometer dataset covers 7 years, though this is still short compared to the number of countries.

5.4.5. Time Dummies

In addition to fixed effects, I also consider the possibility of time effects. Alesina and Ferrara (2002) include time dummies in their empirics, citing previous research on the declining trend of trust. They include year dummies for their panel dataset from 1974 to 1994. In my research I include time effects: i) wave dummies (WVS), and ii) year dummies (Eurobarometer). Prior to including time effects I examined the average level of trust per wave (WVS) and per year (Eurobarometer). Only the last two years of the Eurobarometer dataset observed noticeable declines in trust across the dataset. This could suggest a global shock due to the financial crash and consequent economic shock. Hence, I included time effects in some of the regressions[69] to investigate whether this would affect the results.

In producing further estimations, I found evidence that controlling for wave effects (Ligthart and Oudheusen, 2015) had no impact on the estimations. In the World Values Survey, wave 4 (2005-2009) would occasionally be statistically significant, but this did not have an effect on the controls or decentralization coefficients. In the Eurobarometer dataset, the dummy variable for year 2008 was negatively associated with trust, reducing trust by 5% or more across the entire dataset. The size of the coefficients did change when including year dummies, but the significance and sign were unchanged, and the overall narrative unaffected. I chose not to include time effects in the final results for this reason.

[69] In order to test the effect of time based dummies in the estimations, I included wave dummies (WVS) and year dummies (Eurobarometer Survey) in certain specifications. Specifically, I included time dummies in OLS estimations featuring all controls and the tax or spending decentralization indicators.

5.5. Main Results

In the main results section, I provide a wide selection of estimations for the relationship between fiscal decentralization and trust in government. Each of the estimations is for the same specification containing all of the control variables outlined in section 5.2.3[70]. In each table I examine the effects of fiscal decentralization (three indicators) and trust in government, and for each decentralization indicator there are three interactions with legislative powers of subnational governments, electoral decentralization and government structure (tiers of government). Estimates are organised according to the methods outlined in section 5.4, beginning with cross-sectional analysis (OLS and IV) and moving onto panel econometrics.

5.5.1. Cross-Sectional Estimations

The first set of cross-sectional estimates is for the World Value Survey dataset. In table 54, estimations for decentralization and trust in government are largely insignificant. Tax and spending decentralization is not associated with trust in government, except when interacting with other decentralization indicators. SCG revenue has a positive or negative effect on trust in government depending on whether the local executive is elected or not elected (3). The effect is positive when the local executive is not elected by local citizens, and negative when the local executive is elected. This suggests that direct accountability of local government to local citizens is bad for trust in government at the local level. The size of the coefficients is very small however (either +0.006 or -0.007 depending on appointment or election of local executives).

SCG expenditure and autonomous expenditure decentralization can reduce trust in governments which feature 4 or more tiers of government (8, 12). The size of the coefficients remains fairly small; however, the effect is twice as strong when subnational governments have autonomy over expenditure (12). The final significant estimate is when subnational governments have legislative powers, further fiscal autonomy and spending of subnational governments can reduce trust. A one percentage point increase

[70] I tested specifications featuring decentralization and: i) public mood, ii) public mood and economic variables, iii) public mood, economic variables and government spending and governance, and iv) all variables. If fiscal decentralization were insignificant with all variables included, it would often be insignificant in specifications featuring only public mood etc.

in SCG autonomous expenditure would reduce trust in government by 0.01 within the scale.

The second set of estimations in table 55 is for a broader definition of government, which includes related institutions (civil service, parliament and political parties). Fiscal decentralization appears to have a stronger effect in the second set of results, though the strength of the relationship remains very weak. First, SCG revenue has a positive direct effect on trust in government (1), though neither SCG expenditure nor SCG autonomous expenditure have an effect (5, 9). Second, SCG revenue and SCG autonomous expenditure has different effects on trust in government depending on whether the local executive is appointed or elected locally. The effect is stronger for SCG autonomous expenditure (11) than for SCG revenue (3). Third, fiscal decentralization has an effect on trust when accounting for the number of tiers in government. SCG revenue can improve trust when there are 3 or fewer tiers of government (4), SCG expenditure damages trust when there are 4 or more tiers (8), and SCG autonomous expenditure has a positive effect if the government contains 3 or fewer tiers, but an equal, negative effect otherwise (12).

Finally, there is little evidence of an association between decentralization and trust in the Eurobarometer dataset (table 56). SCG revenue increases trust if subnational governments do not have legislative. A one percentage point increase in fiscal decentralization reduces trust by 0.5 percent

Table 54: Cross Sectional OLS Estimates, Dependent Variable: Trust in Government (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-1.381	-1.539	-1.247	-1.597	-1.420	-1.465	-1.351	-1.728*	-0.442	-1.418	-0.491	-1.059
	(1.069)	(1.064)	(0.869)	(1.018)	(0.967)	(0.946)	(0.909)	(0.888)	(1.268)	(1.184)	(0.967)	(1.060)
Decentralization Indicator												
SCG Revenue	0.001	0.002	0.006*	0.003								
	(0.002)	(0.004)	(0.003)	(0.003)								
SCG					-0.002	-0.003	0.002	0.000				
Expenditure					(0.003)	(0.004)	(0.006)	(0.003)				
SCG Autonom.									-0.001	0.008	0.012	0.004
Expenditure									(0.003)	(0.006)	(0.009)	(0.003)
Decentralization Interactions												
Decentralization		-0.001				0.000				-0.010*		
x Legislation		(0.004)				(0.004)				(0.006)		
Decentralization			-0.007*				-0.004				-0.012	
x Election			(0.004)				(0.006)				(0.009)	
Decentralization				-0.003				-0.004**				-0.008***
x Tiers				(0.002)				(0.002)				(0.002)
Controls												
Public Mood	0.713***	0.697**	0.782***	0.646**	0.809***	0.758***	0.820***	0.748***	0.670***	0.583*	0.661***	0.590**
	(0.191)	(0.258)	(0.185)	(0.232)	(0.200)	(0.259)	(0.201)	(0.254)	(0.214)	(0.281)	(0.203)	(0.248)
Real GDP per	0.289	0.334	0.291*	0.366	0.282	0.302	0.287	0.382*	0.112	0.444	0.169	0.290
capita	(0.212)	(0.219)	(0.164)	(0.213)	(0.193)	(0.194)	(0.177)	(0.186)	(0.258)	(0.264)	(0.192)	(0.245)
Economic	0.056**	0.056	0.021	0.061*	0.027	0.032	0.018	0.026	0.006	-0.010	-0.006	0.006
Growth	(0.025)	(0.041)	(0.026)	(0.031)	(0.027)	(0.039)	(0.028)	(0.031)	(0.029)	(0.037)	(0.026)	(0.028)
Unemployment	0.001	0.003	0.013	0.002	0.005	0.006	0.010	0.007	0.007	0.009	0.015	0.009
	(0.011)	(0.013)	(0.010)	(0.010)	(0.009)	(0.011)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.008)
Government	0.002	0.002	-0.013	0.004	-0.002	0.000	-0.008	0.000	-0.010	-0.017	-0.020	-0.005
Size	(0.016)	(0.021)	(0.016)	(0.017)	(0.015)	(0.020)	(0.017)	(0.016)	(0.014)	(0.018)	(0.015)	(0.013)
Governance	0.049**	0.045	0.064***	0.036	0.057**	0.052*	0.062***	0.040	0.063**	0.022	0.070***	0.035
	(0.024)	(0.029)	(0.021)	(0.028)	(0.022)	(0.026)	(0.020)	(0.024)	(0.026)	(0.029)	(0.020)	(0.029)
Ethnolinguistic	0.003	0.003	0.001	0.003	0.003	0.004	0.002	0.004	0.002	0.006**	0.001	0.004
Fractionalization	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
POLITY	-0.029**	-0.029**	-0.030**	-0.031**	-0.022*	-0.021*	-0.025**	-0.023*	-0.015	-0.021*	-0.021**	-0.016
	(0.013)	(0.014)	(0.011)	(0.014)	(0.012)	(0.012)	(0.012)	(0.012)	(0.010)	(0.011)	(0.010)	(0.010)
Observations	34	32	34	33	33	31	33	32	31	29	31	30
R-squared	0.809	0.801	0.834	0.818	0.778	0.768	0.784	0.807	0.625	0.635	0.664	0.713

****, ** and * represent significance at the 1, 5 and 10% levels respectively. Robust standard errors are in parenthesis*

Table 55: Cross Sectional OLS Estimates, Dependent Variable: Trust in Government and Institutions[71] (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-1.447	-1.816*	-1.230*	-1.674	-1.496	-1.649*	-1.353*	-1.860**	-0.636	-1.283	-0.708	-1.275
	(1.110)	(1.054)	(0.701)	(1.088)	(0.942)	(0.898)	(0.742)	(0.841)	(1.219)	(1.191)	(0.806)	(1.067)
Decentralization Indicator												
SCG Revenue	0.005**	0.007	0.014***	0.006**								
	(0.003)	(0.004)	(0.003)	(0.003)								
SCG					0.000	-0.001	0.009	0.002				
Expenditure					(0.002)	(0.004)	(0.005)	(0.002)				
SCG Autonom.									0.002	0.006	0.020***	0.006**
Expenditure									(0.003)	(0.006)	(0.006)	(0.002)
Decentralization Interactions												
Decentralization		-0.002				0.000				-0.005		
x Legislation		(0.003)				(0.003)				(0.006)		
Decentralization			-0.011***				-0.008				-0.018***	
x Election			(0.003)				(0.005)				(0.006)	
Decentralization				-0.002				-0.003*				-0.006***
x Tiers				(0.002)				(0.002)				(0.002)
Controls												
Public Mood	0.482**	0.453*	0.593***	0.388*	0.622***	0.524**	0.643***	0.515**	0.557**	0.445*	0.545***	0.433*
	(0.181)	(0.224)	(0.149)	(0.194)	(0.179)	(0.216)	(0.170)	(0.203)	(0.204)	(0.237)	(0.181)	(0.217)
Real GDP per	0.336	0.439*	0.340**	0.417*	0.329	0.384*	0.338**	0.449**	0.136	0.358	0.218	0.330
capita	(0.222)	(0.211)	(0.135)	(0.225)	(0.203)	(0.188)	(0.157)	(0.188)	(0.253)	(0.267)	(0.154)	(0.249)
Economic	0.048*	0.045	-0.008	0.056*	0.004	0.014	-0.013	0.010	-0.012	-0.013	-0.029	-0.005
Growth	(0.026)	(0.037)	(0.021)	(0.030)	(0.024)	(0.032)	(0.022)	(0.027)	(0.028)	(0.037)	(0.022)	(0.029)
Unemployment	-0.000	0.002	0.018*	0.001	0.006	0.007	0.016*	0.008	0.008	0.009	0.020*	0.010
	(0.012)	(0.014)	(0.010)	(0.011)	(0.009)	(0.011)	(0.008)	(0.009)	(0.010)	(0.010)	(0.010)	(0.008)
Government	0.008	0.008	-0.016	0.011	0.002	0.007	-0.012	0.006	-0.002	-0.002	-0.016	0.004
Size	(0.014)	(0.019)	(0.014)	(0.015)	(0.013)	(0.017)	(0.013)	(0.013)	(0.013)	(0.017)	(0.013)	(0.011)
Governance	0.028	0.016	0.051**	0.014	0.038	0.026	0.048**	0.017	0.049*	0.018	0.059***	0.019
	(0.026)	(0.030)	(0.020)	(0.030)	(0.023)	(0.025)	(0.019)	(0.024)	(0.028)	(0.031)	(0.020)	(0.030)
Ethnolinguistic	0.002	0.003	0.000	0.003	0.003	0.004	0.001	0.004*	0.002	0.004	0.000	0.004
Fractionalization	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
POLITY	-0.020	-0.020	-0.020**	-0.020	-0.009	-0.007	-0.014	-0.009	0.000	-0.003	-0.009	-0.001
	(0.014)	(0.014)	(0.010)	(0.015)	(0.011)	(0.012)	(0.011)	(0.011)	(0.007)	(0.009)	(0.007)	(0.007)
Observations	34	32	34	33	33	31	33	32	31	29	31	30
R-squared	0.720	0.710	0.822	0.720	0.681	0.670	0.725	0.722	0.609	0.594	0.718	0.685

****, ** and * represent significance at the 1, 5 and 10% levels respectively. Robust standard errors are in parenthesis*

[71] See Appendix A for definitions of the dependent variables, including "trust in government and institutions", and all other variables

Table 56: Cross Sectional OLS Estimates, Dependent Variable: Trust in Government (EB Survey)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-314.147**	-276.620*	-285.615*	-287.908**	-318.589**	-296.834**	-307.011**	-290.059*	-332.875**	-331.176**	-235.610	-290.764*
	(131.269)	(134.423)	(140.003)	(133.510)	(130.145)	(134.280)	(142.704)	(136.121)	(143.262)	(142.846)	(170.524)	(147.839)
Decentralization Indicator												
SCG Revenue	-0.100	-0.527*	0.045	0.025								
	(0.194)	(0.288)	(0.664)	(0.248)								
SCG					-0.087	-0.431	-0.016	0.075				
Expenditure					(0.196)	(0.346)	(0.732)	(0.253)				
SCG Autonom.									0.060	0.013	1.022	0.493
Expenditure									(0.336)	(0.557)	(0.972)	(0.470)
Decentralization Interactions												
Decentralization		0.409				0.339				0.057		
x Legislation		(0.268)				(0.316)				(0.589)		
Decentralization			-0.131				-0.062				-0.927	
x Election			(0.550)				(0.602)				(0.868)	
Decentralization				-0.064				-0.080				-0.276
x Tiers				(0.198)				(0.215)				(0.394)
Controls												
Public Mood	1.191**	1.225**	1.117**	1.074**	1.301**	1.365**	1.274**	1.118*	1.247*	1.253	0.970	0.991*
	(0.437)	(0.465)	(0.459)	(0.411)	(0.555)	(0.568)	(0.572)	(0.530)	(0.673)	(0.725)	(0.653)	(0.536)
Real GDP per	37.696	23.501	34.144	39.454	38.171	26.363	36.900	41.325	43.402	42.737	29.014	46.139
capita	(26.245)	(24.173)	(25.071)	(27.261)	(26.531)	(24.317)	(25.494)	(27.883)	(29.104)	(27.920)	(31.542)	(31.857)
Economic	0.294	1.782	0.251	0.128	-0.129	1.064	-0.162	-0.141	-0.235	-0.085	-0.532	-0.006
Growth	(1.324)	(2.061)	(1.372)	(1.464)	(1.785)	(2.518)	(1.853)	(1.912)	(2.164)	(2.661)	(2.307)	(2.936)
Unemployment	0.183	-0.075	0.230	-0.567	0.189	-0.033	0.210	-0.593	0.266	0.247	0.433	-0.905
	(0.347)	(0.347)	(0.370)	(0.987)	(0.360)	(0.374)	(0.407)	(0.980)	(0.455)	(0.490)	(0.391)	(1.495)
Government	1.121	2.586	0.901	0.748	1.009	2.359	0.898	0.562	1.023	1.139	0.557	0.443
Size	(1.365)	(1.808)	(1.644)	(1.698)	(1.457)	(2.185)	(1.860)	(1.816)	(1.478)	(2.019)	(1.828)	(1.718)
Governance	1.128	2.641	1.462	0.509	0.822	2.080	0.928	0.114	0.205	0.288	1.493	-0.764
	(2.735)	(2.429)	(2.766)	(2.955)	(2.812)	(2.523)	(2.859)	(3.030)	(3.398)	(3.350)	(3.618)	(3.772)
Ethnolinguistic	0.538**	0.524**	0.493*	0.476*	0.557**	0.568**	0.537	0.474*	0.548**	0.548**	0.418	0.415
Fractionalization	(0.224)	(0.218)	(0.280)	(0.249)	(0.236)	(0.233)	(0.305)	(0.264)	(0.223)	(0.233)	(0.254)	(0.247)
POLITY	7.387	6.462	6.778	6.320	7.336	6.943	7.050	6.009	6.851	6.665	5.337	5.510
	(5.933)	(5.440)	(6.389)	(6.234)	(6.236)	(5.978)	(7.066)	(6.507)	(6.651)	(7.146)	(6.226)	(7.578)
Observations	26	26	26	25	25	25	25	24	23	23	23	22
R-squared	0.717	0.752	0.719	0.736	0.716	0.737	0.717	0.737	0.692	0.692	0.722	0.737

****, ** and * represent significance at the 1, 5 and 10% levels respectively. Robust standard errors are in parenthesis*

The control variables often have no effect on trust in government. Public mood has a strong, positive effect on trust in government, which is an expected result. The strength of the explanatory power of public mood is weakened when the dependent variable is trust in government and institutions (table 55). In the Eurobarometer dataset the relationship is strong – a change in public mood results in a larger change in trust in government. For the remaining controls, the estimates if significant are not robust. The quality of government is positive in most specifications, whilst institutional democracy has a surprising negative effect on trust between countries. However, this result may confirm the view of Nye (1997) that citizens in less developed countries are more trusting of governmental authority than in more developed (wealthier) societies. Finally, ethnolinguistic fractionalization is positively associated with trust in government in the Eurobarometer dataset. One explanation could be that greater fractionalization means more representation of minority groups, and minority groups may be more trusting of governments.

Previous research in this area has found that ethnolinguistic fractionalization is negatively associated with inter-personal trust (see Alesina and Ferrara, 2002; Gustavsson and Jordahl, 2008).

5.5.2. Cross-sectional instrument variable estimator

The second set of estimates are produced using a cross-sectional instrument variable model. There are three sets of IV estimations: two for the World Values Survey for the two dependent variables, and one for the Eurobarometer Survey. The instruments are the same for both datasets: land area, population size and the proportion of the nation's population living in the capital.

The first stage estimates for the World Values Survey are presented in table 57. The first stage is the same for the both dependent variables in the World Values Survey, and the corresponding second stages in tables 58 and 59.

Table 57: Cross Sectional IV Estimates (First Stage), Dependent Variable: Decentralization (World Values Survey)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	1.008**	0.716*	0.385	0.847	0.799*	0.530	0.332	0.695	0.464	0.602	0.419	0.736
	(0.434)	(0.409)	(0.363)	(0.519)	(0.425)	(0.342)	(0.296)	(0.478)	(0.686)	(0.510)	(0.268)	(0.666)
Instrument Variables												
Country Size (Land Area)	0.015***	0.006	0.000	0.014***	0.020***	0.011**	0.003	0.018***	0.018***	0.008*	-0.001	0.016***
	(0.004)	(0.005)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.005)	(0.004)	(0.002)	(0.004)
Country Population	0.034***	0.028***	0.044***	0.032**	-0.023	-0.033	0.015	-0.030	-0.012	-0.031	0.019*	-0.028
	(0.009)	(0.009)	(0.006)	(0.011)	(0.037)	(0.020)	(0.018)	(0.040)	(0.037)	(0.019)	(0.010)	(0.038)
Capital Population (%)	-0.006**	-0.002	-0.001	-0.005**	-0.006**	-0.002	-0.002	-0.005**	-0.004*	-0.001	-0.000	-0.004*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Second Stage Controls												
Public Mood	-0.063	-0.163*	-0.077	-0.102	-0.015	-0.093	-0.058	-0.038	-0.007	0.074	-0.036	0.038
	(0.064)	(0.088)	(0.056)	(0.081)	(0.071)	(0.072)	(0.053)	(0.087)	(0.103)	(0.053)	(0.029)	(0.116)
Real GDP per capita	-0.207*	-0.147	-0.122	-0.162	-0.153	-0.099	-0.103	-0.124	-0.070	-0.201	-0.128*	-0.144
	(0.101)	(0.086)	(0.090)	(0.135)	(0.100)	(0.077)	(0.075)	(0.124)	(0.156)	(0.125)	(0.069)	(0.179)
Economic Growth	-0.001	0.026*	0.016	0.004	-0.009	0.016	0.011	-0.005	-0.002	0.013	0.004	-0.007
	(0.013)	(0.014)	(0.009)	(0.016)	(0.014)	(0.014)	(0.010)	(0.016)	(0.017)	(0.012)	(0.006)	(0.019)
Unemployment	0.004	-0.002	-0.007*	0.005	0.004	-0.001	-0.006*	0.005	0.000	-0.002	-0.004**	-0.000
	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.003)	(0.002)	(0.005)
Government Size	-0.003	0.009	0.012**	-0.001	-0.006	0.005	0.010*	-0.005	-0.007	0.004	0.007**	-0.009
	(0.008)	(0.006)	(0.005)	(0.009)	(0.008)	(0.006)	(0.006)	(0.009)	(0.011)	(0.005)	(0.003)	(0.011)
Governance	0.034**	0.013	0.007	0.027	0.032**	0.013	0.006	0.027	0.023	0.030*	0.005	0.033
	(0.015)	(0.016)	(0.013)	(0.020)	(0.013)	(0.014)	(0.011)	(0.018)	(0.017)	(0.014)	(0.006)	(0.021)
Ethnolinguistic Fractionalization	0.001	0.000	0.002**	0.001	0.001	-0.000	0.002**	0.001	0.001	-0.002**	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.002)
POLITY	0.013**	0.011**	0.007	0.013**	0.013**	0.011***	0.007*	0.013***	0.005	0.006*	0.004**	0.005
	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.003)	(0.004)	(0.005)	(0.003)	(0.002)	(0.005)
Decentralization (Interaction)		0.468***	0.675***	0.040		0.488***	0.696***	0.087		0.796***	0.957***	0.186
		(0.126)	(0.154)	(0.127)		(0.099)	(0.160)	(0.116)		(0.127)	(0.098)	(0.194)
F-test (p-value) for instruments	0.000	0.001	0.000	0.000	0.000	0.049	0.361	0.000	0.000	0.231	0.251	0.004
Observations	32	30	32	31	31	29	31	30	29	27	29	28
R-squared	0.736	0.860	0.895	0.741	0.726	0.875	0.900	0.732	0.627	0.896	0.956	0.647

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

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The first stage estimates indicate that the instrument variables chosen in this research are good predictors of the variation in the decentralization variable. In all but three specifications, the f-test for collective strength of the instrument variables is rejected at the 10% level. Furthermore, the instruments exhibit effects on decentralization that the literature expects. Fiscal decentralization is increasing with country size and population, and decreasing as the percentage of the nation's population living in the capital increases. The other explanatory variables are often statistically significant in the first stage, with exception of POLITY, the indicator for democracy. Democracy is found to be statistically associated with decentralization in most specifications. Other aspects of decentralization are also found to be associated with decentralization, as expected.

There are two sets of second stage estimates produced from the first stage. The first, in table 58, is for the dependent variable: trust in government. The results here are consistent with those in the OLS cross-sectional estimations. SCG revenue is positively associated with trust in government when the local government executive is appointed, and negatively associated when the local government executive is elected (3). The only other statistically significant effect is in specification 12, where an increase in autonomous spending is negatively associated with citizen trust in government when there are 4 or more tiers of government. The magnitude of these effects is also close to that observed in the cross-sectional estimations in table 54.

The diagnostic tests are not ideal however. In a few specifications, the Hansen J-statistic (p-value) is below 0.1. This means that the null hypothesis of instrument exogeneity could be rejected at the 10% level. However, this is limited to only a handful of specifications, restricted to the SCG revenue indicator. Furthermore, the Durbin-Wu-Hausman test provides evidence that decentralization may not be endogenous, and given the similarity between the OLS and IV estimations for the cross-sectional dataset, this suggests that instrumenting decentralization may be unnecessary. Nevertheless, the results in the IV estimations support those in the OLS estimations.

When the dependent variable is trust in government and institutions, in table 59, the effects are also fairly consistent with the corresponding estimates in the OLS cross-sectional model, in table 55. SCG revenue is positively associated with trust in government in specifications 1-4. SCG revenue shares a positive relationship with trust in government when subnational government does not have the power to legislate; when the local government executive is appointed, and when the number of tiers of government are less than 4.

Table 58: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Trust in Government (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-0.843	-1.104	-0.915	-1.033	-0.995	-0.907	-0.819	-1.268*	0.345	-0.244	2.659	-0.065
	(0.890)	(0.882)	(0.794)	(0.864)	(0.762)	(0.826)	(1.205)	(0.746)	(0.871)	(0.875)	(1.758)	(0.684)
Decentralization Indicator												
SCG Revenue	0.001	0.005	0.006*	0.004								
	(0.002)	(0.006)	(0.003)	(0.003)								
SCG Expenditure					-0.0045	-0.004	-0.035	-0.002				
					(0.003)	(0.008)	(0.024)	(0.004)				
SCG Autonom. Expenditure									-0.002	0.010	-0..056	0.004
									(0.004)	(0.010)	(0.044)	(0.004)
Decentralization Interactions												
Decentralization x Legislation		-0.003				0.001				-0.011		
		(0.005)				(0.006)				(0.009)		
Decentralization x Election			-0.006*				0.027				0.055	
			(0.003)				(0.020)				(0.044)	
Decentralization x Tiers				-0.002				-0.003				-0.006***
				(0.002)				(0.002)				(0.002)
Controls												
Public Mood	0.673***	0.755***	0.765***	0.644***	0.788***	0.722***	0.636***	0.730***	0.621***	0.540***	0.462**	0.572***
	(0.152)	(0.241)	(0.158)	(0.183)	(0.165)	(0.226)	(0.233)	(0.199)	(0.166)	(0.194)	(0.204)	(0.184)
Real GDP per capita	0.174	0.228	0.206	0.229	0.199	0.182	0.054	0.282*	-0.050	0.179	-0.743	0.056
	(0.179)	(0.176)	(0.151)	(0.179)	(0.156)	(0.165)	(0.269)	(0.157)	(0.179)	(0.244)	(0.473)	(0.150)
Economic Growth	0.045**	0.024	0.017	0.048*	0.010	0.022	0.051	0.015	-0.016	-0.038	-0.000	-0.014
	(0.022)	(0.043)	(0.025)	(0.026)	(0.022)	(0.036)	(0.046)	(0.025)	(0.021)	(0.024)	(0.036)	(0.018)
Unemployment	0.006	0.011	0.014	0.006	0.010	0.010	-0.016	0.011	0.013*	0.017***	-0.011	0.014**
	(0.008)	(0.010)	(0.009)	(0.008)	(0.006)	(0.009)	(0.023)	(0.007)	(0.007)	(0.006)	(0.023)	(0.006)
Government Size	-0.001	-0.008	-0.013	0.001	-0.005	-0.002	0.035	-0.003	-0.015	-0.025**	0.020	-0.011
	(0.012)	(0.017)	(0.013)	(0.013)	(0.012)	(0.016)	(0.031)	(0.012)	(0.011)	(0.012)	(0.028)	(0.008)
Governance	0.066***	0.066***	0.073***	0.055**	0.073***	0.071***	0.060*	0.057***	0.087***	0.055	0.108***	0.065***
	(0.021)	(0.024)	(0.018)	(0.024)	(0.018)	(0.022)	(0.034)	(0.020)	(0.016)	(0.034)	(0.030)	(0.018)
Ethnolinguistic Fractionalization	0.002	0.002	0.001	0.002	0.003*	0.003	0.009	0.004**	0.002	0.004*	0.005	0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.006)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
POLITY	-0.035***	-0.038***	-0.034***	-0.036***	-0.025**	-0.025**	-0.011	-0.026**	-0.019***	-0.026***	0.004	-0.019***
	(0.012)	(0.012)	(0.011)	(0.013)	(0.011)	(0.013)	(0.019)	(0.011)	(0.006)	(0.007)	(0.020)	(0.007)
DWH test	0.740	0.921	0.925	0.944	0.316	0.622	0.049	0.498	0.394	0.828	0.160	0.853
Hansen J-statistic	0.067	0.068	0.213	0.038	0.177	0.158	0.855	0.147	0.274	0.320	0.796	0.244
Observations	32	30	32	31	31	29	31	30	29	27	29	28
R-squared	0.827	0.824	0.841	0.831	0.788	0.783	0.549	0.812	0.680	0.737	0.286	0.754

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using land area, population size and capital population as % of national population, from the first. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

Table 59: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Trust in Government and Institutions (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-0.870	-1.558*	-1.089	-1.111	-1.067	-1.058	-0.974	-1.455**	0.147	-0.047	0.985	-0.429
	(0.972)	(0.855)	(0.718)	(0.957)	(0.733)	(0.808)	(0.966)	(0.704)	(0.810)	(1.085)	(1.003)	(0.732)
Decentralization Indicator												
SCG Revenue	0.006**	0.014***	0.015***	0.008**								
	(0.003)	(0.005)	(0.003)	(0.003)								
SCG Expenditure					-0.002	-0.006	-0.018	-0.001				
					(0.003)	(0.007)	(0.017)	(0.003)				
SCG Autonom. Expenditure									0.001	0.002	-0.017	0.003
									(0.003)	(0.007)	(0.030)	(0.004)
Decentralization Interactions												
Decentralization x Legislation		-0.008*				0.003				-0.001		
		(0.004)				(0.005)				(0.008)		
Decentralization x Election			-0.017***				0.014				0.018	
			(0.003)				(0.014)				(0.029)	
Decentralization x Tiers				-0.0020				-0.002				-0.004
				(0.002)				(0.002)				(0.002)
Controls												
Public Mood	0.434***	0.589**	0.605***	0.366**	0.578***	0.410**	0.497**	0.458***	0.484***	0.398**	0.426***	0.387**
	(0.145)	(0.237)	(0.137)	(0.160)	(0.150)	(0.178)	(0.203)	(0.160)	(0.160)	(0.165)	(0.152)	(0.172)
Real GDP per capita	0.210	0.363**	0.305**	0.285	0.252	0.271	0.175	0.375**	-0.019	0.053	-0.268	0.149
	(0.198)	(0.174)	(0.147)	(0.205)	(0.162)	(0.170)	(0.215)	(0.154)	(0.163)	(0.273)	(0.288)	(0.159)
Economic Growth	0.037	-0.007	-0.016	0.044*	-0.009	0.018	0.013	0.003	-0.029	-0.023	-0.024	-0.019
	(0.024)	(0.039)	(0.020)	(0.026)	(0.019)	(0.027)	(0.037)	(0.022)	(0.019)	(0.022)	(0.026)	(0.020)
Unemployment	0.004	0.013	0.021**	0.005	0.010	0.009	-0.004	0.012*	0.013*	0.014**	0.005	0.014**
	(0.010)	(0.010)	(0.009)	(0.009)	(0.007)	(0.008)	(0.017)	(0.006)	(0.007)	(0.006)	(0.017)	(0.006)
Government Size	0.005	-0.008	-0.018	0.008	-0.001	0.009	0.020	0.004	-0.006	-0.004	0.005	-0.002
	(0.011)	(0.016)	(0.012)	(0.011)	(0.010)	(0.014)	(0.023)	(0.011)	(0.009)	(0.010)	(0.021)	(0.008)
Governance	0.044*	0.037	0.057***	0.030	0.053***	0.041*	0.046	0.032	0.071***	0.057	0.078***	0.045**
	(0.024)	(0.029)	(0.019)	(0.029)	(0.020)	(0.022)	(0.029)	(0.020)	(0.018)	(0.036)	(0.021)	(0.020)
Ethnolinguistic Fractionalization	0.001	0.003	-0.000	0.002	0.003*	0.003*	0.006	0.004**	0.001	0.002	0.002	0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
POLITY	-0.025*	-0.030**	-0.022**	-0.025*	-0.011	-0.006	-0.004	-0.010	-0.003	-0.004	0.004	-0.004
	(0.013)	(0.013)	(0.009)	(0.014)	(0.011)	(0.012)	(0.016)	(0.010)	(0.005)	(0.005)	(0.014)	(0.005)
DWH test	0.748	0.303	0.460	0.538	0.215	0.407	0.070	0.360	0.376	0.424	0.337	0.461
Hansen J-statistic	0.007	0.003	0.209	0.005	0.355	0.244	0.838	0.182	0.596	0.382	0.617	0.205
Observations	32	30	32	31	31	29	31	30	29	27	29	28
R-squared	0.737	0.713	0.813	0.728	0.689	0.662	0.471	0.721	0.666	0.654	0.544	0.711

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using land area, population size and capital population as % of national population, from the first. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

In contrast, when subnational governments have legislative powers, and when the local government executive is elected, SCG revenue has a negative effect. The main difference between the OLS and IV estimations is the loss of significance for SCG expenditure and autonomous expenditure. This may indicate that decentralization was subject to endogeneity bias, and the effects of decentralization were overstated in the OLS estimations. However, the Durbin-Wu-Hausman test does not reject the null hypothesis in all but one specification, therefore decentralization could be treated as exogenous. Another explanation could be that the instruments are not precise in explaining variations in decentralization. The instruments are found to be exogenous however, as the p-value for Hansen J-statistic is found to be above 0.10 in most specifications.

The final set of cross-sectional instrument variable estimates are produced for the Eurobarometer dataset. Table 60 presents the first stage estimates, and table 61 the second stage estimates. In the first stage estimations it is clear that the instrument variables: land size, population and capital population (%) are not as effective in capturing variations in decentralization between European countries, as they are capturing variations in the World Values Survey dataset. The f-tests for collective significance are mixed across all specifications. In four specifications, the f-test of instrument strength rejects the null hypothesis at the 10% significance level. For some specifications it is borderline, and in other specifications the instruments are unsuitable for predicting variations in decentralization. Furthermore, when population is statistically associated with decentralization, the relationship is not as expected. In specifications 9 and 12 for example, the coefficient is in fact negative, not positive (as it was for the WVS first stages). On the other hand, land area and capital population (%) exhibit expected effects.

Given the disappointing first stage estimations, it may be difficult to read much into the second stage estimations in table 61. The cross-sectional OLS estimates were almost entirely insignificant, and there is not much evidence in the cross-sectional IV either. However, the evidence of statistical significance is limited to a single interaction, and consistent between the decentralization indicators. When the local government executive is appointed, tax and spending decentralization are negatively associated with trust in government, but when the local government executive is, the opposite is true. This effect is strongest for SCG autonomous expenditure – a 1% increase in autonomous spending decentralization results in a 3% increase (appointed) or decrease (elected) in citizen trust in government

Table 60: Cross Sectional IV Estimates (1st Stage), Dependent Variable: Decentralization (EB Survey)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	0.425	0.527	-0.754	0.415	0.141	0.317	-0.741	0.030	0.404	0.031	-0.278	0.282
	(1.602)	(1.694)	(0.698)	(1.725)	(1.479)	(1.544)	(0.617)	(1.711)	(1.399)	(1.418)	(0.220)	(1.339)
Instrument Variables												
Country Size	0.245	0.075	-0.046	0.231	0.289	0.125	-0.013	0.256	0.406**	0.274**	0.008	0.223
(Land Area)	(0.205)	(0.178)	(0.095)	(0.226)	(0.204)	(0.162)	(0.094)	(0.218)	(0.138)	(0.102)	(0.047)	(0.192)
Country	-0.084	-0.005	0.020	-0.072	-0.115	-0.047	-0.005	-0.110	-0.292*	-0.155	-0.025	-0.232*
Population	(0.153)	(0.093)	(0.076)	(0.184)	(0.153)	(0.082)	(0.078)	(0.178)	(0.132)	(0.093)	(0.056)	(0.100)
Capital	-0.003	-0.001	-0.002*	-0.003	-0.004	-0.001	-0.002*	-0.003	-0.005**	-0.002	-0.001	-0.004
Population (%)	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)
Second Stage Controls												
Public Mood	0.230	0.144	0.157	0.216	0.650	0.485	0.224	0.705	1.041	0.975	0.091	0.818
	(0.669)	(0.569)	(0.256)	(0.745)	(0.656)	(0.574)	(0.298)	(0.804)	(0.679)	(0.549)	(0.126)	(0.671)
Real GDP per	-0.164	-0.242	0.087	-0.169	-0.166	-0.254	0.067	-0.168	0.031	-0.040	0.051	-0.038
capita	(0.271)	(0.289)	(0.131)	(0.291)	(0.259)	(0.273)	(0.117)	(0.302)	(0.246)	(0.241)	(0.044)	(0.241)
Economic	-0.014	0.013	0.001	-0.014	-0.027	0.003	-0.002	-0.024	-0.052**	-0.010	-0.004	-0.042*
Growth	(0.018)	(0.017)	(0.009)	(0.020)	(0.018)	(0.018)	(0.009)	(0.020)	(0.019)	(0.017)	(0.008)	(0.020)
Unemployment	-0.002	-0.005	-0.002	-0.001	-0.002	-0.005*	-0.002	-0.000	0.003	-0.001	0.000	0.014
	(0.003)	(0.003)	(0.002)	(0.008)	(0.003)	(0.002)	(0.002)	(0.008)	(0.003)	(0.004)	(0.001)	(0.014)
Government	-0.003	0.016	0.008	-0.003	-0.001	0.019	0.009*	0.002	-0.013	0.012	0.002	-0.003
Size	(0.017)	(0.020)	(0.005)	(0.021)	(0.018)	(0.020)	(0.005)	(0.022)	(0.013)	(0.010)	(0.003)	(0.013)
Governance	0.033	0.034	0.005	0.034	0.027	0.030	0.006	0.027	-0.000	-0.002	0.000	0.012
	(0.023)	(0.025)	(0.012)	(0.025)	(0.021)	(0.024)	(0.011)	(0.026)	(0.021)	(0.019)	(0.004)	(0.024)
Ethnolinguistic	0.002	0.001	0.002**	0.002	0.003	0.002	0.003**	0.003	0.002	0.001	0.001*	0.001
Fractionalization	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.000)	(0.002)
POLITY	0.033	0.015	0.021	0.034	0.035	0.016	0.022	0.034	-0.066	-0.056	-0.000	-0.050
	(0.047)	(0.039)	(0.022)	(0.052)	(0.050)	(0.038)	(0.022)	(0.053)	(0.058)	(0.037)	(0.013)	(0.047)
Decentralization		0.437*	0.623***	-0.014		0.463*	0.619***	0.073		0.687**	0.828***	0.267
(Interaction)		(0.237)	(0.099)	(0.193)		(0.248)	(0.089)	(0.209)		(0.211)	(0.082)	(0.282)
F-test (p-value) for												
instruments	0.051	0.909	0.112	0.288	0.020	0.813	0.062	0.326	0.011	0.129	0.295	0.176
Observations	23	23	23	22	22	22	22	21	20	20	20	19
R-squared	0.703	0.788	0.951	0.673	0.735	0.820	0.961	0.713	0.713	0.862	0.988	0.787

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 61: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Trust in Government (EB Survey)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-2.455*	-1.238	-4.165***	-2.476*	-2.606**	-2.159	-4.120***	-2.684*	-2.593*	-2.673*	-4.178***	-2.216
	(1.282)	(2.436)	(1.246)	(1.315)	(1.303)	(1.474)	(1.275)	(1.379)	(1.378)	(1.531)	(1.572)	(1.796)
Decentralization Indicator												
SCG Revenue	-0.142	-1.981	-1.296**	-0.225								
	(0.289)	(1.723)	(0.509)	(0.355)								
SCG					-0.092	-1.032	-1.191**	-0.129				
Expenditure					(0.268)	(0.871)	(0.505)	(0.361)				
SCG Autonom.									0.098	0.672	-3.466***	0.930
Expenditure									(0.301)	(0.673)	(1.340)	(0.810)
Decentralization Interactions												
Decentralization		1.222				0.756				-0.602		
x Legislation		(1.053)				(0.629)				(0.817)		
Decentralization			0.930**				0.914**				3.139**	
x Election			(0.397)				(0.387)				(1.229)	
Decentralization				0.059				0.065				-0.496
x Tiers				(0.167)				(0.197)				(0.544)
Controls												
Public Mood	1.099***	1.247	1.382***	1.127***	1.254**	1.593***	1.372***	1.330**	1.111**	0.770	1.031**	0.560
	(0.384)	(0.769)	(0.362)	(0.389)	(0.496)	(0.583)	(0.468)	(0.541)	(0.551)	(0.688)	(0.495)	(0.875)
Real GDP per	0.246	-0.274	0.450**	0.233	0.272	-0.028	0.437*	0.274	0.290	0.350	0.449*	0.372
capita	(0.239)	(0.622)	(0.214)	(0.241)	(0.246)	(0.356)	(0.225)	(0.244)	(0.267)	(0.303)	(0.258)	(0.299)
Economic	-0.001	0.044	0.003	0.001	-0.005	0.017	0.004	-0.004	-0.010	-0.021	-0.004	-0.001
Growth	(0.010)	(0.042)	(0.008)	(0.013)	(0.013)	(0.030)	(0.011)	(0.015)	(0.016)	(0.023)	(0.012)	(0.028)
Unemployment	0.004	-0.007	0.001	0.002	0.004	-0.002	0.001	0.002	0.006**	0.008*	0.005*	-0.007
	(0.003)	(0.009)	(0.003)	(0.007)	(0.003)	(0.005)	(0.003)	(0.007)	(0.003)	(0.004)	(0.003)	(0.018)
Government	0.014	0.058	0.028**	0.016	0.014	0.044	0.030***	0.016	0.015	0.001	0.031**	0.002
Size	(0.011)	(0.044)	(0.011)	(0.012)	(0.011)	(0.033)	(0.011)	(0.013)	(0.011)	(0.019)	(0.013)	(0.018)
Governance	0.023	0.087	0.012	0.024	0.017	0.047	0.011	0.015	0.013	0.009	0.016	-0.002
	(0.025)	(0.073)	(0.022)	(0.028)	(0.026)	(0.037)	(0.024)	(0.026)	(0.029)	(0.033)	(0.027)	(0.032)
Ethnolinguistic	0.005**	0.005*	0.008***	0.005***	0.005**	0.006***	0.008***	0.005**	0.005***	0.005**	0.008***	0.003
Fractionalization	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
POLITY	0.057	0.063	0.101*	0.060	0.054	0.055	0.097*	0.053	0.050	0.079	0.110**	0.049
	(0.042)	(0.049)	(0.059)	(0.040)	(0.043)	(0.042)	(0.056)	(0.041)	(0.043)	(0.072)	(0.046)	(0.051)
DWH Test (p-value)	0.767	0.210	0.359	0.714	0.687	0.505	0387	0.751	0.792	0.438	0.622	0.408
Hansen J-statistic (p-value)	0.096	0.185	0.232	0.045	0.085	0.115	0.193	0.041	0.040	0.048	0.153	0.018
Observations	23	23	23	22	22	22	22	21	20	20	20	19
R-squared	0.687	0.288	0.694	0.680	0.680	0.602	0.687	0.677	0.672	0.638	0.701	0.594

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using land area, population size and capital population as % of national population, from the first. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

5.5.3. Fixed Effects Panel Estimator

The final set of estimations are produced using a fixed effects panel estimator. The estimates for the World Values Survey are provided in table 62 (trust in government) and 63 (trust in government and institutions). The estimations provide no evidence of a statistical association between decentralization and trust in government or trust in government and institutions. Of the control variables, public mood continues its strong association with citizen trust in government and related institutions. Unemployment is found to explain negative changes in trust in government over time, and POLITY, is positively associated with trust in government over time as well. This result is interesting. This suggests that improvements in democracy and participation result in falls in trust over time, rather than increases as expected. This may raise questions about the direction of causality here, as the strengthening of democratic processes may occur in response to declining trust, for example. Or, as a consequence of greater democratic participation of citizens, trust falls as citizens raise their expectations of government.

The final set of estimates are for the Eurobarometer dataset, in table 64. When including country fixed effects in the panel estimator, there is some evidence that fiscal decentralization is associated with trust in government. This evidence is mostly limited to interactions between tax and spending decentralization, and local government accountability. When the local government executive is appointed, greater tax and spending decentralization reduce citizen trust in government. When the local government executive is appointed, greater tax and spending decentralization improves citizen trust in government by a similar magnitude. This effect is strongest in specification (7) for spending decentralization – a 1% increase in SCG expenditure decentralization results in a 12.7% fall in trust (appointed) or 12.5% increase in trust (elected), year on year. This result was also observed in the cross-sectional IV estimates in table 62.

Finally, spending decentralization also improves trust when the number of tiers of government is greater than 4. This result is an anomaly compared with other tax and spending indicators in the same estimation set, and with previous estimates in different models and for the World Values Survey dataset.

Table 62: Fixed Effects Panel Estimates, Dependent Variable: Trust in Government (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-0.663	-0.648	-0.674	-0.614	0.636	0.626	0.629	0.637	0.408	2.203	-5.844	0.753
	(1.302)	(1.329)	(1.426)	(1.494)	(1.218)	(1.248)	(1.340)	(1.267)	(2.071)	(2.533)	(6.845)	(1.541)
Decentralization Indicator												
SCG Revenue	-0.008	-0.008	-0.006	-0.008								
	(0.007)	(0.009)	(0.087)	(0.008)								
SCG					0.003	0.002	0.005	0.003				
Expenditure					(0.009)	(0.011)	(0.086)	(0.012)				
SCG Autonom.									-0.000	-0.021	0.124	0.009
Expenditure									(0.008)	(0.023)	(0129)	(0.013)
Decentralization Interactions												
Decentralization		-0.001				0.002				0.029		
x Legislation		(0.002)				(0.014)				(0.028)		
Decentralization			-0.003				-0.002				-0.138	
x Election			(0.093)				(0.007)				(0.143)	
Decentralization				-0.002				-0.007				-0.017
x Tiers				(0.019)				(0.016)				(0.017)
Controls												
Public Mood	1.486***	1.485***	1.481**	1.477***	1.570***	1.574***	1.568***	1.570***	1.812**	1.733**	2.407***	1.670*
	(0.459)	(0.470)	(0.594)	(0.487)	(0.383)	(0.406)	(0.473)	(0.452)	(0.699)	(0.606)	(0.814)	(0.802)
Real GDP per	-0.103	-0.106	-0.102	-0.109	-0.524*	-0.523*	-0.523*	-0.524*	-0.546	-0.767	-0.251	-0.562
capita	(0.290)	(0.289)	(0.307)	(0.299)	(0.276)	(0.279)	(0.296)	(0.273)	(0.418)	(0.490)	(0.577)	(0.448)
Economic	0.005	0.004	0.005	0.004	-0.035**	-0.035*	-0.035*	-0.035*	-0.016	-0.024	-0.011	-0.016
Growth	(0.022)	(0.023)	(0.022)	(0.021)	(0.017)	(0.017)	(0.017)	(0.017)	(0.034)	(0.035)	(0.033)	(0.036)
Unemployment	-0.037**	-0.037**	-0.037**	-0.037*	-0.037***	-0.037***	-0.037***	-0.037***	-0.047***	-0.050***	-0.034	-0.053***
	(0.018)	(0.017)	(0.017)	(0.020)	(0.012)	(0.012)	(0.012)	(0.012)	(0.016)	(0.016)	(0.024)	(0.012)
Government	0.011	0.011	0.012	0.011	0.033	0.033	0.033	0.033	0.044*	0.029	0.148	0.050*
Expenditure	(0.022)	(0.023)	(0.043)	(0.022)	(0.019)	(0.021)	(0.037)	(0.021)	(0.023)	(0.031)	(0.114)	(0.025)
Governance	0.061	0.063	0.061	0.062	0.032	0.027	0.032	0.032	0.013	-0.043	0.200	0.016
	(0.107)	(0.118)	(0.111)	(0.108)	(0.098)	(0.106)	(0.101)	(0.107)	(0.107)	(0.122)	(0.216)	(0.098)
POLITY	0.021**	0.021**	0.021	0.021**	0.014	0.015*	0.014	0.014	0.014	0.013	0.146	-0.003
	(0.010)	(0.009)	(0.015)	(0.009)	(0.008)	(0.008)	(0.015)	(0.008)	(0.142)	(0.127)	(0.183)	(0.157)
Observations	42	42	42	42	40	40	40	40	36	36	36	36
R-squared	0.559	0.559	0.559	0.559	0.695	0.695	0.695	0.695	0.733	0.752	0.756	0.748
Groups	19	19	19	19	19	19	19	19	18	18	18	18

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 63: Fixed Effects Panel Estimates, Dependent Variable: Trust in Government and Institutions (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	0.651	0.600	0.538	0.647	1.398	1.346	1.238	1.296	2.866	4.017	5.523	3.265**
	(1.128)	(1.105)	(1.087)	(1.303)	(1.083)	(1.109)	(0.977)	(1.297)	(2.084)	(2.321)	(4.346)	(1.286)
Decentralization Indicator												
SCG Revenue	-0.002	-0.003	0.024	-0.002								
	(0.005)	(0.006)	(0.057)	(0.006)								
SCG					0.003	-0.001	0.043	0.002				
Expenditure					(0.007)	(0.010)	(0.0586)	(0.011)				
SCG Autonom.									0.001	-0.012	-0.051	0.011
Expenditure									(0.006)	(0.010)	(0.078)	(0.009)
Decentralization Interactions												
Decentralization		0.005				0.008				0.018		
x Legislation		(0.010)				(0.011)				(0.017)		
Decentralization			-0.027				-0.041				0.058	
x Election			(0.060)				(0.062)				(0.086)	
Decentralization				0.000				0.004				-0.019
x Tiers				(0.013)				(0.014)				(0.012)
Controls												
Public Mood	1.281***	1.284***	1.227**	1.282***	1.298***	1.320***	1.237***	1.331***	0.955*	0.904*	0.702	0.791
	(0.349)	(0.352)	(0.432)	(0.373)	(0.323)	(0.342)	(0.373)	(0.398)	(0.491)	(0.447)	(0.531)	(0.498)
Real GDP per	-0.220	-0.213	-0.211	-0.220	-0.450**	-0.443**	-0.433**	-0.437**	-0.203	-0.345	-0.329	-0.222
capita	(0.171)	(0.166)	(0.171)	(0.187)	(0.174)	(0.177)	(0.171)	(0.196)	(0.274)	(0.307)	(0.356)	(0.275)
Economic	-0.001	0.000	-0.001	-0.001	-0.018	-0.018	-0.018	-0.017	0.032	0.026	0.030	0.032*
Growth	(0.012)	(0.014)	(0.012)	(0.011)	(0.012)	(0.013)	(0.012)	(0.011)	(0.019)	(0.020)	(0.017)	(0.018)
Unemployment	-0.038***	-0.037***	-0.038***	-0.038***	-0.038***	-0.036***	-0.038***	-0.037***	-0.054***	-0.056***	-0.060***	-0.061***
	(0.011)	(0.010)	(0.011)	(0.013)	(0.010)	(0.010)	(0.011)	(0.010)	(0.011)	(0.011)	(0.015)	(0.008)
Government	-0.004	-0.003	0.006	-0.004	0.009	0.013	0.023	0.010	0.038**	0.029*	-0.006	0.046**
Expenditure	(0.013)	(0.014)	(0.031)	(0.013)	(0.013)	(0.015)	(0.029)	(0.014)	(0.016)	(0.016)	(0.069)	(0.017)
Governance	-0.016	-0.025	-0.014	-0.016	-0.035	-0.056	-0.033	-0.042	-0.154*	-0.191*	-0.234	-0.151**
	(0.074)	(0.081)	(0.075)	(0.074)	(0.071)	(0.077)	(0.072)	(0.072)	(0.076)	(0.092)	(0.136)	(0.054)
POLITY	0.014**	0.015***	0.011	0.014**	0.011**	0.013***	0.006	0.010**	-0.179**	-0.179**	-0.235**	-0.199**
	(0.005)	(0.005)	(0.009)	(0.005)	(0.004)	(0.004)	(0.009)	(0.004)	(0.084)	(0.078)	(0.105)	(0.086)
Observations	42	42	42	42	40	40	40	40	36	36	36	36
R-squared	0.668	0.671	0.672	0.668	0.727	0.734	0.734	0.728	0.842	0.854	0.848	0.873
Groups	19	19	19	19	19	19	19	19	18	18	18	18

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 64: Fixed Effects Panel Estimates, Dependent Variable: Trust in Government (EB Survey)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	0.992	1.041	1.345	1.092	1.096	1.057	1.917**	1.262	-0.048	-0.146	0.025	0.063
	(0.904)	(0.938)	(0.870)	(0.984)	(0.941)	(0.943)	(0.893)	(0.937)	(0.709)	(0.694)	(0.686)	(0.672)
Decentralization Indicator												
SCG Revenue	-0.210	-0.242	-3.947***	-0.275								
	(0.268)	(0.285)	(0.980)	(0.304)								
SCG					-0.135	-0.184	-12.681***	-0.309				
Expenditure					(0.189)	(0.213)	(2.420)	(0.278)				
SCG Autonom.									-0.263	-0.717*	-3.143	-0.609
Expenditure									(0.404)	(0.410)	(2.962)	(0.433)
Decentralization Interactions												
Decentralization		0.305				1.365				1.565**		
x Legislation		(1.168)				(1.417)				(0.705)		
Decentralization			3.814***				12.531***				2.962	
x Election			(0.905)				(2.328)				(2.963)	
Decentralization				0.463				2.439**				0.797
x Tiers				(1.025)				(1.169)				(0.782)
Controls												
Public Mood	0.423***	0.424***	0.392***	0.427***	0.425***	0.411***	0.380***	0.397**	0.376**	0.383**	0.367**	0.385**
	(0.143)	(0.142)	(0.140)	(0.144)	(0.142)	(0.146)	(0.130)	(0.144)	(0.150)	(0.150)	(0.147)	(0.148)
Real GDP per	-0.288*	-0.300*	-0.348**	-0.322	-0.328*	-0.342**	-0.414**	-0.431**	-0.216	-0.233	-0.220	-0.233
capita	(0.159)	(0.162)	(0.151)	(0.192)	(0.164)	(0.164)	(0.149)	(0.180)	(0.173)	(0.162)	(0.171)	(0.167)
Economic	0.003	0.003	0.003	0.003	0.004*	0.004	0.002	0.003	0.004**	0.005**	0.004**	0.005**
Growth	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Unemployment	-0.012***	-0.012***	-0.013***	-0.013***	-0.013***	-0.012***	-0.013***	-0.013***	-0.011***	-0.010**	-0.011***	-0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Government	0.004	0.003	0.004	0.003	0.005	0.004	-0.003	0.005	0.005	0.005	0.004	0.006
Expenditure	(0.009)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)	(0.008)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)
Governance	-0.017	-0.016	-0.015	-0.013	-0.017	-0.014	-0.023	-0.011	-0.007	-0.006	-0.008	-0.008
	(0.019)	(0.019)	(0.019)	(0.020)	(0.020)	(0.020)	(0.017)	(0.019)	(0.019)	(0.019)	(0.018)	(0.019)
POLITY	0.061	0.060	0.061	0.061	0.063	0.065	0.074	0.070	0.125***	0.139***	0.127***	0.120***
	(0.062)	(0.061)	(0.063)	(0.061)	(0.062)	(0.063)	(0.065)	(0.065)	(0.032)	(0.031)	(0.031)	(0.030)
Observations	162	162	162	161	156	156	156	155	146	146	146	145
R-squared	0.316	0.317	0.340	0.318	0.328	0.332	0.391	0.347	0.344	0.368	0.356	0.351
Groups	26	26	26	25	25	25	25	24	24	24	24	23

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Of the control variables, public mood shares a strong positive association with trust in government, as expected. The strength of the association is not as high as expected, and suggests that other factors explain variations in trust in government than simply the general mood citizens. Economic performance indicators observe mixed results. Unemployment is consistently, negatively associated with citizen trust in government – a result observed in the WVS estimations. Income is negatively associated with trust, but economic growth observes a positive association in some specifications. Unemployment and income results may indicate that citizens put a greater weight on employment statistics than income. Particularly as increases in unemployment are likely affect the poor more, whilst increases in income does not necessarily indicate increases in income for the low paid.

5.5.4. Main Results Summary

Across the selection of estimations provided in this section, there is some evidence that decentralization has an effect on citizen trust in government and related institutions. This effect is often observed through various interactions with other aspects of decentralization. The key results are outlined below:

1. In the World Values Survey, there is only evidence that decentralization explains cross-sectional variations in trust in government. These findings are fairly robust to IV estimations, and indicate that decentralization, particularly SCG revenue, is positively associated with trust in government when subnational governments do not have the power to legislate, when the local government executive is appointed, and when the number of tiers of government are fewer than 4. Spending decentralization, is found to be negatively associated with trust in government, when there are 4 or more tiers of government.
2. Fiscal decentralization can explain variations in trust over time, but only for the Eurobarometer dataset. This indicates that decentralization only affects trust over time in shorter intervals (annual), rather than in waves (several years at a time). When including fixed country effects, greater tax and spending decentralization is negatively associated with trust in government when the local government executive is appointed, and positively associated with trust, when the executive is elected.

Overall, the results indicate that decentralization can affect trust, though mostly through certain interactions. The results are not robust, varying between WVS and Eurobarometer datasets and between different estimations.

5.6. Additional Interactions

In this section I perform three further interactions so that I can better understand the merits and dangers of decentralization regarding citizen trust. The interactions are between decentralization and i) the quality of government (CPI), ii) total government expenditure (% of GDP), and iii) local government population size (LG Population). Estimates are provided for a cross-sectional instrument variable estimator and a fixed effects panel estimator, for both dataset.

5.6.1. Cross-Sectional Instrument Variable Estimator

The first set of estimates are for the cross-sectional instrument variable model. The first stage estimates for the World Values Survey dataset are presented in table 65. Land area is found to be consistently associated with the degree of tax and spending decentralization in the first stage, exhibiting the expected positive correlation (see Wallis and Oates, 1988; Panizza, 1998). Population size is also found to be statistically significant in some regressions, but with mixed effects on tax and spending decentralization. Capital population (%) is found to be negatively associated with decentralization, which is the expected relationship based on the literature.

The p-value for the f-tests are often less than 0.10, thereby rejecting null hypothesis that he instruments do not collectively explain variations in decentralization. This would indicate that the instruments are good predictors of variation in the decentralization variable. In specifications 7 and 11, when interacting decentralization and total government expenditure, the instruments are weaker however. This may be important to note when reflecting on second stage estimates in tables 66 and 67.

Table 65: Cross Sectional IV Estimates (1st Stage), Dependent Variable: Decentralization, with Additional Interactions (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	1.008**	0.612***	0.237	0.977**	0.799*	0.571***	0.264	0.756*	0.464	0.384*	0.075	0.477
	(0.434)	(0.201)	(0.243)	(0.390)	(0.425)	(0.198)	(0.239)	(0.401)	(0.686)	(0.190)	(0.238)	(0.593)
Instrument Variables												
Country Size	0.015***	0.005*	-0.002	0.017***	0.020***	0.007**	-0.002	0.016***	0.018***	0.007**	-0.002	0.012**
(Land Area)	(0.004)	(0.002)	(0.003)	(0.004)	(0.004)	(0.003)	(0.002)	(0.005)	(0.005)	(0.003)	(0.002)	(0.005)
Country	0.034***	0.028***	0.009*	-0.136	-0.023	0.006	0.009	-0.224	-0.012	0.009	0.010	-0.270*
Population	(0.009)	(0.004)	(0.004)	(0.158)	(0.037)	(0.018)	(0.018)	(0.186)	(0.037)	(0.018)	(0.013)	(0.146)
Capital	-0.006**	-0.000	0.000	-0.006**	-0.006**	-0.001	0.000	-0.005**	-0.004*	-0.000	-0.000	-0.004*
Population (%)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.000)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Second Stage Controls												
Public Mood	-0.063	0.003	0.001	-0.044	-0.015	0.017	0.002	-0.034	-0.007	-0.014	-0.022	-0.009
	(0.064)	(0.037)	(0.032)	(0.068)	(0.071)	(0.039)	(0.032)	(0.078)	(0.103)	(0.040)	(0.037)	(0.089)
Real GDP per	-0.207*	-0.104**	0.015	-0.158	-0.153	-0.093**	-0.000	-0.096	-0.070	-0.047	0.046	-0.028
capita	(0.101)	(0.045)	(0.064)	(0.106)	(0.100)	(0.044)	(0.061)	(0.107)	(0.156)	(0.037)	(0.053)	(0.128)
Economic	-0.001	-0.009*	-0.002	-0.011	-0.009	-0.013**	-0.002	-0.013	-0.002	-0.007	-0.003	-0.012
Growth	(0.013)	(0.005)	(0.004)	(0.017)	(0.014)	(0.005)	(0.005)	(0.015)	(0.017)	(0.005)	(0.005)	(0.018)
Unemployment	0.004	0.002	0.000	0.006	0.004	0.003	0.001	0.005	0.000	0.001	-0.000	0.003
	(0.004)	(0.002)	(0.001)	(0.004)	(0.003)	(0.002)	(0.001)	(0.004)	(0.006)	(0.001)	(0.001)	(0.006)
Government	-0.003	-0.001	-0.017***	-0.008	-0.006	-0.002	-0.015***	-0.009	-0.007	-0.001	-0.011**	-0.010
Size	(0.008)	(0.002)	(0.004)	(0.009)	(0.008)	(0.003)	(0.005)	(0.008)	(0.011)	(0.002)	(0.004)	(0.010)
Governance	0.034**	-0.020***	-0.000	0.029*	0.032**	-0.017***	0.002	0.024	0.023	-0.014**	-0.003	0.017
	(0.015)	(0.006)	(0.007)	(0.014)	(0.013)	(0.005)	(0.007)	(0.015)	(0.017)	(0.005)	(0.005)	(0.013)
Ethnolinguistic	0.001	-0.001	-0.000	0.001	0.001	-0.001	-0.000	0.001	0.001	-0.000	0.000	0.000
Fractionalization	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
POLITY	0.013**	0.005**	-0.001	0.010*	0.013**	0.005**	-0.000	0.008	0.005	0.001	-0.001	0.000
	(0.005)	(0.002)	(0.003)	(0.006)	(0.005)	(0.002)	(0.003)	(0.006)	(0.005)	(0.003)	(0.001)	(0.006)
Decentralization		0.115***	0.058***	0.256		0.111***	0.057***	0.469		0.112***	0.055***	0.734*
(Interaction)		(0.008)	(0.006)	(0.238)		(0.007)	(0.005)	(0.385)		(0.008)	(0.005)	0.734*
F-test (p-value) for instruments	0.000	0.000	0.017	0.003	0.000	0.015	0.755	0.005	0.000	0.048	0.509	0.011
Observations	32	32	32	32	31	31	31	31	29	29	29	29
R-squared	0.736	0.973	0.966	0.756	0.726	0.968	0.961	0.748	0.627	0.960	0.965	0.693

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

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There are two sets of second stage estimates: i) trust in government (table 66), and ii) trust in government and institutions (table 67).

In table 66, the results are either mostly insignificant, but there is some evidence that government spending and local jurisdiction population size have some bearing on the relationship between decentralization and trust in government. First, SCG revenue is positively associated with trust when government spending is lower. However, as total government spending rises, trust in government is decreasing with SCG revenue (3). Total government spending is also found to be positively associated with trust in government in specification 3. This suggests that a greater degree of decentralization, combined with higher levels of spending, reduces citizen trust in government overall.

Second, SCG revenue and autonomous spending have contrasting effects on trust in government, when the population size of local jurisdictions is higher (4 and 12). SCG revenue increases citizen trust in when the average population size of the local jurisdiction is larger (4). However, the opposite is true for SCG autonomous spending (12). When the size of the local jurisdiction is increasing, higher levels of SCG autonomous spending reduces trust in government. The contrast in results between SCG revenue and SCG autonomous spending may indicate that citizens have a different response to decentralization depending on whether it is tax or spending.

In table 67, any evidence of a link between decentralization and trust in government and institutions is limited to SCG revenue only. In specification 2, SCG revenue improves trust when the quality of the government is lower. Governance is found to be positively associated with trust in government, as we would expect. This indicates that when the quality of government is lower, citizens prefer to see greater decentralization of revenue functions. Therefore, decentralization mitigates against the negative consequences of low government quality and higher (perceived) corruption. Once again, revenue decentralization is positively associated with trust in government when total government spending is lower. As government spending rises, the positive response citizens have initially declines (3). Finally, citizens trust government more when revenue functions are devolved to larger local government sizes (4).

In the cross-sectional IV estimates for the WVS dataset, the Hansen J-statistics often do not reject the null hypothesis, therefore instruments are suitable in most specifications. Furthermore, the Durbin-Wu-Hausman test does not reject the null hypothesis, therefore decentralization could be treated as exogenous.

Table 66: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Trust in Government, with Additional Interactions (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-0.843	-1.307	-2.289*	-0.789	-0.995	-0.487	1.176	-1.099	0.345	0.704	0.705	0.332
	(0.890)	(0.942)	(1.185)	(0.802)	(0.762)	(1.053)	(2.225)	(0.839)	(0.871)	(0.885)	(1.069)	(0.901)
Decentralization Indicator												
SCG Revenue	0.001	0.008	0.050***	-0.004								
	(0.234)	(0.005)	(0.018)	(0.003)								
SCG Expenditure					-0.004	-0.011	-0.083	0.001				
					(0.003)	(0.014)	(0.082)	(0.004)				
SCG Autonom. Expenditure									-0.002	-0.008	-0.038	-0.007
									(0.004)	(0.013)	(0.042)	(0.007)
Decentralization Interactions												
Decentralization x Governance		-0.001				0.001				0.001		
		(0.001)				(0.002)				(0.002)		
Decentralization x Expenditure			-0.003***				0.004				0.002	
			(0.001)				(0.005)				(0.002)	
Decentralization x LG Population				0.001**				-0.002				-0.003*
				(0.000)				(0.002)				(0.002)
Controls												
Public Mood	0.673***	0.691***	0.735***	0.732***	0.788***	0.805***	0.828***	0.830***	0.621***	0.605***	0.552***	0.624***
	(0.152)	(0.142)	(0.162)	(0.161)	(0.165)	(0.188)	(0.319)	(0.183)	(0.166)	(0.176)	(0.199)	(0.173)
Real GDP per capita	0.174	0.231	0.135	0.154	0.199	0.117	0.195	0.219	-0.050	-0.098	0.096	-0.027
	(0.179)	(0.181)	(0.248)	(0.163)	(0.156)	(0.175)	(0.364)	(0.161)	(0.179)	(0.153)	(0.388)	(0.201)
Economic Growth	0.045**	0.043**	0.034	0.019	0.010	0.001	-0.011	0.011	-0.016	-0.022	-0.030	-0.019
	(0.022)	(0.019)	(0.021)	(0.021)	(0.022)	(0.030)	(0.048)	(0.021)	(0.021)	(0.023)	(0.022)	(0.021)
Unemployment	0.006	0.006	0.006	0.010	0.010	0.012	0.016	0.010	0.013*	0.014**	0.014	0.013**
	(0.008)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.012)	(0.007)	(0.007)	(0.007)	(0.009)	(0.007)
Government Size	-0.001	-0.001	0.083**	-0.003	-0.005	-0.007	-0.131	-0.008	-0.015	-0.015	-0.058	-0.019*
	(0.012)	(0.012)	(0.033)	(0.012)	(0.012)	(0.013)	(0.140)	(0.012)	(0.011)	(0.010)	(0.042)	(0.011)
Governance	0.066***	0.095***	0.066**	0.075***	0.073***	0.048	0.088*	0.065***	0.087***	0.068**	0.078**	0.093***
	(0.021)	(0.024)	(0.029)	(0.019)	(0.018)	(0.038)	(0.048)	(0.019)	(0.016)	(0.031)	(0.031)	(0.018)
Ethnolinguistic Fractionalization	0.002	0.003	0.004*	0.003*	0.003*	0.002	0.000	0.002	0.002	0.001	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
POLITY	-0.035***	-0.035***	-0.027*	-0.027**	-0.025**	-0.024*	-0.027*	-0.029***	-0.019***	-0.019***	-0.023***	-0.017**
	(0.012)	(0.010)	(0.014)	(0.012)	(0.011)	(0.014)	(0.016)	(0.011)	(0.006)	(0.007)	(0.008)	(0.007)
DWH test	0.740	0.450	0.180	0.495	0.316	0.126	0.080	0.940	0.394	0.172	0.127	0.641
Hansen J-statistic	0.067	0.085	0.608	0.082	0.177	0.202	0.541	0.074	0.274	0.358	0.572	0.179
Observations	32	32	32	32	31	31	31	31	29	29	29	29
R-squared	0.827	0.845	0.787	0.836	0.788	0.776	0.080	0.817	0.680	0.662	0.431	0.597

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using land area, population size and capital population as % of national population, from the first. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

Table 67: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Trust in Government and Institutions, with Additional Interactions (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-0.870	-1.770*	-3.141**	-0.849	-1.067	-0.696	-0.270	-1.097	0.147	0.357	0.368	0.186
	(0.972)	(0.911)	(1.482)	(0.768)	(0.733)	(0.915)	(1.130)	(0.770)	(0.810)	(0.811)	(0.870)	(0.841)
Decentralization Indicator												
SCG Revenue	0.006**	0.018***	0.081***	-0.004								
	(0.003)	(0.005)	(0.021)	(0.003)								
SCG Expenditure					-0.002	-0.005	-0.027	-0.001				
					(0.003)	(0.010)	(0.049)	(0.003)				
SCG Autonom. Expenditure									0.001	-0.0019	-0.018	0.002
									(0.003)	(0.008)	(0.037)	(0.003)
Decentralization Interactions												
Decentralization x Governance		-0.002***				0.000				0.000		
		(0.001)				(0.001)				(0.001)		
Decentralization x Expenditure			-0.004***				0.001				0.001	
			(0.001)				(0.003)				(0.002)	
Decentralization x LG Population				0.001***				-0.000				-0.001
				(0.000)				(0.001)				(0.001)
Controls												
Public Mood	0.434***	0.458***	0.523**	0.516***	0.578***	0.585***	0.584***	0.589***	0.484***	0.473***	0.445***	0.487***
	(0.145)	(0.120)	(0.220)	(0.153)	(0.150)	(0.160)	(0.186)	(0.161)	(0.160)	(0.161)	(0.169)	(0.169)
Real GDP per capita	0.210	0.331*	0.163	0.205	0.252	0.186	0.227	0.258	-0.019	-0.058	0.050	-0.031
	(0.198)	(0.197)	(0.385)	(0.172)	(0.162)	(0.174)	(0.181)	(0.168)	(0.163)	(0.146)	(0.331)	(0.163)
Economic Growth	0.037	0.035*	0.021	-0.002	-0.009	-0.013	-0.013	-0.008	-0.029	-0.031	-0.036**	-0.029
	(0.024)	(0.018)	(0.028)	(0.020)	(0.019)	(0.025)	(0.025)	(0.019)	(0.019)	(0.021)	(0.018)	(0.019)
Unemployment	0.004	0.004	0.004	0.010	0.010	0.011	0.012	0.010	0.013*	0.013*	0.013*	0.013*
	(0.010)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)
Government Size	0.005	0.005	0.136***	0.002	-0.001	-0.002	-0.042	-0.002	-0.006	-0.006	-0.029	-0.007
	(0.011)	(0.011)	(0.037)	(0.011)	(0.010)	(0.010)	(0.079)	(0.010)	(0.009)	(0.010)	(0.038)	(0.009)
Governance	0.044*	0.098***	0.043	0.058***	0.053***	0.036	0.058**	0.051**	0.071***	0.064**	0.066**	0.069***
	(0.024)	(0.026)	(0.045)	(0.022)	(0.020)	(0.030)	(0.023)	(0.020)	(0.018)	(0.025)	(0.028)	(0.020)
Ethnolinguistic Fractionalization	0.001	0.003*	0.005	0.003**	0.003*	0.002	0.002	0.003*	0.001	0.001	0.002	0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
POLITY	-0.025*	-0.024**	-0.013	-0.011	-0.011	-0.012	-0.014	-0.012	-0.003	-0.003	-0.005	-0.003
	(0.013)	(0.010)	(0.019)	(0.012)	(0.011)	(0.012)	(0.011)	(0.011)	(0.005)	(0.005)	(0.006)	(0.005)
DWH test	0.748	0.846	0.006	0.188	0.215	0.200	0.451	0.343	0.376	0.197	0.259	0.551
Hansen J-statistic	0.001	0.012	0.410	0.252	0.355	0.246	0.255	0.338	0.594	0.555	0.587	0.523
Observations	32	32	32	32	31	31	31	31	29	29	29	29
R-squared	0.737	0.787	0.309	0.784	0.689	0.689	0.520	0.704	0.666	0.665	0.519	0.683

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using land area, population size and capital population as % of national population, from the first. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

The final set of cross-sectional IV estimations are for the Eurobarometer dataset. The first stage estimates in table 68 are similar to those in the section 5.5 for this dataset. Country size, population and capital population (%) are not as effective in capturing variations in decentralization for the Eurobarometer dataset, and are collectively significant in only half of the specifications, as indicated by the p-values for the f-tests. Land area exhibits the expected effect on decentralization, though population size is negatively associated with the degree of decentralization, which is an unexpected result. Capital population is also negatively associated with decentralization, though this is expected.

The second stage estimates in table 69 suggest that the relationship between tax and spending decentralization and trust in government depends on government quality, government spending and local jurisdiction population size. First, SCG revenue and expenditure are negatively associated with trust when the quality of government is lower, but positively associated with trust when quality of government is higher. Therefore, citizens prefer functions to be decentralized when they have greater confidence in the integrity of their government overall. This result is in contrast to the corresponding results in the WVS estimates and may indicate that citizens in European countries have a different view on decentralization and corruption, with respect to trust in government.

Second, SCG revenue and autonomous spending increase trust when total government spending is higher (3 and 11). If government spending is very low, citizens trust government less when those limited resources are distributed between subnational and local governments (11).

Third, a consistent result across all indicators of tax and spending decentralization is that citizens trust government more when tax and spending is devolved to smaller government units. On the other hand, as the size of the local jurisdiction (population) increases, higher tax and spending decentralization reduce trust (4, 8 and 12).

Finally, the Hansen J-statistic confirms the validity of the chosen instruments in the IV estimations. In only one specification (9) is the null hypothesis rejected at the 10% level. Furthermore, the Durbin-Wu-Hausman test suggest that decentralization could be treated as exogenous. In only the last two specifications (11 and 12), is the null hypothesis rejected at the 1% level.

Table 68: Cross Sectional IV Estimates (1st Stage), Dependent Variable: Decentralization, with Additional Interactions (EB Survey)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	1.618*	0.741	0.432**	0.551	1.843**	0.841	0.518**	0.800	1.197	0.401	0.249	0.712
	(0.878)	(0.568)	(0.166)	(1.083)	(0.790)	(0.549)	(0.197)	(0.965)	(0.835)	(0.400)	(0.151)	(0.627)
Instrument Variables												
Country Size (Land Area)	0.191	0.018	0.037	0.144	0.234	0.029	0.056*	0.220	0.393**	-0.012	0.001	0.320*
	(0.215)	(0.051)	(0.031)	(0.133)	(0.240)	(0.039)	(0.027)	(0.138)	(0.142)	(0.047)	(0.028)	(0.139)
Country Population	-0.128	0.037	0.005	-0.667***	-0.189	0.029	-0.007	-0.669***	-0.362***	0.006	0.011	-0.456**
	(0.175)	(0.057)	(0.023)	(0.194)	(0.195)	(0.049)	(0.022)	(0.179)	(0.103)	(0.046)	(0.027)	(0.158)
Capital Population (%)	-0.004*	0.000	-0.000	-0.001	-0.005*	0.000	-0.000	-0.002	-0.006***	-0.000	-0.000	-0.004*
	(0.002)	(0.001)	(0.000)	(0.002)	(0.002)	(0.001)	(0.000)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Second Stage Controls												
Public Mood	-0.134	-0.216	-0.058	0.001	0.050	-0.343*	-0.115	0.001	0.830	-0.210*	-0.095	0.496
	(0.603)	(0.163)	(0.080)	(0.439)	(0.672)	(0.172)	(0.072)	(0.470)	(0.553)	(0.109)	(0.063)	(0.390)
Real GDP per capita	-0.276	-0.090	-0.024	-0.109	-0.333	-0.116	-0.046	-0.187	-0.021	-0.007	-0.016	-0.015
	(0.195)	(0.115)	(0.040)	(0.214)	(0.191)	(0.112)	(0.043)	(0.203)	(0.202)	(0.073)	(0.033)	(0.161)
Economic Growth	-0.015	0.001	-0.003	0.004	-0.025	0.003	-0.002	0.001	-0.057**	-0.001	-0.001	-0.029
	(0.020)	(0.008)	(0.003)	(0.018)	(0.024)	(0.008)	(0.003)	(0.024)	(0.018)	(0.007)	(0.005)	(0.018)
Unemployment	-0.001	-0.003**	-0.000	-0.004	-0.000	-0.003**	-0.001	-0.004	0.005	-0.001	-0.000	0.001
	(0.003)	(0.001)	(0.000)	(0.002)	(0.003)	(0.001)	(0.000)	(0.003)	(0.003)	(0.001)	(0.000)	(0.003)
Government Size	-0.013	-0.007*	-0.017***	0.009	-0.013	-0.007**	-0.016***	0.010	-0.019	-0.004	-0.008***	-0.005
	(0.014)	(0.003)	(0.001)	(0.015)	(0.016)	(0.003)	(0.002)	(0.017)	(0.011)	(0.003)	(0.002)	(0.009)
Governance	0.050***	-0.023*	0.003	0.024	0.053**	-0.016	0.005	0.031	0.008	-0.011	0.001	0.007
	(0.016)	(0.012)	(0.004)	(0.021)	(0.019)	(0.012)	(0.004)	(0.020)	(0.018)	(0.007)	(0.003)	(0.014)
Ethnolinguistic Fractionalization	0.001	0.012	0.004	-0.010	-0.007	0.017	0.007	-0.008	-0.095	-0.006	0.003	-0.065
	(0.054)	(0.017)	(0.007)	(0.036)	(0.058)	(0.015)	(0.006)	(0.037)	(0.062)	(0.010)	(0.007)	(0.044)
POLITY	-0.134	-0.216	-0.058	0.001	0.050	-0.343*	-0.115	0.001	0.830	-0.210*	-0.095	0.496
	(0.603)	(0.163)	(0.080)	(0.439)	(0.672)	(0.172)	(0.072)	(0.470)	(0.553)	(0.109)	(0.063)	(0.390)
Decentralization (Interaction)		0.131***	0.046***	2.156**		0.129***	0.046***	2.033**		0.130***	0.050***	1.282**
		(0.011)	(0.002)	(0.856)		(0.009)	(0.002)	(0.805)		(0.012)	(0.003)	(0.490)
F-test (p-value) for instruments	0.062	0.326	0.045	0.019	0.053	0.127	0.078	0.011	0.005	0.798	0,618	0.068
Observations	23	23	23	23	22	22	22	22	20	20	20	20
R-squared	0.673	0.969	0.995	0.817	0.680	0.978	0.995	0.824	0.694	0.978	0.994	0.813

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 69: Cross Sectional IV Estimates (2nd Stage), Dependent Variable: Trust in Government, with Additional Interactions (EB Survey)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-0.110	2.582	1.129	-1.143	-0.227	2.948	0.754	-1.324	-0.555	3.929	6.914**	-0.964
	(1.443)	(2.368)	(1.712)	(1.571)	(1.499)	(2.524)	(1.896)	(1.499)	(1.561)	(3.230)	(3.514)	(1.491)
Decentralization Indicator												
SCG Revenue	-0.239	-4.377*	-4.133	0.780***								
	(0.434)	(2.410)	(2.555)	(0.278)								
SCG Expenditure					-0.111	-4.322**	-2.859	0.875***				
					(0.394)	(2.121)	(2.129)	(0.218)				
SCG Autonom. Expenditure									0.256	-11.745	-29.924*	1.520***
									(0.382)	(8.674)	(16.526)	(0.267)
Decentralization Interactions												
Decentralization x Governance		0.618*				0.608**				1.588		
		(0.324)				(0.280)				(1.134)		
Decentralization x Expenditure			0.200*				0.144				1.533*	
			(0.119)				(0.098)				(0.834)	
Decentralization x LG Population				-0.959***				-1.049***				-2.258***
				(0.279)				(0.252)				(0.481)
Controls												
Public Mood	0.434	-0.502	0.158	0.669*	0.427	-1.244	0.007	0.520	0.480	-2.526	-3.082	0.067
	(0.494)	(0.891)	(0.603)	(0.365)	(0.528)	(1.078)	(0.610)	(0.361)	(0.578)	(2.099)	(1.887)	(0.456)
Real GDP per capita	-0.056	-0.237	0.009	0.248	-0.035	-0.321	-0.008	0.319	0.048	-0.060	-0.340	0.219
	(0.294)	(0.377)	(0.306)	(0.343)	(0.301)	(0.416)	(0.321)	(0.324)	(0.308)	(0.464)	(0.665)	(0.320)
Economic Growth	0.004	0.001	-0.005	-0.017	0.006	0.018	0.004	-0.013	0.002	0.002	-0.034	-0.029
	(0.013)	(0.019)	(0.013)	(0.013)	(0.015)	(0.022)	(0.015)	(0.013)	(0.018)	(0.030)	(0.039)	(0.018)
Unemployment	0.005**	-0.005	0.004*	0.010***	0.005**	-0.007	0.004*	0.010***	0.006**	-0.005	0.006	0.012***
	(0.002)	(0.007)	(0.002)	(0.002)	(0.002)	(0.007)	(0.002)	(0.002)	(0.003)	(0.009)	(0.004)	(0.004)
Government Size	-0.001	-0.037*	-0.071	-0.009	0.002	-0.035*	-0.046	-0.010	0.005	-0.039	-0.243*	-0.012
	(0.014)	(0.022)	(0.048)	(0.012)	(0.013)	(0.021)	(0.039)	(0.012)	(0.013)	(0.032)	(0.131)	(0.012)
Governance	0.060*	-0.077	0.051*	0.014	0.056	-0.050	0.051	0.009	0.039	-0.097	0.076	0.019
	(0.034)	(0.072)	(0.028)	(0.033)	(0.034)	(0.054)	(0.033)	(0.031)	(0.033)	(0.118)	(0.070)	(0.031)
Ethnolinguistic Fractionalization	0.011	0.048	0.021	-0.008	0.008	0.072	0.020	-0.009	-0.002	-0.015	0.122*	0.032
	(0.036)	(0.048)	(0.029)	(0.043)	(0.037)	(0.047)	(0.030)	(0.042)	(0.045)	(0.076)	(0.070)	(0.057)
POLITY	0.434	-0.502	0.158	0.669*	0.427	-1.244	0.007	0.520	0.480	-2.526	-3.082	0.067
	(0.494)	(0.891)	(0.603)	(0.365)	(0.528)	(1.078)	(0.610)	(0.361)	(0.578)	(2.099)	(1.887)	(0.456)
DWH test	0.470	0.136	0.168	0.342	0.447	0.192	0.268	0.283	0.759	0.173	0.003	0.009
Hansen J-statistic	0.218	0.523	0.299	0.485	0.165	0.203	0.150	0.446	0.055	0.188	0.753	0.517
Observations	23	23	23	23	22	22	22	22	20	20	20	20
R-squared	0.553	0.347	0.516	0.663	0.557	0.472	0.553	0.691	0.553			0.650

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients. SCG Revenue, SCG Expenditure and SCG Autonomous Expenditure are instrumented using land area, population size and capital population as % of national population, from the first. The p-values for the Durbin-Wu-Hausman test and Hansen J-statistic are provided.

5.6.2. Fixed Effects Panel Estimator (WVS)

The final set of estimates are produced using a fixed effects panel estimator. In the first set of estimations in table 70, tax and spending decentralization are associated with trust in government through interactions with the quality of government and the size of the local jurisdiction.

First, when the quality of government is lower, citizens prefer functions to be centralized, and when the quality of government is higher, greater decentralization of revenue functions improves trust (2). This result did not appear in the cross-sectional IV estimations however, and contrasts with the results in table 67 (trust in government and institutions).

The second, and perhaps strongest result, is in interactions between spending decentralization and local jurisdiction population size. When the population size of the local jurisdiction is smaller, higher levels of spending and autonomous spending decentralization improve trust (8 and 12). Conversely, as local population size increases, greater decentralization begins to reduce citizen trust in government. This result is consistent with previous estimations, and suggests that citizens have a different response to decentralization depending on how small or large the local population is.

In the second set of estimations for the relationship between tax and spending decentralization and trust in government and institutions, there is more evidence of a link between decentralization and trust (table 71). As before, revenue decentralization only affects trust in government through interactions with the governance indicator. However, in these estimates spending and autonomous spending also observe the same effect (6 and 10). Spending decentralization also affects citizen trust in government through total government spending (7 and 11) and through local jurisdiction population size (12). When total spending is lower, greater spending decentralization improves trust, but as total spending increases, greater decentralization starts to reduce citizen trust. The effect of government spending on trust in government, in specifications 7 and 11, is positive. Therefore, a combination of higher spending and greater decentralization reduces citizen trust in government.

Finally, the result in specification 12 supports the finding in table 70, where decentralization increases trust for smaller local populations, and decreases trust when devolved to local governments responsible for larger local populations

Table 70: Fixed Effects Panel Estimates, Dependent Variable: Trust in Government, with Additional Interactions (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	-0.663	-0.145	-0.541	-0.535	0.636	0.743	1.394	1.586	0.408	1.806	1.197	2.165
	(1.302)	(0.920)	(1.297)	(1.520)	(1.218)	(1.152)	(1.384)	(1.265)	(2.071)	(2.831)	(1.818)	(1.980)
Decentralization Indicator												
SCG Revenue	-0.008	-0.040**	0.006	-0.003								
	(0.677)	(1.412)	(4.217)	(2.345)								
SCG					0.003	-0.0184	0.047	0.041*				
Expenditure					(0.009)	(0.016)	(0.045)	(0.021)				
SCG Autonom.									-0.000	-0.019	0.023	0.036*
Expenditure									(0.008)	(0.031)	(0.041)	(0.020)
Decentralization Interactions												
Decentralization		0.005**				0.003				0.003		
x Governance		(0.002)				(0.002)				(0.005)		
Decentralization			-0.001				-0.003				-0.001	
x Expenditure			(0.002)				(0.002)				(0.002)	
Decentralization				-0.004				-0.031*				-0.037*
x LG Population				(0.017)				(0.016)				(0.020)
Controls												
Public Mood	1.486***	1.558***	1.432***	1.441**	1.570***	1.585***	1.455***	1.279***	1.812**	1.612*	1.625**	1.586**
	(0.459)	(0.442)	(0.474)	(0.526)	(0.383)	(0.375)	(0.329)	(0.368)	(0.699)	(0.845)	(0.635)	(0.632)
Real GDP per	-0.103	-0.092	-0.162	-0.113	-0.524*	-0.476	-0.772*	-0.614**	-0.546	-0.596	-0.649	-0.705
capita	(0.290)	(0.237)	(0.334)	(0.306)	(0.276)	(0.275)	(0.405)	(0.283)	(0.418)	(0.426)	(0.480)	(0.474)
Economic	0.005	0.001	0.002	0.004	-0.035**	-0.031*	-0.047***	-0.044**	-0.016	-0.020	-0.020	-0.017
Growth	(0.022)	(0.017)	(0.026)	(0.023)	(0.017)	(0.016)	(0.013)	(0.019)	(0.034)	(0.035)	(0.035)	(0.039)
Unemployment	-0.037**	-0.034**	-0.040**	-0.037*	-0.037***	-0.033**	-0.049**	-0.033**	-0.047***	-0.051***	-0.053**	-0.054***
	(0.018)	(0.016)	(0.017)	(0.018)	(0.012)	(0.012)	(0.018)	(0.012)	(0.016)	(0.016)	(0.020)	(0.015)
Government	0.011	0.023	0.032	0.011	0.033	0.038*	0.100	0.037	0.044*	0.034	0.068	0.050*
Expenditure	(0.022)	(0.024)	(0.057)	(0.022)	(0.019)	(0.020)	(0.063)	(0.021)	(0.023)	(0.029)	(0.046)	(0.027)
Governance	0.061	-0.103	0.042	0.057	0.032	-0.060	-0.047	-0.008	0.013	-0.052	-0.028	-0.050
	(0.107)	(0.135)	(0.111)	(0.109)	(0.098)	(0.109)	(0.119)	(0.107)	(0.107)	(0.149)	(0.114)	(0.115)
POLITY	0.021**	0.031***	0.020**	0.022**	0.014	0.021**	0.010	0.022**	0.014	-0.018	-0.003	-0.014
	(0.010)	(0.010)	(0.009)	(0.008)	(0.008)	(0.008)	(0.007)	(0.009)	(0.142)	(0.169)	(0.142)	(0.140)
Observations	42	42	42	42	40	40	40	40	36	36	36	36
R-squared	0.559	0.622	0.563	0.560	0.695	0.714	0.718	0.730	0.733	0.737	0.738	0.771
Groups	19	19	19	19	19	19	19	19	18	18	18	18

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 71: Fixed Effects Panel Estimates, Dependent Variable: Trust in Government and Institutions, with Additional Interactions (WVS)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	0.651	1.057	0.795	0.682	1.398	1.508	2.357**	2.094	2.866	6.840***	5.066***	4.815***
	(1.128)	(1.039)	(1.192)	(1.381)	(1.083)	(1.116)	(1.115)	(1.231)	(2.084)	(1.770)	(0.837)	(0.951)
Decentralization Indicator												
SCG Revenue	-0.002	-0.026**	0.015	-0.001								
	(0.005)	(0.011)	(0.030)	(0.019)								
SCG					0.003	-0.018	0.059**	0.031				
Expenditure					(0.007)	(0.015)	(0.028)	(0.020)				
SCG Autonom.									0.001	-0.052***	0.066***	0.041***
Expenditure									(0.006)	(0.018)	(0.018)	(0.009)
Decentralization Interactions												
Decentralization		0.004**				0.003*				0.008***		
x Governance		(0.001)				(0.002)				(0.003)		
Decentralization			-0.001				-0.003*				-0.004***	
x Expenditure			(0.002)				(0.002)				(0.001)	
Decentralization												-
x LG Population				-0.001				-0.023				0.0405***
				(0.014)				(0.016)				(0.008)
Controls												
Public Mood	1.281***	1.337***	1.217***	1.270***	1.298***	1.314***	1.153***	1.085**	0.955*	0.387	0.433	0.704**
	(0.349)	(0.336)	(0.396)	(0.421)	(0.323)	(0.322)	(0.300)	(0.379)	(0.491)	(0.533)	(0.328)	(0.322)
Real GDP per	-0.220	-0.211	-0.289	-0.223	-0.450**	-0.400*	-0.763***	-0.516**	-0.203	-0.345	-0.492**	-0.380*
capita	(0.171)	(0.150)	(0.218)	(0.190)	(0.174)	(0.191)	(0.244)	(0.184)	(0.274)	(0.222)	(0.215)	(0.187)
Economic	-0.001	-0.004	-0.005	-0.001	-0.018	-0.014	-0.034***	-0.025*	0.032	0.021	0.020*	0.030**
Growth	(0.012)	(0.009)	(0.014)	(0.012)	(0.012)	(0.011)	(0.009)	(0.014)	(0.019)	(0.013)	(0.011)	(0.012)
Unemployment	-0.038***	-0.036***	-0.041***	-0.038***	-0.038***	-0.034***	-0.053***	-0.034***	-0.054***	-0.065***	-0.070***	-0.062***
	(0.011)	(0.009)	(0.011)	(0.011)	(0.010)	(0.008)	(0.013)	(0.011)	(0.011)	(0.008)	(0.008)	(0.006)
Government	-0.004	0.005	0.021	-0.004	0.009	0.014	0.094*	0.012	0.038**	0.011	0.106***	0.045***
Expenditure	(0.013)	(0.018)	(0.043)	(0.013)	(0.013)	(0.018)	(0.048)	(0.014)	(0.016)	(0.014)	(0.022)	(0.013)
Governance	-0.016	-0.145*	-0.038	-0.017	-0.035	-0.128	-0.134	-0.064	-0.154*	-0.339***	-0.270***	-0.225***
	(0.074)	(0.076)	(0.083)	(0.077)	(0.071)	(0.088)	(0.087)	(0.075)	(0.076)	(0.086)	(0.063)	(0.065)
POLITY	0.014**	0.022***	0.013**	0.014***	0.011**	0.017***	0.005	0.016***	-0.179**	-0.270***	-0.227***	-0.210***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.006)	(0.003)	(0.084)	(0.090)	(0.061)	(0.060)
Observations	42	42	42	42	40	40	40	40	36	36	36	36
R-squared	0.668	0.731	0.676	0.668	0.727	0.758	0.783	0.755	0.842	0.896	0.906	0.913
Groups	19	19	19	19	19	19	19	19	18	18	18	18

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

Table 72: Fixed Effects Panel Estimates, Dependent Variable: Trust in Government, with Additional Interactions (EB Survey)

	1	2	3	4	5	6	7	8	9	10	11	12
Constant	0.992	0.976	1.347	1.063	1.096	1.196	1.512	1.150	-0.048	-0.049	-0.042	0.014
	(0.904)	(0.872)	(1.020)	(0.920)	(0.941)	(0.899)	(1.034)	(0.929)	(0.709)	(0.712)	(0.731)	(0.712)
Decentralization Indicator												
SCG Revenue	-0.210	-1.598	-1.125	1.084								
	(0.268)	(1.325)	(0.676)	(1.682)								
SCG					-0.135	-2.219*	-1.317*	3.435				
Expenditure					(0.189)	(1.212)	(0.716)	(2.054)				
SCG Autonom.									-0.263	-0.159	-0.355	0.523
Expenditure									(0.404)	(1.630)	(1.601)	(1.198)
Decentralization Interactions												
Decentralization		0.201				0.286				-0.013		
x Governance		(0.164)				(0.170)				(0.176)		
Decentralization			0.048				0.067				0.004	
x Expenditure			(0.035)				(0.043)				(0.068)	
Decentralization				-0.882				-2.370*				-0.567
x LG Population				(1.005)				(1.353)				(0.607)
Controls												
Public Mood	0.423***	0.426***	0.417***	0.404***	0.425***	0.439***	0.411***	0.384**	0.376**	0.375**	0.376**	0.367**
	(0.143)	(0.145)	(0.130)	(0.138)	(0.142)	(0.146)	(0.127)	(0.138)	(0.150)	(0.151)	(0.150)	(0.149)
Real GDP per	-0.288*	-0.235	-0.316*	-0.308*	-0.328*	-0.292	-0.366**	-0.365**	-0.216	-0.217	-0.215	-0.221
capita	(0.159)	(0.175)	(0.174)	(0.158)	(0.164)	(0.171)	(0.177)	(0.156)	(0.173)	(0.176)	(0.174)	(0.171)
Economic	0.003	0.003	0.003	0.003	0.004*	0.004*	0.003	0.003	0.004**	0.004**	0.004**	0.004*
Growth	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Unemployment	-0.012***	-0.011***	-0.013***	-0.012***	-0.013***	-0.013***	-0.013***	-0.012***	-0.011***	-0.011***	-0.011***	-0.010**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Government	0.004	0.004	-0.009	0.003	0.005	0.008	-0.010	0.001	0.005	0.005	0.005	0.004
Expenditure	(0.009)	(0.010)	(0.013)	(0.009)	(0.010)	(0.010)	(0.013)	(0.009)	(0.010)	(0.009)	(0.012)	(0.010)
Governance	-0.017	-0.066	-0.015	-0.016	-0.017	-0.081*	-0.013	-0.006	-0.007	-0.005	-0.007	-0.006
	(0.019)	(0.049)	(0.019)	(0.019)	(0.020)	(0.043)	(0.018)	(0.023)	(0.019)	(0.031)	(0.019)	(0.019)
POLITY	0.061	0.069	0.061	0.061	0.063	0.074	0.063	0.063	0.125***	0.125***	0.125***	0.122***
	(0.062)	(0.060)	(0.061)	(0.063)	(0.062)	(0.060)	(0.062)	(0.066)	(0.032)	(0.032)	(0.032)	(0.032)
Observations	162	162	162	162	156	156	156	156	146	146	146	146
R-squared	0.316	0.325	0.323	0.321	0.328	0.344	0.339	0.348	0.344	0.344	0.344	0.349
Groups	26	26	26	26	25	25	25	25	24	24	24	24

***, ** and * represent significance at the 1, 5 and 10% levels respectively. White robust standard errors are in parenthesis below the coefficients.

The final set of estimates are for the Eurobarometer dataset in table 72. There is very little evidence that decentralization affects trust in government over time in the Eurobarometer dataset. What evidence there is, is limited to spending decentralization only, in specifications 6 to 8. When government quality is lower (6) and government spending is lower (7), higher decentralization reduces trust in government. Finally, when local population size is larger, higher spending decentralization also reduces trust in government. Though the coefficients are only statistically significant at the 10% level, this result is consistent with previous estimates in the Eurobarometer and WVS estimations.

5.6.3. Additional Interactions Summary

Additional interactions provided in this section produce some interesting results. The main findings are:

1. Fiscal decentralization appears to improve government trust when the quality of government is greater (according to the CPI). This is the case in all fixed effects estimations for at least one of the decentralization indicators, and in the cross-sectional IV estimates for the Eurobarometer survey. There is one contradictory result, in the WVS estimates, in table 67. This is the exception however.
2. Interactions between fiscal decentralization and total government spending observe contrasting effects between WVS and Eurobarometer datasets. In the WVS, SCG revenue, combined with higher levels of total spending, leads to lower trust in government in cross-sectional estimations. Furthermore, spending decentralization observes the same effect in fixed effects panel estimates (trust in government and institutions). However, in the Eurobarometer dataset, and specifically the cross-sectional IV estimates, decentralization has a negative effect on trust when spending is lower. Though the IV estimations may suffer from weak instrumentation, this result is also observed in the fixed effects panel estimations for SCG expenditure (table 72). This could indicate that the response of citizens to decentralization and government spending in European countries, differs from citizens in other countries.
3. Fiscal decentralization appears to have different effects on trust in government depending on the population size of the local jurisdiction. The results are mixed in the cross-sectional IV estimations, with different effects between the WVS and Eurobarometer dataset. However, in the fixed effects panel estimations, spending

decentralization leads to greater trust in government over time, when the size of the local jurisdiction is smaller. However, as the size of the local jurisdiction increases, greater decentralization reduces trust in government.

5.7. Conclusion and Closing Remarks

In this chapter I have examined empirically the relationship between fiscal decentralization on citizen trust in government. As this is a relatively new area of research, I began this chapter by establishing how fiscal decentralization may affect citizen trust in government, and why this is important. Using the decentralization dataset outlined in chapter 2 and two datasets for trust in government (World Values Survey, Eurobarometer), I produced estimations for the effects of tax, spending and other forms of decentralization on trust in government. The main findings of my empirical research are:

1. Tax and spending decentralization has little effect on trust. This is in contrast to the most comparable piece of research by Ligthart and Oudheusen (2015). I included more controls for economic performance, government spending, government quality and democracy, which may explain the difference in the results. Instead, interactions between tax and spending decentralization and other forms of decentralization generate some interacting effects.
2. In the World Values Survey, there is evidence that tax decentralization in particular explains variations in trust between countries. SCG revenue is found to be positively associated with trust in government in institutions, and this is robust to IV estimations. There is no evidence in the fixed effects panel estimator however, which may reflect on the quality of the estimations (due to inefficiency). All evidence of an association between decentralization and trust in government for the Eurobarometer dataset is restricted to interactions with other types of decentralization. Specifically, legislative autonomy and elected local government executives improves trust.
3. The relationship between decentralization and trust in government also depends on other conditions examined in section 5.6. Decentralization improves trust in government when the quality of government is greater. The results for interactions between decentralization and government spending and local jurisdiction population size are mixed however. The WVS and Eurobarometer survey observe different effects, specifically in the cross-sectional IV estimates. This may indicate weak

instrumentation, or that the effects of decentralization on trust through various interactions depends on the frequency of data and the time period covered. For example, over longer periods of time in the World Values Survey, higher levels of decentralization to larger local governments (in terms of population), reduces trust.

Overall, the evidence here suggests that whilst the degree of tax and spending decentralization, and the degree of local government autonomy, have very little impact on citizen trust in government, the complexity of decentralized government and the closeness of local government to citizens does have some bearing on this relationship. This is particularly important as it may be evidence that fiscal decentralization does indeed bring government closer to people (Musgrave, 1983), which is often cited as one of the main motivations behind the decentralization of government. Ultimately further work is required to examine the effects of government decentralization on trust. In my work I provide some ideas of how decentralization may affect citizens' view of government, but more data, and data that specifically focuses on local government (share, autonomy), could provide greater insight into the relationship between decentralization and trust. Future empirical research should also consider different instrumentation of decentralization. Though area and population size have been used as instruments previously, even with an additional instrument (capital population %), the instruments were sometimes weak in the cross-sectional IV estimations.

6. Thesis Conclusion

In this thesis, I have examined several aspects of fiscal decentralization, from tax and spending decentralization, to local government accountability and local jurisdiction area and population size. The aim of this thesis was to examine the effects of these aspects of fiscal decentralization on several key areas of public policy: poverty and income distribution (chapter 3), public healthcare and public education (chapter 4) and trust in government (chapter 5). The key results of my research are as follows:

1. The overarching result from my thesis is that the effects of fiscal decentralization depend on more than whether subnational governments account for a greater (or smaller) proportion of total government taxation and spending. Further tax and spending decentralization rarely has consistent effects in the topics covered in this research. Instead, tax and spending decentralization, in tandem with other forms of decentralization, such as the degree of local government autonomy and accountability to local citizens, produce more consistent effects.
2. Fiscal decentralization appears to reduce income inequality in high income countries, but increase absolute poverty in low and middle income countries. Furthermore, greater decentralization has a positive effect on the poor and poorest when the size (area) of local jurisdiction is smaller. This result contradicts some of the decentralization theory discussed in chapter 1, specifically, that fiscal decentralization may lead to a race to the bottom in taxation (Hoyt, 1991) and lower spending on essential public services (Keen and Marchand, 1997; Besley and Coate, 2003). Instead, this finding may suggest that greater tax and spending decentralization when the size of local government is smaller may empower the poorest, leading subnational governments to be more responsive to the needs of the poor. Therefore, this finding is more in line with the theories of Oates (1972) and Tiebout (1956).

3. Fiscal decentralization has neither a positive or negative effect on public services. Instead, certain public services may benefit from greater fiscal decentralization, whilst others may not. The main conclusions from chapter 4 is that greater fiscal decentralization can improve public healthcare where subnational governments have autonomy over spending and when total public healthcare expenditure is higher. This suggests that developing countries may benefit from greater centralization, at least with respect to public healthcare. Secondly, local government accountability affects the relationship between decentralization and public education. There is also evidence that fiscal decentralization may be stronger when there is a greater degree of heterogeneity between citizens, which supports a widely-held view in the literature (see Oates, 1972, and Khaleghian, 2004).
4. Citizens appear to be indifferent towards the arrangement of tax and spending decision making between central and subnational governments. Instead, citizens trust government more when there are fewer government tiers and when the local government is closer to local citizens. Citizens trust government less when tax and spending is devolved between many tiers of subnational governments. Finally, where fiscal decentralization brings government closer to local citizens, further tax and spending decentralization can improve trust in government overall.

Overall, the main finding from the empirical research in this thesis is that tax and spending authority of subnational governments may be less important than other aspects of decentralization. Often tax and spending decentralization has mixed or no significant effect on the topics covered in this research. Therefore, decentralization policy and reform should focus on other aspects of fiscal decentralization. The evidence in this research supports the views expressed by Bahl (1999) and Treisman (2000) that the effects of decentralization depend on the design of decentralized government, and the different aspects of fiscal decentralization. The implications of these findings, with respect to decentralization policy and reform, are important.

First, decentralization reform should not be limited to the devolution of tax and spending. Instead, reform packages should consider a range of different types of decentralization, and developing countries should not seek to expand subnational government activity and autonomy in the hope that this alone will bring about the supposed benefits of fiscal decentralization.

Second, there is limited evidence that fiscal decentralization has consistent positive effects on any of the subjects covered in this research, and there is the risk that further

decentralization may actually harm provision of public services, for example, vaccination coverage. Therefore, there should be no expectation that decentralization reform will lead to lower poverty, less inequality, better public healthcare and public education or stronger links between citizens and government (represented by trust in government). Countries that have implemented decentralization reforms, particularly with a focus on tax and spending decentralization, as reported by Dillinger (1994) and Stein (1998), are unlikely to produce universal effects.

Third, empirical research on the effects of fiscal decentralization should consider other aspects of decentralization. The research carried out here demonstrates that the effects of tax and spending decentralization are often sensitive to the design of fiscal decentralization (Bahl, 1999). Only recently has research begun to include other aspects of fiscal decentralization (see Altunbas and Thornton, 2011). Treisman (2000) among others has provided evidence that effects of government decentralization can differ between the different aspects of decentralization. It is important that when suggesting policy on fiscal decentralization, that we consider all forms of decentralization as well. Future research in the area of fiscal decentralization should incorporate measures of different aspects of decentralization so that more insightful conclusions can be made on the effects of fiscal decentralization.

Finally, I will reflect on some of the shortcomings of my work and will make suggestions for how future studies can build on the research in this thesis.

First, further work should be done to examine the effects of fiscal decentralization on absolute poverty. This area of study is in its infancy, yet there is a great deal of value in research on the distributional effects of fiscal decentralization. My empirical research produces little evidence of any association between fiscal decentralization and absolute poverty. It may be that fiscal decentralization has no effect on absolute poverty. However, if more data becomes available, then further evidence may provide different results and robust conclusions on the effects of fiscal decentralization on absolute poverty. Furthermore, the limited quantity of data available for tax and spending decentralization in low and middle income countries prevented an investigation into the long-term effects of fiscal decentralization. It is likely that fiscal decentralization will produce long term effects, as well as the short term effects examined here. This is relevant to each of the topics covered in this research.

Second, I also suggest that future decentralization research should focus on local government. Wallis and Oates (1988); Treisman (2002) and more recently, Ivanyna and Shah (2014), have all discussed to some extent vertical decentralization – the idea that tax

and spending functions devolved to local governments indicate greater decentralization than the same functions devolved to subnational governments. In my research I used indicators for subnational government share of total government responsibility. However, some of the stronger results in my research concern local government accountability, government structure and the characteristics of local government (local jurisdiction area size and local population). Ivanyna and Shah (2014) provide an extensive dataset on local government, however the data is cross-sectional only. Local government tax and spending share and autonomy, combined with measures of local government size and so forth, could provide an insight into the effects of fiscal decentralization on the various topics covered in this research.

Appendices

Appendix A: Variable Data, Definitions and Sources

VARIABLE	DEFINITION	SOURCE
Poverty and Income Distribution Indicators		
Income Distribution (Gini Coefficient)	Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 1 implies perfect inequality.	World Bank, World Development Indicators; OECD, Income Distribution Database; UNU-Wider
Absolute Poverty	Absolute Poverty is the percentage of the population living on less than $1.25 a day at 2005 international prices. As a result of revisions in PPP exchange rates, poverty rates for individual countries cannot be compared with poverty rates reported in earlier editions.	World Bank, Poverty and Inequality Database
Public Healthcare Indicators		
Vaccinations	Average of two vaccinations: i) DPT, ii) Measles, for 12-23 months old. (World Bank definition: Child immunization measures the percentage of children ages 12-23 months who received vaccinations before 12 months or at any time before the survey.)	World Bank, World Development Indicators
Infant Mortality	Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year.	World Bank, World Development Indicators
Public Education Indicators		
Classroom Size (primary)	Primary school pupil-teacher ratio is the number of pupils enrolled in primary school divided by the number of primary school teachers (regardless of their teaching assignment).	World Bank, World Development Indicators
Primary Enrolment	Net enrolment ratio is the ratio of children of official school age based on the International Standard Classification of Education 1997 who are enrolled in primary school to the population of the corresponding official school age	World Bank, World Development Indicators; UNESCO Education Indicators
Trust in Government and Institutions Indicators		
Trust (World Values Survey)	"I am going to name a number of organisations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all?" I convert the qualitative responses into a scale: 0 (none at all), 1 (not very much), 2 (quite a lot) and 3 (great deal). Country data is constructed as the average response from all participants in the survey. Data is provided in waves: 1990-1994, 1995-1998, 1999-2004 and 2005-2009. Trust in government is a single variable in the dataset, whilst trust in government and institutions is calculated as the average of four separate indicators for trust in government, parliament, political parties and civil service.	World Values Survey,

Trust (Eurobarometer)	"I would like to ask you a question about how much trust you have in certain institutions. For each of the following institutions, please tell me if you tend to trust it or tend not to trust it?". Responses are in three categories: trust, do not trust, and don't know. The original data contains percentages for each of these categories. My data is the ratio of those who said they trust, to those who said they either trust or do not trust.	Eurobarometer Trust Dataset
Trust (Edelman Barometer)	"How much do you trust each of these institutions to do what is right?". Respondents are aged between 35-64 years old, college-educated, household income in top quantile. Data is provided per country, as a percentage of the positive responses. I construct a panel dataset from annual publications of the work, between 2005 and 2009.	Annual Edelman Trust Barometer (2005-2009)
Panel Decentralization Indicators		
Subnational Government Revenue Decentralization	SCG (state and local government) revenue as a % of general government revenue (central and SCG), not including transfers	World Bank Fiscal Decentralization Indicators
Subnational Government Expenditure Decentralization	SCG (state and local government) expenditure as a % of general government revenue (central and SCG), not including transfers	World Bank Fiscal Decentralization Indicators
Subnational Government Autonomous Expenditure Decentralization	Fiscal Decentralization is a constructed variable from existing World Bank Fiscal Decentralization Indicators dataset. It is calculated as Expenditure Decentralization * Fiscal Gap (Subnational Government Own-Source Revenue as a percentage of Subnational Government Expenditure)	World Bank Fiscal Decentralization Indicators
Other Decentralization Indicators		
Legislative Decentralization	Sub-central legislatures have autonomy in certain specified areas--i.e. constitutional authority to legislate--not explicitly subject to central laws (1)	Treisman (2008)
Federal Dummy	Dummy variable: countries with federal government (1), countries with unitary government (0)	Treisman (2008)
Electoral Dummy	Executive at bottom tier directly elected (1) or chosen by directly elected assembly (0)	Treisman (2008)
Tiers	Dummy variable: if country has 4 or more tiers of government (1); if countries has fewer than 4 tiers of government (0)	Treisman (2008)
Local Government Average Area Size	The logarithm of the average size of the smallest jurisdiction (local government). Original data was recorded in square kilometres	Ivanyna and Shah (2014)
Local Government Average Population Size	The logarithm of the average number of citizens living in the smallest jurisdiction (local government). Original data was recorded in 1,000s	Ivanyna and Shah (2014)
Control Variables		

Logarithm of Real Income	The logarithm of GDP per capita based on purchasing power parity (PPP). Data are in constant 2011 international dollars.	World Bank, World Development Indicators
Economic Growth	Annual percentage growth rate of GDP per capita based on constant local currency.	World Bank, World Development Indicators
Inflation	Annual change in prices as measured by the consumer price index	World Bank, World Development Indicators
Unemployment Rate	Unemployment refers to the share of the labour force that is without work but available for and seeking employment. Definitions of labour force and unemployment differ by country.	World Bank, World Development Indicators
Trade	Ratio of total trade (imports and exports) to Gross National Product (GDP)	World Bank, World Development Indicators
General Government Expenditure	General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). Data are in current U.S. dollars.	World Bank, World Development Indicators
Governance	The Corruption Perceptions Index (CPI) represents the perception of corruption in the public sector. Several sources (three or more) are included in any given value within the CPI, including information on bribery of public officials, embezzlement of public funds, and questions probing the effectiveness of public sector anti-corruption efforts. The index ranges from 0 (very high corruption perceived) to 10 (very low corruption perceived).	Transparency International (TI)
Population	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. The values shown are midyear estimates.	World Bank, World Development Indicators
Fractionalization Ethnolinguistic	The average of ethnic and language fractionalization indices. Ethnic fractionalization is the probability that two randomly selected people from a given country do not belong to same ethnolinguistic group. Language fractionalization is the probably that two randomly selected individuals speak different languages	Alesina et al. (2003): Fractionalization Database
Heterogeneity Index (cross-sectional)	The heterogeneity index is based on the average area of local government unit, ethno-linguistic, age, income, urbanization composition of the country's population, as well as its geographical features (relief, versatility of climate zones, etc.)	Ivanyna and Shah (2014)
Democracy	Computation: subtraction of the AUTOC score (autocracy indicator) from the DEMOC score (institutional democracy scale). Score ranges from 10 (strongly democratic) to -10 (strongly autocratic)	Polity IV Project: Political Regime Characteristics and Transitions
Public Health Expenditure, per capita	Public Healthcare Expenditure per capita is the public current spending on healthcare divided by the population. This indicator is constructed using three available indicators: i) public healthcare expenditure as % GDP, ii) private healthcare expenditure as % of GDP, iii) total healthcare spending (public and private) per capita.	World Bank, World Development Indicators
Public Education Expenditure, per student	Public expenditure per student is the public current spending on education divided by the total number of students by level, as a percentage of GDP per capita.	UNESCO Education Statistics

Hospital Beds	Hospital beds include inpatient beds available in public, private, general, and specialized hospitals and rehabilitation centres. In most cases beds for both acute and chronic care are included.	World Health Organization, supplemented by country data.
Physicians (per 1,000 people)	Physicians include generalist and specialist medical practitioners.	World Health Organization, Global Atlas of the Health Workforce.
Hospital Beds	Hospital beds include inpatient beds available in public, private, general, and specialized hospitals and rehabilitation centres. In most cases beds for both acute and chronic care are included.	World Health Organization, supplemented by country data.
Instrument Variables		
Land Area	Total land area in square kilometres	World Bank, World Development Indicators
Capital Population (%)	The percentage of the nation's population living in the capital city. This variable is constructed from two variables from the data source: urbanisation and capital population. Urbanisation is the percentage of the nation's population living in urban areas, and capital is the percentage of the urban population living in the capital.	World Bank, World Development Indicators
Direct Democracy	Qualitative variable: 1 - legislative provisions for public approval (in form of local referendums), in case of certain council or executive decisions; 0.5 - legislative provisions for public approval (in forms of public hearings, citizen assemblies) in case of certain council or executive decisions; 0.25 - legislative provisions for other forms of citizen participation (civil councils, open sessions of LG councils, possibility to initiate local referendum, possibility to submit citizens' petitions and initiatives to council); 0 - no legal provisions for direct democracy	Ivanyna and Shah (2014)
Legal Origins	Dummy variable: countries classed according to legal origins (laws of land origination), based on the data provided by La Porta et al. (1999)	La Porta, Lopez-de-Silanes, Shleifer, Vishny (1999)

Appendix B: Chapter 3 Poverty Country List

COUNTRY	CONTINENT	INCOME CLASSIFICATION	DATA IN CROSS-SECTIONAL	
			Income Distribution (57)	Absolute Poverty (26)
Bolivia	S.A.	Low	✓	✓
Georgia	EU	Low	✓	✓
Moldova	EU	Low	✓	✓
Mongolia	AS	Low	✓	
Tajikistan	AS	Low	✓	✓
Argentina	S.A.	Middle	✓	✓
Armenia	EU	Middle	✓	✓
Belarus	EU	Middle	✓	✓
Bulgaria	EU	Middle	✓	
Chile	S.A.	Middle	✓	✓
Colombia	S.A.	Middle	✓	✓
Costa Rica	N.A.	Middle	✓	✓
Croatia	EU	Middle	✓	✓
El Salvador	N.A.	Middle	✓	✓
Estonia	EU	Middle	✓	✓
Honduras	N.A.	Middle	✓	✓
Hungary	EU	Middle	✓	
Kazakhstan	AS	Middle	✓	✓
Latvia	EU	Middle	✓	
Macedonia	EU	Middle	✓	✓
Malaysia	AS	Middle	✓	✓
Mexico	N.A.	Middle	✓	✓
Paraguay	S.A.	Middle	✓	✓
Peru	S.A.	Middle	✓	✓
Poland	EU	Middle	✓	✓
Romania	EU	Middle	✓	✓
Russia	AS	Middle	✓	
Serbia	EU	Middle	✓	✓
Slovakia	EU	Middle	✓	✓
Slovenia	EU	Middle	✓	
Thailand	AS	Middle	✓	✓
Ukraine	EU	Middle	✓	✓
Australia	OC	High	✓	
Austria	EU	High	✓	
Belgium	EU	High	✓	
Canada	N.A.	High	✓	
Czech Republic	EU	High	✓	
Denmark	EU	High	✓	
Finland	EU	High	✓	
France	EU	High	✓	
Germany	EU	High	✓	
Greece	EU	High	✓	
Iceland	EU	High	✓	
Ireland	EU	High	✓	
Israel	AS	High	✓	
Italy	EU	High	✓	
Luxembourg	EU	High	✓	
Malta	EU	High	✓	
Netherlands	EU	High	✓	
Norway	EU	High	✓	
Portugal	EU	High	✓	
South Korea	AS	High	✓	
Spain	EU	High	✓	
Sweden	EU	High	✓	

Switzerland	EU	High	✓	
United Kingdom	EU	High	✓	
United States	N.A.	High	✓	

Appendix C: Chapter 4 Public Healthcare and Public Education Country List

COUNTRY	CONTINENT	INCOME GROUP	DATA IN CROSS-SECTIONAL			
			Vaccinations	Infant Mortality	Primary Enrolment	Classroom Size
Albania	EU	Low	✓	✓		
Australia	OC	High	✓	✓		✓
Austria	EU	High	✓	✓	✓	
Azerbaijan	EU	Low	✓	✓	✓	✓
Belarus	EU	Middle	✓	✓		
Bolivia	S.A.	Low	✓	✓		
Bulgaria	EU	Middle	✓	✓		
Canada	N.A.	High	✓	✓	✓	✓
Cyprus	EU	Middle	✓	✓	✓	✓
Denmark	EU	High	✓	✓		✓
Estonia	EU	Middle	✓	✓		✓
Finland	EU	High	✓	✓		✓
Georgia	EU	Low	✓	✓	✓	
Germany	EU	High	✓	✓	✓	
Iceland	EU	High	✓	✓		✓
India	AS	Low	✓	✓		✓
Indonesia	AS	Low	✓	✓	✓	
Ireland	EU	High	✓	✓	✓	✓
Israel	AS	High	✓	✓	✓	✓
Italy	EU	High	✓	✓		✓
Kazakhstan	AS	Middle	✓	✓	✓	
Latvia	EU	Middle	✓	✓	✓	
Lithuania	EU	Middle	✓	✓	✓	
Luxembourg	EU	High	✓	✓		✓
Moldova	EU	Low	✓	✓	✓	
Mongolia	AS	Low	✓	✓	✓	
Netherlands	EU	High	✓	✓		✓
Norway	EU	High	✓	✓		✓
Poland	EU	Middle	✓	✓	✓	✓
Portugal	EU	Middle	✓	✓		
Romania	EU	Middle	✓	✓	✓	✓
Russia	AS	Middle	✓	✓	✓	
Slovakia	EU	Middle	✓	✓	✓	
Slovenia	EU	Middle	✓	✓	✓	
South Arica	AF	Middle	✓	✓	✓	✓
Spain	EU	High	✓	✓	✓	✓
Switzerland	EU	High	✓	✓		✓
Tajikistan	AS	Low	✓	✓	✓	
Ukraine	EU	Low	✓	✓	✓	
United States	N.A.	High	✓	✓		✓

Appendix D: Chapter 5 Trust in Government and Institutions Country List

COUNTRY	CONTINENT	INCOME CLASSIFICATION	TRUST	
			WVS (45)	Eurobarometer (26)
Albania	EU	Low	✓	
Argentina	SA	Middle	✓	
Australia	OC	High	✓	
Austria	EU	High		✓
Azerbaijan	EU	Low	✓	
Belarus	EU	Middle	✓	
Brazil	SA	Middle	✓	
Bulgaria	EU	Middle	✓	✓
Canada	NA	High	✓	
Chile	SA	Middle	✓	
China	AS	Middle	✓	
Colombia	SA	Middle	✓	
Croatia	EU	Middle	✓	✓
Cyprus	EU	High	✓	✓
Denmark	EU	High		✓
Estonia	EU	Middle	✓	✓
Finland	EU	High	✓	✓
France	EU	High	✓	✓
Georgia	EU	Middle	✓	
Germany	EU	High	✓	✓
Greece	EU	High		✓
Hungary	EU	High	✓	✓
India	AS	Low	✓	
Iran	AS	Middle	✓	
Ireland	EU	High		✓
Italy	EU	High	✓	✓
Jordan	AS	Middle	✓	
Latvia	EU	Middle	✓	✓
Lithuania	EU	Middle	✓	✓
Luxembourg	EU	High		✓
Macedonia	EU	Middle		✓
Malta	EU	High		✓
Mexico	NA	Middle	✓	
Moldova	EU	Low	✓	
Morocco	AF	Middle	✓	
Netherlands	EU	High	✓	✓
New Zeal	OC	High	✓	
Norway	EU	High	✓	
Peru	SA	Middle	✓	
Poland	EU	Middle	✓	✓
Portugal	EU	High		✓
Romania	EU	Middle	✓	✓
Russia	AS	Middle	✓	
Serbia	EU	Middle	✓	
Slovakia	EU	Middle	✓	✓
Slovenia	EU	High	✓	✓
South Africa	AF	Middle	✓	
Spain	EU	High	✓	✓
Sweden	EU	High	✓	✓
Switzerland	EU	High	✓	
Ukraine	EU	Middle	✓	
United Kingdom	EU	High	✓	✓
United States	NA	High	✓	

Appendix E: Chapter 5 Trust in Government Cross-Sectional Data (World Values Survey)

Country	Trust in…					Public Mood
	Government and Institutions	Government	Parliament	Political Parties	Civil Service	
Albania	1.260	1.388	1.615	1.051	0.986	1.364
Argentina	0.719	0.907	0.696	0.579	0.696	0.696
Australia	1.191	1.191	1.191	1.191	1.191	1.191
Azerbaijan	1.777	2.297	1.923	1.554	1.334	1.419
Belarus	1.170	1.489	1.121	0.895	1.177	1.586
Brazil	1.100		0.788		1.411	1.649
Bulgaria	1.176	1.360	1.082	0.924	1.336	1.702
Canada	1.299	1.316	1.288	1.069	1.521	1.537
Chile	1.314	1.575	1.287	1.049	1.346	1.648
China	2.235	2.316	2.308	2.187	2.128	1.805
Colombia	1.065	1.457	0.942	0.791	1.072	1.688
Croatia	1.318	1.527	1.373	1.047	1.324	1.456
Cyprus	1.467	1.582	1.536	1.181	1.567	1.574
Estonia	1.321	1.430	1.316	0.931	1.608	1.564
Finland	1.333	1.462	1.399	1.025	1.446	1.620
France	1.106	1.006	1.160	0.803	1.455	1.347
Georgia	1.169	1.239	1.085	0.968	1.382	1.697
Germany	1.031	0.987	1.014	0.849	1.275	1.189
Hungary	1.039	1.004	0.997	0.762	1.394	1.259
India	1.573	1.549	1.696	1.373	1.674	2.059
Iran	1.500	1.745	1.701	1.209	1.347	1.734
Italy	1.109	1.075	1.175	0.889	1.297	1.445
Jordan	1.778	2.426	1.816	1.071	1.799	2.279
Latvia	1.053	1.196	0.988	0.678	1.348	1.438
Lithuania	1.213	1.314	1.169	1.012	1.357	1.677
Mexico	1.123	1.155	1.208	1.029	1.101	1.644
Moldova	1.112	1.188	1.127	0.891	1.240	1.582
Morocco	1.249	1.647	1.076	0.917	1.356	1.882
Netherlands	1.098	1.064	1.121	1.041	1.164	1.225
New Zealand	1.241	1.338	1.253	0.981	1.391	1.393
Norway	1.521	1.605	1.683	1.243	1.553	1.501
Peru	0.819	1.054	0.782	0.681	0.760	1.371
Poland	0.979	1.101	0.989	0.715	1.112	1.664
Romania	0.923	0.984	0.868	0.745	1.095	1.828
Russia	1.112	1.159	0.994	0.863	1.431	1.565
Serbia	0.914	1.011	0.899	0.767	0.980	1.275
Slovakia	1.176	1.306	1.103	1.001	1.295	1.565
Slovenia	1.001	1.189	0.980	0.788	1.047	1.313
South Africa	1.570	1.703	1.674	1.371	1.534	1.862
Spain	1.256	1.258	1.310	1.164	1.293	1.338
Sweden	1.398	1.341	1.481	1.228	1.542	1.427
Switzerland	1.450	1.621	1.477	1.126	1.577	1.311
Ukraine	1.043	1.074	0.905	0.834	1.360	1.566
United Kingdom	1.193	1.182	1.240	0.948	1.402	1.368
United States	1.265	1.289	1.204	1.068	1.498	1.614

Appendix F: Chapter 5 Trust in Government Cross-Sectional Data (Eurobarometer Survey)

Country	Eurobarometer Survey		Edelman Barometer	
	Trust in Government	Public Mood	Trust in Government	Public Mood
Austria	53.0	66.0		
Bulgaria	26.1	61.7		
Croatia	21.6	61.5		
Cyprus	64.0	67.9		
Denmark	59.1	68.9		
Estonia	54.4	63.8		
Finland	65.2	73.8		
France	30.1	55.8	31.7	38.1
Germany	37.1	66.4	29.0	36.6
Greece	41.9	61.8		
Hungary	29.4	57.3		
Ireland	36.9	65.7	36.0	47.3
Italy	30.6	57.0	32.0	45.6
Latvia	23.4	58.8		
Lithuania	26.2	65.6		
Luxembourg	71.2	58.8		
Macedonia	41.8	64.8		
Malta	51.6	64.1		
Netherlands	49.0	62.3	65.0	58.2
Poland	18.5	65.8	14.0	43.3
Portugal	35.4	66.7		
Romania	32.7	73.8		
Slovakia	33.7	64.5		
Slovenia	37.3	55.3		
Spain	47.8	55.8	38.5	50.4
Sweden	45.7	57.1	60.0	36.5
United Kingdom	29.4	64.0	30.0	39.4

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